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How dairy consultants help farmers design improved farming systems:

The diagnosis and solving of low profitability problems by an expert dairy consultant

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Abstract

DairyNZ have developed a training programme to improve the capability of novice consultants and this is being tested across seven consultancy firms. One important source of knowledge that would be useful for this training programme, is the knowledge held by experienced farm management consultants. New Zealand has a pool of very experienced farm management consultants with expertise in farm management consultancy. If this pool of expertise could be captured, it could then be passed on to novice farm management consultants to greatly enhance their capability. However, little research has been undertaken on the practices of New Zealand farm management consultants to date. In 2014, a pilot study was initiated to investigate how an "expert" dairy consultant helped a new client design an improved farming system. The pilot study obtained an overview of the problem solving process used by the expert consultant to help design an improved farming system for a new client, but limited detail into how the consultant diagnosed and developed solutions for specific problems such as low levels of profitability or low levels of milksolids production. This study seeks to extend the work undertaken during the pilot study to provide an in-depth understanding of the specific problem solving processes an expert consultant uses to diagnose and develop solutions for a new client whose farm business is achieving low levels of profitability.

The primary aim of the consultant was to help his clients better meet their goals. As such, he operates as a **change agent** where he tries to facilitate change in his clients' attitudes, social norms, knowledge, skills and behaviour. Where possible, the consultant adopts a **participatory approach** to problem solving with the client to ensure problem ownership. He likes clients to actively participate in the process as long as they do him the courtesy of listening to his advice. He is prepared to take the character and goals of clients into account to some extent when responding to clients, but does not change his basic modus operandi.

The results from this study highlight that a good consultant needs to be independent and objective with good people skills. They also need to think systemically, be open to new ideas, adaptable, experienced, knowledgeable, analytical, logical and goal-focused.

Triangulation was found to be critical to problem identification and diagnosis because the consultant is not the problem owner. The consultant might have to deal with missing or erroneous data. Triangulation allows the consultant to assess the reliability of the client's information and check inferences that he has made. This must be done carefully to avoid creating distrust. Several forms of triangulation were identified and the consultant uses the results from this to classify the client in terms of his provision of accurate information.

Unlike the results from other studies, this consultant did not use the client's accounts to identify if a low profitability problem existed. Rather, he used a range of indirect physical and management information to identify a potential low profitability problem. He can do this because he has a good systemic understanding of the drivers of profitability. If such a problem is identified, he then asks the client to put their accounts through Dairybase. The consultant has developed this approach because the financial position of the business is a **sensitive** topic for most farmers. Because of this, new clients are unlikely to talk to the consultant about this easily on a first visit. Instead, the consultant uses a range of indicators to **make sense** of the client's situation.

The consultant drew on his broad knowledge of the region to benchmark client's farms. He knew the amount of pasture dry matter harvested per hectare for different soil types within particular districts, where the location reflected the local climate. He also had similar benchmarks for stocking rate, milksolids production per cow and per hectare for soil type, location and system type. The development of such benchmarks for different regions would be useful for novice consultants. The consultant benchmarks a farm and classifies it as below average, average or above average for the indicator. If performance is above average (e.g. top 10%), this suggests that there is limited scope for improvement in this area. In contrast, if it is below average, this suggests there is considerable opportunity to improve performance. Similarly, if the client's farm performance is average, there is scope to move it into the top 10 - 20% of farms.

High level causes of low profitability include the level of pasture dry matter harvested per hectare, low levels of milksolids production per hectare, the use of high cost supplements and a high cost of milksolids production. Once a high level problem is identified, the consultant uses a diagnostic tree to identify its cause. This mental schema sets out problems and sub-problems by type and as one moves down the tree, there is a set of symptoms associated with each problem type at each level. The schema is used to hypothesise the symptoms associated with possible causes of the problem and rank the most likely causes. Different causes have different indicators or cues (e.g. symptoms of diseases that affect reproductive performance), so the consultant determines the specific set of indicators or cues he need to use to test that the hypothesised cause is in fact the source of the problem. Information is then collected during the farm visit and from the accounts analysis to confirm or refute these hypotheses in order of their ranking in terms of likelihood.

The consultant also has to assess **why** the client is performing poorly in a particular domain at a **high level**. He has to assess if this is a problem due to: 1) a **knowledge problem**, i.e. the client lacks the knowledge and skills to perform well in the domain, 2) an **attitude** or a **motivation problem**, i.e., the client has the knowledge and skills to perform well, but he is not interested in

performing well in that domain, or 3) a **social norm** e.g. the client is driven by the belief that good farmers achieve "high per cow production". The client uses a combination of methods to diagnose between these causes. He also uses different approaches to bring about change when the cause of the problem is: 1) a knowledge gap, or 2) an attitude problem or 3) a social norm.

Once a problem is diagnosed, a key aspect of the consultant's problem solving process is that he tailors his solutions to the client's requirements or context. This is central to his way of operating. He believes that if he fails to do this, then he is unlikely to secure repeat business from the client. To tailor a solution to a specific client, the consultant has to be able to generate a wide range of alternative solutions. This then provides him with a greater likelihood that one of these solutions will best match the client's situation or context. The consultant has techniques that allow him to increase the size of the solution space and also quickly identify a range of possible solutions to a problem. He has a classification schema for problem types and each problem type has a set of alternative solutions that he can draw on to then identify the solution that best meets the client's requirements.

During a visit, the consultant collects information about **constraints** (e.g. high debt levels, desire for high per cow production) that the client's situation will impose on the solutions he generates. He also identified resource opportunities that may be useful for different possible solutions (e.g. low debt levels, sand dunes). The consultant's classification schema also includes a set of attributes for each alternative solution in terms of resource requirements and so-on. He then matches the attributes of the alternative solutions with the constraints (and resource opportunities) to reduce his large set of alternative solutions down to a solution or solutions that best meets the needs of the client. The consultant rarely makes the final decision for his clients, just offering them advice which can be accepted or rejected.

The consultant sees himself as, to some extent, a knowledge broker who is constantly searching for good ideas to apply on-farm. At one end of the spectrum he provides most of the knowledge to his clients. At the other end, he learns a great deal from what he refers to as "***smart, thinking farmers***" who are innovative or doing something different. In the middle of this spectrum, there are farmers he works with to co-construct knowledge where each draws on the other's knowledge and experience to develop useful solutions. As such, the consultant can take the role of: 1) a sole provider of knowledge, 2) a co-constructor of knowledge, and 3) a recipient of knowledge. There are four main sources of new ideas for the consultant – scientists and academics, other rural professionals in the industry, and farmers (clients and non-clients).

The focus of the consultant's work is to bring about practice change so that the client can better meet their goals. In the context of this study, this relates to

improving the profitability of their farm business. Key processes that the consultant used to foster change included: 1) ensuring problem and solution ownership, 2) managing resistance to change, 3) building client self-efficacy, and 4) tailoring solutions to the client.

The other important question for this study is how can this knowledge be best used to train novice consultants? The study has made much of the expert consultant's tacit knowledge explicit and this can form the basis for training. Seminars and workshops can be run. Processes and templates that can assist novices with their work can be developed. A workshop could take the novices through the processes used by the expert consultant. The novices could test these approaches in the field and then reflect on them in a group situation designed to foster learning. These workshops could cover the following topics: information gathering and triangulation, problem identification and sense-making, problem diagnosis, solution tailoring, change management, the role of networks, the co-construction of knowledge; and identifying, evaluating and introducing new knowledge to clients. Templates could be developed such as the diagnostic tree described in this study to help novice consultants with the development of their own diagnostic processes. Similarly, the senior consultants in local consultancy firms could provide benchmarking standards for farms by soil type, location (climate) and system type for their region that would help a novice consultant more quickly identify potential problems on-farm. They could also document the diagnostics they use locally and use these to train new consultant. In the same vein, they could develop a typology of solutions for different problems along with their attributes and show how these can be tailored to specific problem contexts. These local resources could be built up over time and form part of a firm's important IP. Once a novice has built experience, one of his roles could be to critiques and refine these templates in conjunction with senior staff. Finally, novice consultants need to be made aware of the need for lifelong learning and the role of reflective practice.

1.0 Introduction

There is concern in the farm management consultancy field about the aging population of consultants and the lack of succession planning. One of the factors constraining the employment of new consultants is the time and cost required to train new consultants. Often it can take up to three years before a trainee consultant is proficient in the field. To help overcome this problem, DairyNZ have developed a training programme for new consultants based around the whole farm assessment process they use with their Consulting Officers. This programme is currently being piloted with seven consultancy firms across the country. The aim of the programme is to improve the capability of novice consultants such that they become proficient more quickly and as such reduce the high training cost of new recruits. One important source of knowledge that would be useful for this training programme, is the knowledge held by experienced farm management consultants. New Zealand has a pool of very experienced farm management consultants with expertise in farm management consultancy. If this pool of expertise could be captured, it could then be passed on to novice farm management consultants to greatly enhance their capability. However, little research has been undertaken on the practices of New Zealand farm management consultants to date. An initial pilot study has provided some insights into the problem solving processes used by an expert farm management consultant. However, further in-depth research is required into the diagnostic and solution generation processes used by expert dairy consultant. This study will extend a programme of research into the practices of "expert" farm management consultants that will provide material for the further development and refinement of the DairyNZ programme. Little is also known about the problem solving processes used by novice consultants, so another element of this study will seek to compare and contrast the processes used by a novice with that of an expert at a broad level. Finally, the pilot study highlighted the importance networks play in the expert consultant's practice. The final element of this study will compare and contrast the networks used by an expert consultant with that of a novice. The research questions and objectives for the broader study are set out below. However, this report only describes how an expert consultant identifies, diagnoses and develops solutions for clients with a low profitability problem. The findings from research associated with the other research objectives are reported in two other reports.

1.1 Research questions

1. How can novice farm management consultants in dairying best gain the expertise of experienced consultants?
2. What and how can we learn from expert farm management consultants in dairying to assist less experienced consultants?

1.2 Research Objectives

- To describe the processes expert farm management consultants use to diagnose and tailor solutions for a new client who is achieving low levels of profitability.
- To compare the consultancy process used by a novice consultant with that of an expert.
- To compare the networks used by a novice consultant with that of an expert.
- To determine how best to help novice consultants learn about the practice of farm management consultancy.

2.0 Method

The objective of the study described in this report was to investigate the problem solving processes used by an "expert" farm management consultant to identify, diagnose and solve low profitability problems for a client. A single-case study approach was adopted because it was considered the most appropriate method for collecting in-depth information about processes (O'Leary, 2005). The consultant was selected on the following criteria: specialist dairy consultant, at least twenty years consultancy experience, recognition as an expert in their field, and willingness to participate in the study. The consultant was a dairy consultant who specialised in both production and strategic management. Although recognised for his specialist areas, the consultants also provided general farm management advice. The consultant was an agricultural graduate and had 40 - 45 clients.

Prior to the data collection phase, a review of the literature was undertaken on consultancy and problem solving in particular (See Gray *et al*., 2014; Kemp, 2015). A semi-structured interview protocol (Ritchie and Lewis, 2003; O'Leary, 2005) was designed based on the literature review. The consultant was interviewed about the consultancy process normally used with a new client to identify, diagnose and solve a low profitability problem. Each interview lasted approximately one and a half hours. In total, eight, one and a half hour interviews were conducted with the consultant. Each interview was taped and the tape was transcribed. The data was analysed using a qualitative data analysis technique similar to that advocated by Dey (1993). A summary of the elicited information was sent to the consultants as a case report for verification. Once analysed, the case report was then compared and contrasted to findings reported in the literature.

3.0 Results and discussion

3.1 Introduction

This section presents the results from the study and compares these with the literature. The literature review is provided in a separate OneFarm report (Kemp, 2015) and also in the report by Gray *et al*. (2014). First the client-consultant relationship and the attributes of both a good client and a good consultant are discussed. The problem solving process used by the consultant is then discussed including the problem identification, diagnostic and solution tailoring processes used by the consultant. The final sections covered in the report are those that discuss the co-production of knowledge and the means by which the consultant brings about practice change.

3.2 The consultant-client relationship

The following section discusses the client-consultant relationship. The consultant aims to help his clients better meet their goals. As such, he operates as a change agent (Cerf *et al*., 2011) where he tries to facilitate change in his clients' attitudes, social norms, knowledge and skills and behaviour. Conversely, clients can modify the consultant's behaviour because they are paying for his services. For example, they may ask for a certain type of report. They may ask him to change the report structure or the level of analysis he undertakes. The consultant does a certain level of modelling work and analysis, but a client may ask for some more in-depth analysis. Other modifications might include the timing of visits or who is involved in the visits. The consultant is relaxed about any changes in these areas. Alternatively, the client may influence the consultant in terms of the topics he covers. Some farmers want to discuss financial results and others do not. The consultant compared himself to a handyman, he offers a range of services, and his clients can pick and choose from these. In effect, the consultant is tailoring his practice during a visit to the goals and objectives of his client. The following section discusses aspects of the client-consultant relationship including the characteristics of both a good client and a good consultant, why clients employ consultants and the use of their services.

3.2.1 The characteristics of a good consultant and how to choose one

The consultant believes that to be successful, a consultant requires a number of key characteristics. Good consultants must be **open to new ideas** and be prepared to change their own viewpoint in response to new information. They must also be able to **adapt** to ensure their business survival – he compares it to Darwin and evolution. The consultant stressed that a good consultant is not "a paid best friend", he must be **objective** and **independent**. He does not provided a client with the advice he wants to hear. This is something the consultant monitors over time as a relationship develops to ensure he is not losing his objectivity and independence. If the consultant was asked to make a

recommendation to a farmer thinking about taking on a consultant, he would suggest finding someone **compatible**. He believes that if they are not compatible, sooner or later, the relationship will break down. He suggests that the farmer talk to other farmers who use the consultant and find out what they deliver rather than just ask if the consultant is any good. He also advises that they ask why the farmer uses the consultant and why they believe the consultant is good.

Other criteria include someone who will **challenge the client** and someone who does not agree with everything the client says. The consultant would also recommend someone who will **know and understand the client's goals** and take them into consideration when providing solutions, that is they are **goal-focused**, a point made by Gray *et al*. (1999b). Other criteria would include someone who is **analytical** and **logical,** a point made by Talley (n.d.), **says what they think** and challenges or pushes the client (**help them reach their potential**). The consultant also mentioned criteria that a farmer might not even consider such as the need to find a consultant who will **act as a mentor**.

The consultant's views about the attributes of a good consultant are similar to those expressed by the dairy consultant in the Australian study (Coutts *et al.*, 2007) who thought that it was important to be flexible, experienced, knowledgeable and independent (Coutts *et al*., 2007). Van de Sanden (2011) in his study on what makes a consultancy engagement successful also found that it was important that an advisor be seen as objective. The issue of objectivity/independence is quite complex. Kubr (2002) in his book on corporate consultancy identified five types of independence required by a consultant. These were: technical, financial, administrative, political and emotional independence. To ensure a consultant has his client's best interests at heart, he must show financial, administrative and political independence. Technical and emotional independence are particularly important for farm management consultants. Kubr (2002, p. 6) defines technical independence as "*the ability to provide advice independently of what the client believes, or pretends or wishes to hear".* Because consultants develop strong relationships with clients, emotional independence is particularly important. Kubr (2002, p. 7) defines this as "*the ability to preserve detachment, irrespective of empathy, friendship and other emotional affinities*". Five of the seven clients in the Coutts *et al*.'s (2007) Australian study who were asked about their consultant selection process also thought that compatibility was vitally important. The consultant did not specifically refer to other factors that the clients in the Australian study (Coutts *et al*., 2007) thought were important – appropriate knowledge, skills and experience, however, these criteria were likely taken as a given. Kubr (2002, p. 533) identifies nine criteria for consultant selection in the corporate consultancy world. These include: professional integrity, technical competence, rapport or compatibility, understanding of the problem, context and approach, capability to

deliver, ability to mobilise further resources, cost of service, certification of competency and their professional image. Some of these have been mentioned by the consultant or in the consultancy literature, but not all of them.

3.2.2 The characteristics of a good client

In an Australian study on agricultural advisors (Coutts *et al.*, 2007), consultants were asked in a survey to rate the various characteristics of clients on a scale from Very Important to Less Important. The results indicated that most consultants would like the client to be clear about what they wanted from the interaction and participate in the proceedings whether asking questions, responding to suggestions or engaging in joint decision making. Of somewhat less importance was the requirement that a client should challenge the views of a consultant. The consultant in this study also has criteria for what he considers is a "***good client***". He, too, wants clients who actively participate in the proceedings (Block, 1999), share the decision making, and not believe everything he says. He prefers clients who think for themselves and for him it was very important that they challenge his opinions. Unconstrained by the format of a questionnaire, the consultant also mentioned several other issues. Farmers should give him the courtesy of listening to his advice and the reasons behind it. The consultant is happy if clients do not take his advice provided they listen to what he has to say and take it into account when making their decision. As such, clients have to be receptive and open to new ideas. They also have to demonstrate respect by giving the consultant the courtesy of listening to what he has to say.

The consultant considered that the "***fit***" between a client and a consultant is essentially a personality issue. Certain types of farmers work with certain types of consultants. Some farmers want a straight shooting consultant; others want the consultant to tell them what to do and so-on. As such, farmers tend to select consultants that suit their personality and the consultant believes that this is a **self-regulating** process. McLachlin (1999) in a study of the factors that influenced the success of the consultancy engagement for corporate consultants also identified the "fit" between the client and consultant as important.

The consultant does modify how he responds to client's based on their personality. He views these as modifications to his modus operandi rather than major changes. It takes cognitive effort to move outside one's normal mode of operation and as such the consultant tends to limit the amount of this he undertakes. The consultant also stated that clients have different goals (Cerf & Magne, 2007) and these along with personality, often determine their choice of advisor. For example, farmers that want to achieve high per cow production will be drawn to consultants that focus on this area.

There are times when the consultant makes the final decision for his clients, but he usually provides advice, based on an on-going dialogue, that may be accepted or rejected (Coutts *et al.*, 2007). The consultant is aware that a few clients are reactive and will always do what he suggests (Ingram, 2008). In this situation he has to make doubly sure his advice is correct because he knows it will be implemented without challenge. He cannot change such clients because that is their nature. The consultant will tend to terminate clients that do not meet his criteria, but this can depend on how his business is performing. If he is short of clients, he may retain someone who does not meet his criteria for business reasons (Ingram, 2008). Although he does not have this problem now, he noted that a novice consultant may have to do this to survive. Often the process is self-regulating because the client is not receiving the type of consultancy input he is looking for either.

3.2.3 Why clients employ consultants and their use of the services provided

According to the consultant, his clients are a diverse group (Alvesson *et al.*, 2009) and employ him for a number of reasons. These include someone who will:

- agree with their point of view,
- provide reassurance,
- provide a second opinion,
- provide information about new ideas and technologies,
- provide information about what is happening in the external environment,
- benchmark their performance against other farmers in the district,
- improve business performance.

These reasons can be compared with those actually given by Australian clients in the study by Coutts *et al.* (2007) when asked why they brought in an advisor. They reported that they wanted peace of mind and the opportunity to bring in someone who would provide another opinion. The need for reassurance and the necessity for a second opinion mentioned by the consultant is very similar to this. The Australian farmers also wanted to obtain advice from an independent source, learn what was required to make the business work and get help with making management decisions. More generally, the New Zealand consultant mentioned that his clients wanted information about new ideas and technologies. The requirement to be independent was not cited by him. On the other hand he did have clients that wanted him to benchmark their performance against others in the district. This reason for employing an advisor can be related to improving their profitability or just their standing in the community (Cerf and Magne, 2007). It is a mistake, the consultant believed, to automatically assume that the client has invited them out to the farm to help them improve profitability. For many of the consultant's clients, making more money is generally unimportant. Exceptions to this would be in periods of low payout such as in the

current environment, when such clients will be concerned about the liquidity and profitability of their businesses.

Kubr (2002, p. 13) provided has developed a detailed list of the services a corporate consultant can provide to a client and all of these are relevant to farm management consultants:

- providing information
- providing specialist resources
- establishing business contacts and networks
- providing expert opinion
- doing diagnostic work
- developing action proposals
- improving systems and methods
- planning and managing organisational change
- training and developing management and staff
- providing personal counselling

The consultant's clients, though often only want a subset of the consultant's services. He advises clients about other services they could utilise, but they often decline the offer. He wonders if this is a problem because he has failed to convince them of the benefits of such a service. A key area that many of his clients could benefit from is in the area of business management.

The consultant believes that his clients sit on a continuum from those that could use his services much more effectively through to those that are making full use of them. As a consultant, he can encourage his clients to better use his services, but that is all he can do because they are the ones paying his fees. The dairy advisor in the Australian study by Coutts *et al*. (2007) wanted his clients to have a sound understanding of the business and keep good records in order to make effective use of his services. The consultant in this study believes that some of his clients are not as prepared as they should be for a visit and are unable to provide the relevant information. For example, a number of his clients do not formally measure average pasture cover before a consultancy visit and others will not know how many cows they are milking. Some clients provide him with information, but it is inaccurate (e.g. herd numbers are 30 - 40 cows too high or too low). Some clients will have written questions prepared and others have no clear purpose for the visit. Where information is missing, the consultant has ways in which he can obtain it, but this requires further time. However, for some information (e.g. financial information), the consultant may have no other means of obtaining it and hence he cannot investigate that area on the day. The consultant can draw some inferences (e.g. profitable or not profitable) about a client's financial performance from other data. As such, poor preparation from the client may mean that the consultant has to spend more time sourcing information, or he may not investigate certain areas and the client misses out on

the benefit of his expertise. The consultant will tell the client this and explain that if they wanted him to investigate that area, the client would need to provide specific information. The client then has to decide if they want to collect the relevant information. The following sections will describe the problem solving process used by the consultant in relation to low profitability problems on-farm.

3.3 The problem solving process used by the expert consultant

In the following sections, the process the consultant undertakes to identify, diagnose and solve low profitability problems on a client's property is described. The consultant's process of problem solving is not as linear and straightforward as the normative problem solving models in the literature (e.g. Johnson, 1976). During the problem identification phase, the consultant will investigate areas that may indicate a low profitability problem (e.g. poor grazing management). However, this indicator also highlights one of the causes of low profitability, and it also indicates a possible solution to the problem (improve the client's grazing management capabilities). As such, the process the consultant uses almost simultaneously identifies the problem, diagnoses the cause of the problem and identifies a likely solution. Alternatively, he may complete a back calculation that indicates that pasture dry matter harvested per hectare may be limiting profitability. For this high level problem, he will then need to diagnose the cause of this from a wide range of possibilities (e.g. infra-structure, grazing management, system design). However, as with the previous example, the diagnosis of the problem then indicates the nature of the likely solution. For example, if the problem is a low level of soil fertility, the solution will tend to focus on improving this.

The consultant is also different from most other New Zealand consultants reported in the literature (Rogers *et al*. 1996a,b; 1997) who analyse a farmers accounts either prior to or during the visit. In contrast, the consultant in this study initially identifies a potential low profitability problem without analysing the client's accounts, but using a range of other cues. If the consultant identifies a low profitability problem, he will then ask the client to put his accounts through Dairybase so that he can then analyse the client's financial situation. As such, there is a two-step process where the consultant undertakes a preliminary problem identification and diagnostic process during the first visit which is then followed by a second visit where the consultant takes the client through an analysis of his accounts to diagnose the exact cause of a low profitability problem and then the consultant develops solutions to this problem with the client. The overall process is similar to that reported in other studies (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; Bruce, 2013) where a consultant compares cues to benchmarks to initially identify a potential problem and then undertakes a more detailed diagnosis to determine the exact cause of the problem before tailoring a solution. Prior to describing the consultant's problem identification

and diagnostic processes, the role the client plays in the problem solving process is described.

3.3.1 The role of the client in the problem identification and diagnostic process

The consultant was asked what the client's role was in the diagnostic process in relation to low profitability. He believes that it is critical that the client is ***bought into the process*** and is ***motivated*** to improve the profitability of his farm business. As such, the client has to be **receptive** to the idea that the farm has a profitability problem and the consultant has to be **honest** when dealing with the client and providing information. The consultant stated that he wants a client who states something like: "***yes, I am committed, I want to do this [improve the profitability of their farm business], this is important***". The consultant wants the client to admit he has a profitability problem and that he is keen to solve it. If the client is not interested in improving profitability, then the consultant will not pursue this area directly. He stated that: "***if you don't have buy-in, it is like taking your kids to the ballet and they are not interested in it***". The consultant either has to establish he has buy-in from the client, or he has to create this.

In the diagnostic process, an important role that the client plays is as the "***provider of information***". This is important because "***they will know things that I [the consultant] don't know***" about the farm business and their farming system. The consultant admitted that he does not have all the answers and he ***might obtain the answers from the client***. So the client may also be a **source of solutions** to the problem. The consultant stated that when he is undertaking a diagnosis with the client, it is always good if he can get the client to **come up with the answer themselves**. He gave the example of a successful advisor where after the consultant had left, the farmer thought he was pretty hopeless, but he now knew what the problem was with his farm business. However, he points out that a consultant has to take credit for assisting with the diagnosis because otherwise he will not be invited back. As such, the consultant tries to "***lead his clients through the diagnostic process"***. These results are different from other studies (e.g. Rogers *et al*., 1996a,b; Gray *et al*.,1999a,b, 2000; Bruce 2013) that have focused on the role of the consultant in problem solving with limited reference the client. In this study, the consultant has highlighted the importance of involving the client in the process in order to bring about change. In corporate consultancy the importance of participative change where consultants work closely with an organisation to bring about change has been stressed for many years (Kubr, 2002).

The consultant was asked how he leads a client through the diagnostic process in relation to profitability. He stated that he might start them off with a high

level question such as "***Where do you think there are some areas that are going to affect your profitability***?" Sometimes they go "off-track" and the consultant will need to bring them back on-track with another question such as: "***What about this area, how do you think your feed allocation is going***?" Again, their response might be on-track or they may go off-track again. So the consultant leads them through the diagnostic process with questions. For example, he might then ask: "***Where do you think your post-grazing residuals are most of the time***?" As such, the consultant has hypothesised what the likely problems are and he guides the client through a diagnostic process aimed at confirming (or refuting) the existence of these problems. The consultant is also **monitoring** the client's input into this process and **controlling** deviations from the planned diagnostic path through the use of **guiding questions** that are designed to keep the client "**on-track**". Sometimes the client will diagnose the problem with little help from the consultant and at other times the consultant will have to lead them through the whole process. However, he stressed that most of the time he gets the client to think through the diagnosis. He stated: "***Yeah, if you can [get them to think through the diagnostic process], it is a powerful process***". He stated that it is powerful because it brings about "***self-realisation***".

An alternative approach to the consultant's process is to tell the client directly what the problem is e.g. he could tell them that their pasture utilisation is poor and their post-grazing residuals are wrong. He stated that a client's first response to this is to take up a ***defensive position***. The client will then defend their position. The client and consultant end up in a **confrontational situation** which then makes it very difficult for him to change the client's behaviour. However, if the consultant can lead them through the diagnostic process, they then realise that their grazing management is not that good and that they could improve it. Overcoming resistance to change has been highlighted by Kubr (2002) as an important area in the corporate consultancy literature. The consultant believes that this is a critical skill for a young consultant. He ***does not believe that young consultants are trained in this skill***. Some people have a natural ability in this area, but little training is provided for this. Other consultants are very direct and tell farmers how "bad" their management is. The consultant noted that some clients like consultants that are direct and "***don't pull the punches***". This highlights differences in the attitudes of individuals towards change and their ability to change (Kubr, 2002), something good consultants such as the expert in this study assess.

The consultant also involves the client in the process of developing a solution to the problem. Often he will ask a client, "***how would you overcome this problem***?" This provides another opportunity for the client to take ownership of the problem and the solution. However, the consultant admits that the client's input into this process ranges from the consultant solely providing the solution,

the consultant and client jointly developing a solution, through to the client developing the solution himself. This will depend upon the capability and confidence of the client in the problem domain. The consultant also provided the example where he has explained the reason for the problem and put forward a suitable solution only to find the client puts forward an alternative, but effective solution. In this situation, the consultant reported that the client had identified other constraints or reasons (issues to do with the context) for the alternative solution that the consultant did not know about.

3.3.2 The role of triangulation in the problem identification and diagnostic process

The consultant stressed the importance of cross-checking or triangulation when identifying and/or diagnosing problems on a client's property and that this process should occur throughout a visit e.g. "***one always has to ask cross-checking questions***". For example, he always verifies a farmer's cost of milk production because of the problems of calculating it correctly and also because it may be artificially low (or high). Often farmers exaggerate their performance because of ego or to gain mana or status. Alternatively, costs may be artificially low because of how they are classified for tax purposes by the accountant or for other reasons (e.g. high spending on R & M and fertiliser in the previous year when the milk price was high). As such, the ability to cross-check information provided by the client is a key skill for a consultant. The role of triangulation in problem identification and diagnosis has also been highlighted in other studies of consultancy (Rogers *et al*., 1996a; Gray *et al*., 1999a, 2000; Bruce 2013).

The consultant provided an example of **cross-checking questions**. He might ask a client how much supplement he is feeding his herd. The client might respond by stating 4.0 kg/cow/day. The consultant would then ask him how many wagon loads of supplement he is feeding out per day. The consultant will know roughly what a wagon load holds and he can divide this number by the number of cows on-hand to double check the client's estimate. Normally the consultant will ask the first question, then ask something in between and then bring in a cross-checking question so that it **does not appear** that he is **challenging the information** the client is providing. He will also never directly state that he does not believe them because this will lead to the client becoming defensive. In an assessment of novice consultants' use of the DairyNZ "Whole Farm Assessment and Planning Program" Kenny and Nettle (2013) identified that they needed to be able to triangulate information better because the cross-checking questions they used often put farmers on the defensive.

For the above example, if the cross checking shows that the actual amount fed is within 0.5 kg DM/cow/day of the client's estimate, then the consultant will not pursue the issue further. However, if it out by a significant margin, he will state "that doesn't sound quite right?" as opposed to accusing the client that he is

lying. The consultant will then rework his numbers out loud with the client e.g. "That doesn't sound quite right. How many loads did you say? And you have this many cows, so that is X kg DM divided by Y cows". As such the consultant takes the client through the calculation to confirm that they are not feeding the amount of supplement they thought they were. As such, a key aspect of this triangulation process is to structure it such that 1) the client does not feel that their honesty has been called into question and 2) that they are involved in the cross-checking process that confirms they have made an error. Whatever the situation, the consultant will never directly state that he does not believe the client because the farmer will become defensive. He avoids the problems of novice consultants who reported that the cross-checking questions they used often put farmers on the defensive (Kenny and Nettle, 2013).

Triangulation is important because as a consultant "***where you get things wrong is where you haven't got the picture right***". If the consultant does not know what drives the client or does not pick up any "**red flags**" during the farm walk, he can think the client is performing well when the farmer is only performing averagely. Sometimes this can occur if one is in a new area and does not know some of the resources such as the different soil types or climatic issues in that area. There may be areas that are sand country, areas of heavier soils (or lighter), or they may have micro-climate issues. Some areas might be very wet, others very dry. A key issue he has to establish is what is good versus average levels of milksolids production for this area. For example, 900 – 1000 kg MS/ha might be good on sand country, but only average on other soil types. He stressed that "***you've just got to keep your expectations in the right zone***". The consultant pointed out that the important thing is "***to know that you don't know everything***" and this rule helps ensure that the consultant does not get caught out when he visits a client in an area that he is not familiar with.

The use of triangulation also allows the consultant as he gets to know his clients to **classify** them into farmers that provide reliable and accurate information and those that do not. With regards to grazing management, the consultant might ask: "1) What is your rotation length? 2) How much area have you got in grass? and 3) What area are you giving them per day?" The consultant uses questions 1 and 2 to estimate the area the client should be feeding the herd per day and then compares this with what he is actually feeding them to see if the two numbers match. The consultant stated that some information can be triangulated and other information cannot.

A key part of the consultant's process is to know when information provided by the client does not sound correct. He is forever assessing the **correctness** of the information he is obtaining from the client. He stated that "***You've always got to question, and you've always got to assess, does this sound right,***

and if you don't ask that, you are going to let some rubbish [false information] slip through". When assessing information from the client, the consultant is always asking himself "***does it feel right***"? If it does not feel right, the consultant will go back and ask further questions of the client to verify the information. This is another example of triangulation. The same thing could happen when he is finding out about the client's skills and abilities or modelling a farm on a spreadsheet or in Farmax. The consultant is cross-checking information from the client all the time. For example, if the client states that his cost of milk production is $3.50/kg MS, the consultant will think "***well that pretty damn good, you had better show me your books because it may or may not be right***".

Often "**alarm bells**" ring because the consultant has **built up a set of expectations** about the client and his capability during the picture building phase and if the client tells him something that is not congruent with the consultant's expectations, this will trigger him to investigate the area further (Figure 3). He stated that "***for any system, you've got to have checks and balances … And so mine would be, how much away from expectations is it***"?

Overall, the consultant builds a picture of the client over time as he collects information during the farm visit. From this, he uses a range of techniques (benchmarking, comparative analysis) to classify the client and his farm business. Drawing on his classifications, he then infers expectations about the client's capability and performance. These expectations are then compared to additional information that is collected as the visit progresses. If the new information meets the consultant's expectations, then this validates that his current "picture" of the client is correct (Figure 3). However, if the new information is different from his expectations, then he will collect further information to verify the new information. In some instances he may find that the new information was incorrect. For example, the client may have mis-calculated a performance indicator and the farm is actually performing to the level the consultant expected. This then validates that his original picture of the client is correct (Figure 3). Alternatively, the new information may be found to be correct. This then invalidates the consultant's picture of the client and he has to revise it (Figure 3). To develop the skills to build accurate expectations about a client and their farming system takes experience, but the consultant stated that one can short circuit this by using networks and resource people such as the Dairybase staff.

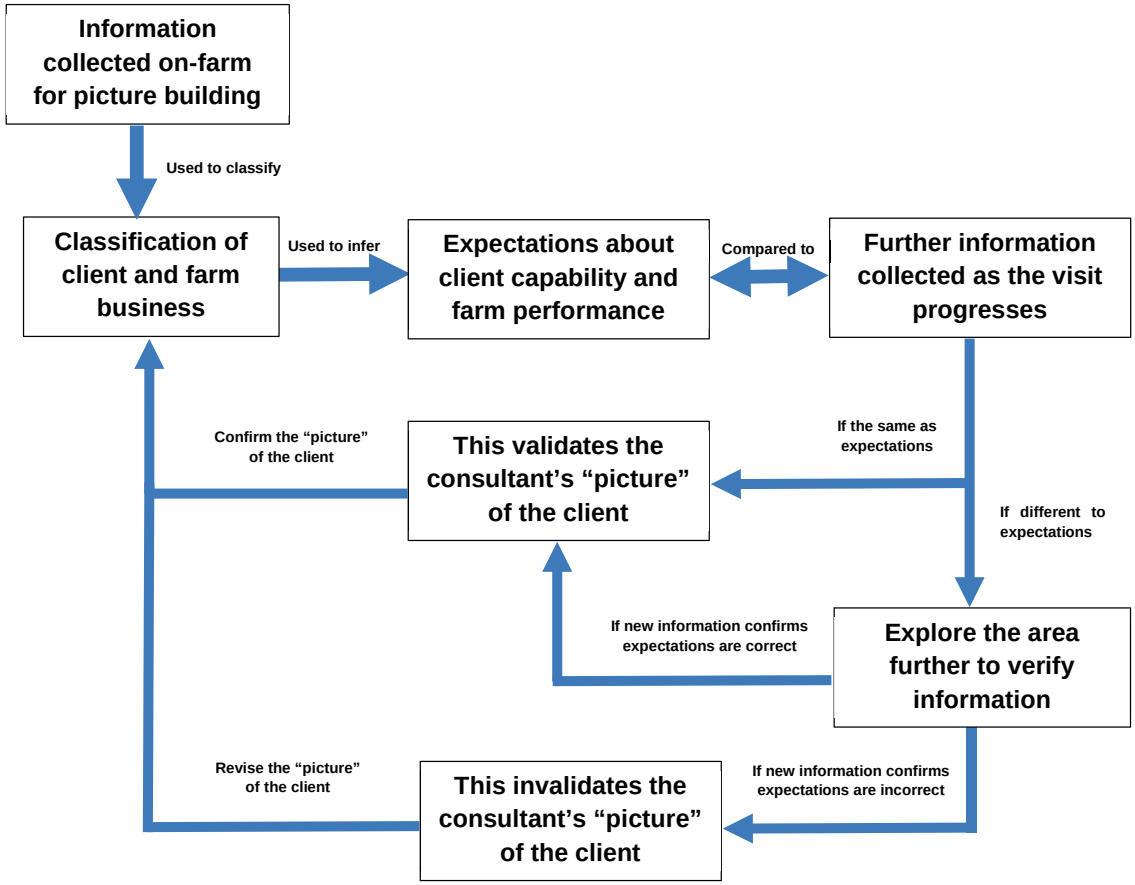

Figure 1. Information verification process.

Gray *et al*. (1999a, 2000) also reported that expert consultants used information to classify their clients and their farm businesses and that further inferences about the client's capability and performance were then drawn from these classifications. However, they did not discuss this in relation to the triangulation process and the validation or invalidation of the consultant's knowledge about the client. However, the role of expectations in the identification of faulty knowledge by farmers has been described in a study by Gray *et al*. (2003).

3.3.3 Problem identification and sense making

Unlike other consultant that use accounts analysis prior to or during a first visit to identify a low profitability problem (Rogers *et al*., 1996a,b; 1997), this consultant identifies if a client has a low profitability problem from physical and management information. If such a problem is identified he then asks the client to put their accounts through Dairybase. The consultant has developed this approach because the financial position of the business is a **sensitive** topic for most farmers. Because of this, new clients are unlikely to talk to the consultant about this easily on a first visit. Kemp *et al*. (2000) reported that the consultant

in their study did not discuss sensitive topics such as the client's financial position or their personal goals until they had developed a good level of rapport. The stage at which the consultant can ask a new client about their financial situation differs from client to client. Some may be very open and provide full disclosure on the first visit, others may require 3 – 6 visits and some clients never discuss their financial position. The latter employ the consultant for technical, not financial advice. The consultant makes the analogy to adult education, adults know what they want to learn and he as a consultant has to respect that. As such, on a first visit, it is best to talk about less sensitive material such as the physical resources of the farm, the farming system and the physical performance of the farm.

As with other studies (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013), the consultant uses a wide range of physical indicators or cues to identify the problem. These included indicators for: wastage of capital, physical productivity measures, and the client's use of different feed types. One financial indicator the consultant considers is the cost of milk production ($/kg MS). However, he again uses physical indicators such as the amount and type (low versus high cost) of supplement the client uses as proxy indicators of a high cost of milk production. A range of indicators are used by the consultant to **make sense** of the client's situation. As such, problem identification is analogous to **sense making** (Klein *et al*., 2006) where a range of information sources or cues are used to make sense of a situation. These physical indicators provide the consultant with an idea about how the farm is performing financially, but to really understand this, he must look at their financial accounts.

3.3.4 The selection of problem identification and diagnostic indicators

The consultant draws on a wide range of sources to determine what indicators will be most useful to him in diagnosing particular problems. These include various experts, written material, seminars and conferences. He stated that he is constantly dealing with **new knowledge** that is being developed by science, some of which contradicts previously held beliefs. First he assesses if the information they provide is new (Figure 2), that is, it is something he did not previously know. If a source has identified important drivers of profitability, then he would look into the research and assess its usefulness or relevance (Figure 2). However, for this new knowledge to be acceptable to the consultant, it has to be provided by a reputable science provider such as DairyNZ (Figure 2). He draws heavily on New Zealand research that has investigated the drivers of profitability on dairy farms. He needs to know which key performance indicators are the important indicators of profitability. He stressed that there is no point focusing on indicators that have a 10 – 15% correlation with on-farm profitability. He wants to identify the indicators that have a high correlation with profitability.

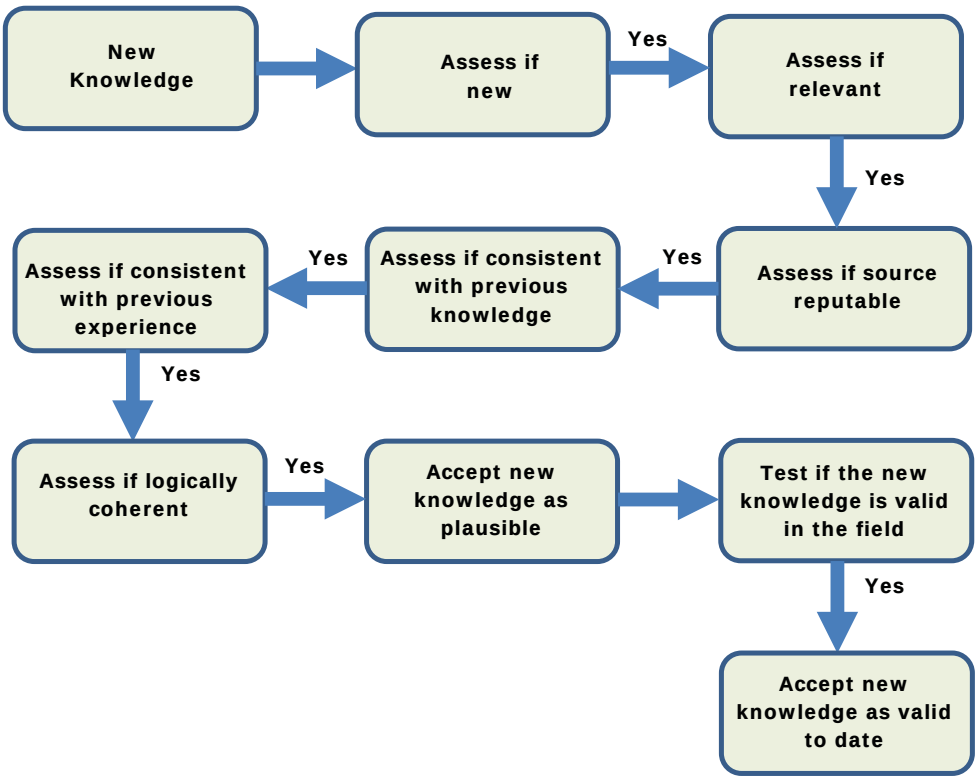

Figure 2. How the consultant evaluates new scientific knowledge.

The consultant stated that recent research has highlighted that high milksolids production per cow and per hectare is poorly correlated to profitability. In contrast, pasture dry matter harvested per hectare and the cost of milk production are highly correlated with profitability. As such, these are the indicators that the consultant places a heavy weighting on when he is assessing the profitability of a farm business. Previously, milksolids production per hectare was a useful indicator of farm profitability because farm systems were similar and they all used a low level of inputs. The consultant stressed that pasture dry matter harvested per hectare and cost of milk production are only "***partial***" indicators of profitability. If he wants to truly assess the profitability of a client's farm, he has to calculate the indices at the top of his "***profitability tree***" which is return on assets. Shadbolt (2012) also makes this point in her paper on competitive strategy analysis of New Zealand pastoral dairy farming systems. She states that partial indicators like operating profit per hectare and operating expenses per kilogram of milksolids fail to recognise the asset base required to deliver the production in a farm system and therefore the cost of that asset base. As such, she advocates that return on assets and return on equity are the most appropriate indicators of on-farm profitability because they take into account the cost of the asset.

Some of the **new knowledge** developed by science contradicts previously held beliefs. As such, the consultant also assesses the veracity of the information against his previous experience and knowledge and on the basis of **logical** coherence (Figure 2). Normally new research ***reinforces*** what he has known intuitively, but it "***cements the knowledge***". His reaction to the material on indicators of profitability would have been "***yes that is very logical and that doesn't surprise me***". This information did not induce an "**ah ha moment**" where the results ran counter to his beliefs about the drivers of profitability. For example, he would have already known from his experience that milksolids production per hectare is not a great indicator of profitability, but he would not have known the degree to which this was true. If the new knowledge passes all these tests, the consultant will accept it as plausible and then apply it in the field. His ultimate test of the validity of such new knowledge is if it is validated in the field with his clients. Little is written about learning and knowledge in relation to farm management consultants. However, several farmer learning studies have highlighted the role of validation in the learning process (Gray *et al*., 2003; Sewell *et al*., 2016).

The consultant pro-actively builds networks to source information about on-farm profitability in a similar way to advisors in the study by Klerkx and Proctor (2013). This is similar to Thompson's (2005) research where he found that people with pro-active personalities obtained performance benefits by developing social networks that provide them with resources and latitude to pursue high level initiatives. As a consultant, he has to decide who he listens to in terms of providing him with useful knowledge and who not to listen to. This has been referred to as "***know-who***" knowledge by Klerkx and Proctor (2013). The consultant made the point that he cannot listen to everyone otherwise he would go around in circles. Over time, he validates the knowledge he obtains from these experts as it is applied by his clients. For example, in terms of validating the relationship between pasture dry matter harvested per hectare and profitability, the consultant has observed that his clients who harvest less dry matter per hectare tend to be less profitable than those that harvest high levels of pasture dry matter per hectare. Once the consultant has built trust with a particular expert, he is less likely to question their advice. Alternatively, his validation process may mean that his trust in some experts declines over time if their knowledge is found to be faulty. He classifies such individuals as providers of unreliable information.

This material also highlights that there is **risk** around new knowledge for the consultant. If the knowledge is wrong, then the consultant's reputation suffers. Alternatively, if there is useful new knowledge in the domain, but the consultant does not assess that it as useful to his clients, his reputation will also suffer. Cerf *et al*. (2011) discussed the problems of advisors providing advice on sustainability where there is a lack of proven techniques or missing scientific

knowledge in this area. Knowledge assessment or evaluation and validation is an important area for consultants because they are **knowledge brokers** (Klerkx *et al*., 2009; Klerkx and Proctor 2013) and also **boundary spanners** (Eastwood *et al*., 2012) between scientists and farmers. As a knowledge broker, the identification of reliable knowledge sources is critical both for the individual advisor and the industry they operate in.

3.3.5 Benchmarking physical productivity indicators

To identify a low profitability problem on a first visit, the consultant uses physical productivity indicators to benchmark the farm. The benchmarking process is similar to that reported in other studies (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013) where the consultant compares the farm's values to benchmarks for key indicators to identify if a potential problem exists. The difference between this expert consultant and those in other studies (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013) is that he is using indirect physical indicators rather than financial indicators to identify a low profitability problem. He can do this because he has a good systemic understanding of the drivers of profitability. Gray (2001) reported similar findings in relation to the indirect cues expert dairy farmers used to monitor their farming systems for tactical management purposes. There are dangers in using partial indicators of profitability as advocated by authors such as Shadbolt (2012) and Candler and Sargent (1962). For example, Ho *et al*. (2013) found that no single partial technical measure was a good indicator of return on assets or farm profitability. However Ho *et al*. (2013, p. 896) did argue that "*partial average efficiency ratios, whether technical or economic, are used widely and can represent shorthand proxies indicating something about what is happening at the farm level when the user has a thorough and sound knowledge of the whole system*". Candler and Sargent (1962) showed that increasing physical efficiency in the simple product:factor sense may or may not improve profitability. For example, a farmer in the top 10% for per cow production could improve profitability by reducing per cow production and increasing stocking rate. Ho *et al*. (2013) also pointed out that the logic of using correlations is flawed because a correlation is not causation. They then go onto state (p.897) that: "Apparent correlations between partial average technical measures for levels of single inputs (e.g. nitrogen/ha) and systems output measures (e.g. milk per ha), on individual farms are often mistakenly thought to suggest that better performance in these single measures on *other* farms should lead to improved return on assets or operating profit. This is not the case because each farm is operating on different input response functions". The consultant in this study tries to overcome this problem by developing physical benchmarks around similar resource bundles (soil types and location (climate)) and system types. Candler and Sargent (1962) also argued that where reasonable estimates of the production relationships exist between inputs and outputs, simple farm

standards can be used with confidence. He provided the example of understanding the relationship between fertiliser rates and pasture production. The consultant in this study has a very good knowledge of the relationships between technical factors and production. As such he understands the theory behind the measurements used for benchmarking.

The most important indirect indicator used by the consultant is pasture dry matter harvested per hectare and the associated drivers of this. He based this ranking on work presented by Eric Kolver and Phillipa Hedley at a seminar in 2008 that showed a correlation of 0.68 between pasture dry matter harvested per hectare and economic farm surplus per hectare. The second important set of indicators include low milksolids production per cow, stocking rate and milksolids production per hectare along with their associated drivers and including comparative stocking rate and feed conversion efficiency. The third set of important indicators include those related to supplement use such as: the use of high amounts of non-pasture feed for the level of milksolids production, and the use of expensive feed types, low levels of pasture utilisation and high post-grazing residuals that suggest that feed is being wasted. The consultant may also use indicators associated with reproductive performance and the quality of the client's replacements to indicate a low profitability problem. The final indirect indicator of a low profitability problem is the cost of milk production. Again, the consultant uses indirect physical indicators to identify if the client has a high cost of milk production. The following sections describe how the consultant uses these various indicators to identify if a client has a low profitability problem.

3.3.5.1 Using pasture dry matter harvested as an indicator of a low profitability problem

Pasture dry matter harvested per hectare is a key indicator of farm profitability that is used by the consultant. The consultant mentioned research that had been presented at a seminar showing a high correlation ($R^2 \approx 0.6$) between pasture dry matter harvested per hectare and profitability. This work was presented by Eric Kolver and Phillipa Hedley where they plotted pasture dry matter harvested against economic farm surplus per hectare using data farms that had entered the 2002 Fonterra Westpac Dairy Excellence Awards. They reported a high correlation between these two variables ($R^2 = 0.68$). Using the same data Glassey (2005) found that for every extra tonne of pasture dry matter eaten, economic farm surplus increased by $200/ha. In another study by McGrath (1997), based on 117 Taranaki farms, he found that high economic farm surplus farms (> $2000/ha) consumed 15.8 t DM/ha compared to lower economic farm surplus farms (< $1200/ha) that consumed 11.5 t DM/ha. Savage and Lewis (2005) reported that for farms in their Dairy System Monitoring programme, for every additional 1 t DM pasture harvested/ha, the farm gross margin increased by $339/ha in 2003/04. In 2004/05, using data

from 25 farms, they found that for every additional 1 t DM pasture harvested/ha, the farm gross margin increased by $304/ha with a correlation of 0.65. Interestingly, other studies (Ho *et al*., 2013; Miller and Savage, 2016) have found a low correlation between pasture dry matter harvested and profitability ($R^2 < 0.2$).

These differences in correlations may reflect differences in the samples used to derive the correlation in terms of location and systems type. That is a nationwide survey (broad range of soils and climate) covering all system types is likely to show lower correlations between physical benchmarks and profitability than those derived from regional or district data where farms have similar soils and climate and only represent one system type (e.g. irrigated dairying). The other issue with correlations between pasture dry matter harvested and operating profit per hectare is that the measure takes no account of the value of the assets. It could be expected that higher value land will grow more pasture dry matter per hectare and that the derived correlation is reflecting land value or quality. This problem can be minimised by developing benchmarks for land of similar "quality", something that the consultant attempts to do in relation to his benchmarking process.

The consultant uses both **direct** and **indirect** measures of pasture dry matter harvested (Table 1). This has not been reported in the consultancy literature, but Gray (2001) reported that expert dairy farmers in his study used both direct and indirect measures of an indicator for problem identification. To obtain a direct measure of how much dry matter the client harvested the previous season, the consultant will undertake what he refers to as a "**back calculation**". This back calculation is a process used to calculate the amount of dry matter the client has harvested off his milking platform over the previous season. It is based on the number of cows milked, the total annual milksolids production, the opening and closing supplement levels, and the amount of feed used in the system (forage crops, nitrogen, ProGib, supplements, grazing off etc.). The calculated figure is then compared to the consultant's benchmarks for location and soil type. A similar calculation is set out by DairyNZ (2016a) in their Farmfact publication.

Table 1. Primary and secondary indicators of pasture dry matter harvested.

Direct indicator	Indirect indicators
Pasture dry matter harvested per hectare	State of pastures - pre-grazing pasture cover levels and post-grazing residuals - the grazing history of paddocks - the amount of dead matter in the sward - pre-grazing pasture cover levels and post-grazing residuals Supplement making and use - high post-grazing residuals and supplement wastage - low post-grazing residuals - level of topping - level of supplement made on the platform Pasture management systems - adjustment of grazing area and supplement levels - record average pasture cover levels - monitor pre- and post-grazing pasture cover levels - proportion of the farm topped - amount of supplement made on the platform - level of monitoring and recording undertaken Inconsistencies between verbal cues and observations - grazing rotation - pre-grazing pasture cover levels and post-grazing residuals Discourse on grazing management - use of terms like pasture dry matter harvested per hectare

The consultant has developed a detailed and resource-specific matrix for benchmarking key physical productivity indicators. He has established pasture dry matter harvested levels for good, average and poor farms by district (climate) and soil type. This allows him to compare the performance of his clients to benchmarks that much more closely match the resource bundle they are farming than he can achieve with his financial benchmarking. The reason he classifies farms by district or location is that soil type and climate at different

locations in his region are important drivers of pasture production. This benchmarking process allows the consultant to classify the client's performance as poor, average or good in terms of the indicator. This information is a guide, but the consultant can tell if the figure is in the right ball park by observing his **indirect** measures of pasture dry matter harvested per hectare (Table 1). As such, the consultant uses a process of **triangulation** to ensure that the problem identification process is accurate and that he does not mis-identify the problem. The role of triangulation in problem identification and diagnosis has been highlighted in other studies of consultants (Rogers *et al*., 1996b; Gray *et al*., 1999a,b; 2000; Bruce, 2013).

The consultant uses a range of **indirect** measures to identify if there is a problem in relation to pasture dry matter harvested per hectare (Table 1). To do this, he obtains information about the client's general grazing management. He also observes the state of the pastures on the farm. Key indicators of the amount of pasture dry matter harvested per hectare include: the amount of dead matter in the sward and the degree to which the client's pre- and post-grazing residuals are maintained at levels consistent with best practice. He observes the grazing history of the paddocks on the farm. If a client is poor at grazing management, this will be reflected in his paddocks as the consultant walks around the farm, particularly over summer and autumn. In winter, he might observe that paddocks have been grazed to low residuals that will limit regrowth. Some of this information may take 2 – 3 visits to gather because the consultant is observing if the client's grazing management is consistently poor or if he just happened to turn up on a day when the grazing was more lax than normal due to some aberration. The consultant will also be observing if the client is using too much supplement and under-grazing the sward or too little supplement and over-grazing the sward. He will also be checking if the client has had to top large areas of the farm or make a lot of supplement because he has lost quality on a large proportion of the farm or if the client has failed to make enough supplement and pasture quality has declined as a result. As such, he is looking for information about the quality of the grazing management and the quality of the client's decision making around grazing management, supplement feeding and supplement making.

The consultant also assesses his clients' pasture management systems (Table 1). Poorer managers tend not to: 1) adjust grazing area and supplement levels to achieve post-grazing residual targets, 2) record average pasture cover levels or 3) monitor pre- and post-grazing residuals. They may also do a lot of topping rather than put surplus feed into a silage stack. These indicators are used to assess if the client is wasting feed (or not growing feed to the farm's potential). The consultant also identifies what the client is monitoring because "***client's tend to track what they are interested in***". The consultant is also looking for **inconsistencies** between what the client tells him and what he is observing in

the field. For example, if the client says he harvests about 13 tonne DM/ha/yr, but the consultant is observing that the client's residuals are too high (e.g. 1700 – 1800 kg DM/ha) and the sward has high levels of dead matter, then this will suggest a potential problem in relation to pasture dry matter harvested per hectare. This is similar to the process the consultant in Bruce's (2013) study used to assess the management capability of a new client. The consultant stated that another indicator he looks for is how the client talks to him about pasture management, or the client's **discourse** on the subject. Previous research into consultancy has not identified the discourse of a client as an indicator of a problem.

The process used by the consultant is summarised in Figure 2. First the consultant directly calculates pasture dry matter harvested per hectare per annum using data obtained from the client. This may indicate that the client's level of pasture dry matter harvested is poor, suggesting he may have a low profitability problem. The consultant will then collect information about the **indirect** indicators of low pasture dry matter harvested which might include: the client's grazing management, pre- and post-grazing residuals, the amount of dead matter in the sward, and so-on (Table 1). The consultant may use 2 – 10 indirect indicators to further identify that a problem exists (Figure 1). The consultant will then move to the next indirect physical indicator of low profitability and repeat the process until he has built up a picture of the clients business in relation to low profitability across a wide range of cues (Figure 1). This is similar to the process reported by Gray *et al*. (1999a, 2000) based on the work of Endsley (1997) in the field of naturalistic decision making. Gray *et al*. (1999a, 2000) reported that the consultant in their study had a set of problem types (e.g. a low profitability problem) and that each problem type had a set of attributes which the consultants looked for to identify that that problem type existed. The consultants used these classification schema to categorise the problem. Also of interest was the fact that the consultants in these studies had different sets of "problem types" suggesting that each consultant develops their own personal classification schema for problem diagnosis.

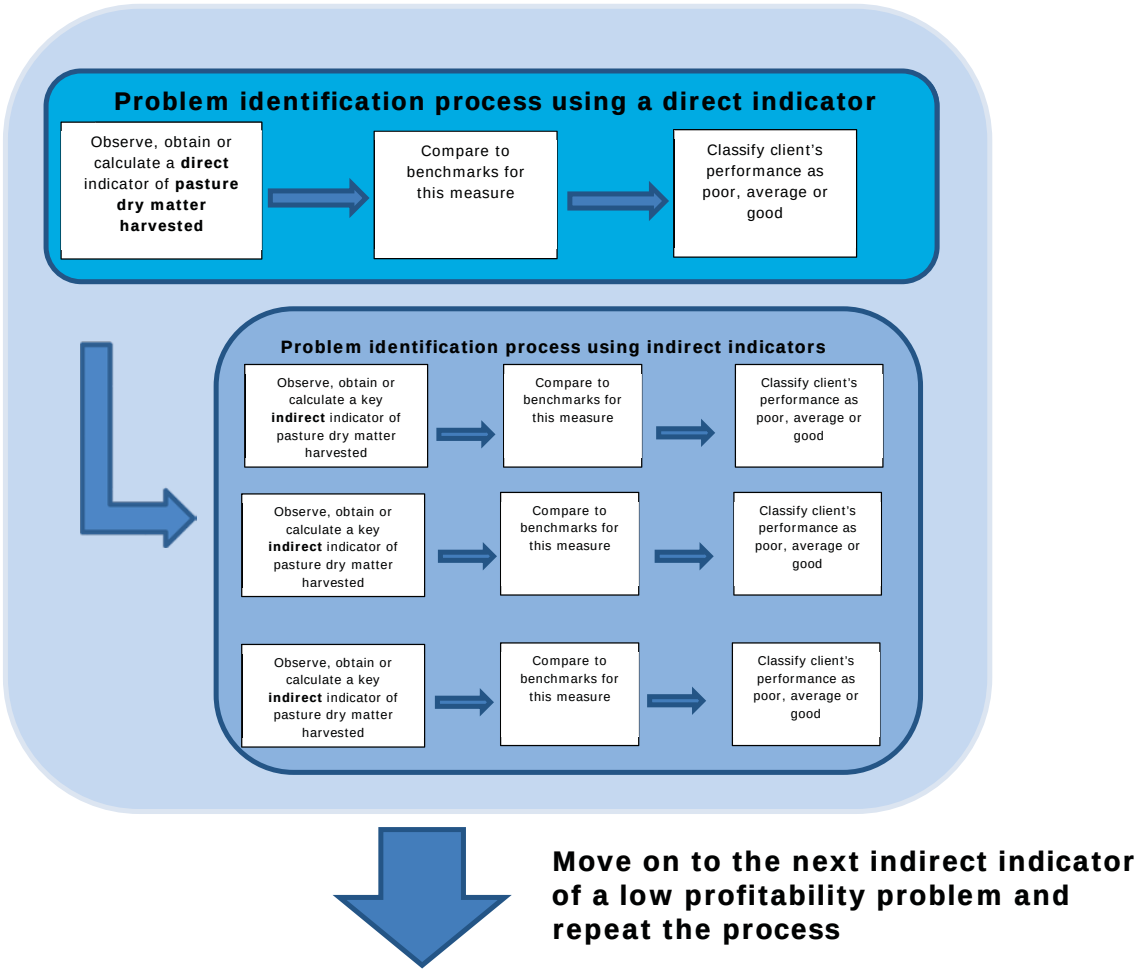

Figure 2. The problem identification and sense-making process used by the consultant.

The process used by the consultant is similar to the **sense making** process described by Klein *et al*. (2006). The consultant uses benchmarking by comparing the clients' values for a parameter against industry standards and classifying the client as poor, average or good in relation to their performance relative to the standard. This is also similar to the benchmarking and classification process identified in other studies (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013). However, these other studies did not provide the detail around the number of cues an expert consultant might draw on to identify a particular problem type. The consultant uses his "diagnostic tree" to assess the importance of his different physical indicators of low profitability and the higher up the tree, the more important the indicator and the higher its correlation to profitability. Gray *et al*. (1999a, 2000) mentioned that consultants in their study compared the diagnostic process to working down a "diagnostic

tree", but they did not mention its role in relation to identifying the importance of different indicators in relation to identifying a problem.

3.3.5.2 Using milksolids production and stocking rate as indicators of a low profitability problem

The next set of indirect indicators of low profitability used by the consultant are milksolids production per cow and per hectare along with stocking rate. Again, the work of Ho *et al*. (2013) reported that these partial indicators had a low correlation with operating profit per hectare for New Zealand farms (R^2 between 0.1 and 0.3). Miller and Savage (2016) reported correlations between operating profit and milksolids per cow (R^2 = 0.06) for a group of South Island farms in 2015/16. Savage and Lewis (2005) however reported that data from South Island farmers in their Dairy Systems Monitoring programme showed a high correlation (R^2 = 0.75) between stocking rate and gross margin per hectare.

An important aspect of his use of milksolids production data for benchmarking purposes and the identification of low profitability problems is his knowledge of what represents good, average and poor levels of milksolids production for each district (location/climate), soil type, and system type within his region. This three-dimensional matrix has been built up as a result of years of experience and through a range of data sources. It provides an interesting contrast to some of the limitations the consultant has with financial benchmarking information. For example, if a client is producing low levels of milksolids per cow and per hectare at a low stocking rate for the system type and soil/climate combination, this may indicate a low profitability problem. For example, a farm that is system 3 producing 320 kg MS/cow or less and around 700 – 800 kg MS/ha with a below average stocking rate for the district and farming system type, may indicate a potential problem in relation to profitability.

The consultant stressed that low profitability problems are all relative in terms of what is good and what is bad and what indicators he uses to identify such problems. He stated that milksolids production per hectare, per cow and stocking rate by themselves are not useful indicators because they need to be "**placed in context**". This is where the consultant's benchmarking matrix is useful because he knows what levels of milksolids production are: good, average, and poor for a given soil type, location and system type. However, there is **other contextual data** that must be taken into account such as the nature of the bought-in feeds or supplements used on a farm. For example, there is a farmer in the Manawatu who is achieving 2000 kg MS/ha at a stocking rate of 4.0 cows/ha producing 500 kg MS/cow. His production figures looked good given his soil type, location and system type, but when the consultant explored what he was feeding the herd to achieve such levels, he found that the farmer was feeding very high cost feeds. This explained the low levels of profitability the farmer was achieving.

The consultant provided examples of his benchmarks for different locations in his region. For example, farms on river silts in the Manawatu should be producing 1000 – 1100 kg MS/ha on **average**. A **good** farmer will be producing more than this (≥ 1200 kg MS/ha) and he would classify a farmer as **poor** if he was producing 700 – 800 kg MS/ha on this country. In contrast, for sand country, a farmer should be producing 800 – 900 kg MS/ha on **average**. A **good** farmer will be producing more than this (≥ 1000 kg MS/ha) and he would classify a farmer as **poor** if he was producing 600 – 700 kg MS/ha on this country. In terms of variation in milksolids production per hectare, the consultant stated that in his region, there is not a lot of variation in terms of climate. The biggest variation is in relation to soil type. Altitude has some effect in terms of the length of the growing season and the level of variation in pasture production. A district such as Apiti which is at a higher altitude than most other dairying districts will have this problem. The consultant stated that there is a rain gradient across the Manawatu, but it is not the critical driver of milksolids production per hectare, whereas soil type is (sand, clay, silt, peat). He has a quite detailed knowledge of the soil types within his different districts along with a good knowledge of the contour in different areas, another driver of net pasture dry matter harvested.

The consultant's assessment of productivity data is also dependent upon the type of system the client is running. The consultant has rules of thumb that adjust his basic benchmarks for soil type and location (climate), for the amount of feed a farmer brings into his system or his system type (System 1 – 5). In effect, the consultant has a three dimensional matrix for soil type, location (climate) and system types in which he has instantiated good, average and poor levels of his various physical productivity measures (e.g. MS/ha, MS/cow, stocking rate) (Figure 3).

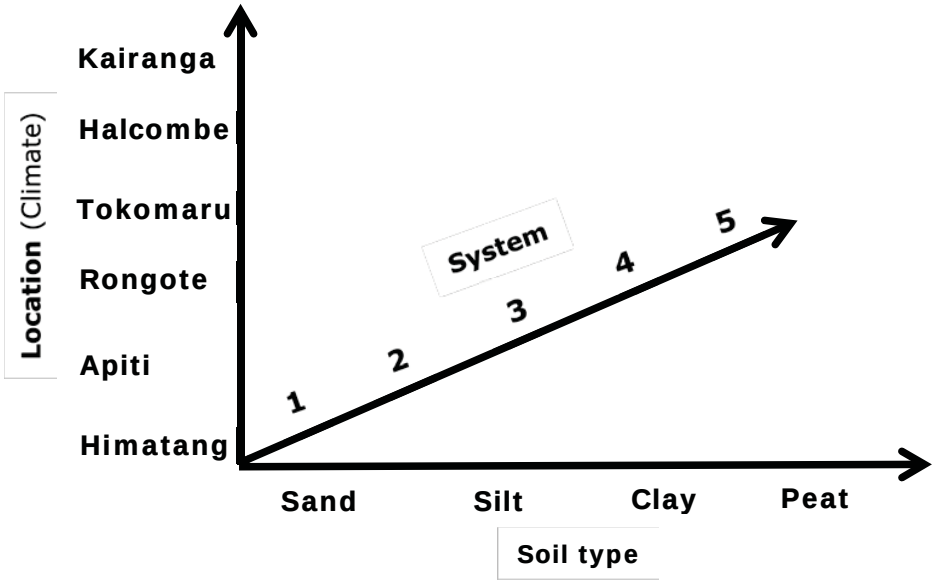

Figure 3. Representation of the consultant's physical productivity matrix for milksolids production

The problem identification process the consultant uses in relation to milksolids production and stocking rate is shown in Figure 4. First he classifies the farm in terms of soil type, location and system type. Second he calculates the milksolids production per hectare, stocking rate and milksolids production per cow for the farm. Drawing on his benchmarking data from his physical productivity matrix (Figure 3) he benchmarks the farm's physical performance and then classifies it as poor, average or good. If the farm's physical performance is classified as poor, then this identifies a potential low profitability problem. If the farm is not classified as poor, then the consultant moves on to look at other indicators. The consultant stressed that production per cow only accounts for about 10 – 20% of the variation in profitability and as such it is a very poor indicator. Therefore the indicator by itself does not mean too much to the consultant. As such it is important to be careful when interpreting what such measures indicate for a client. The consultant does however assess milksolids production per cow and stocking rate when evaluating the productivity of a client's farm.

Generally, low productivity does not result in high levels of profitability unless the client has very good cost control. Similarly, a client could have moderate to good levels of productivity (e.g. 400 kg MS/cow and 1000 kg MS/ha), but their profitability could be low because they are buying in a lot of feed to achieve these levels of productivity. This shows that the consultant is again using a benchmarking and classification process reported in other studies to identify potential problems (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013).

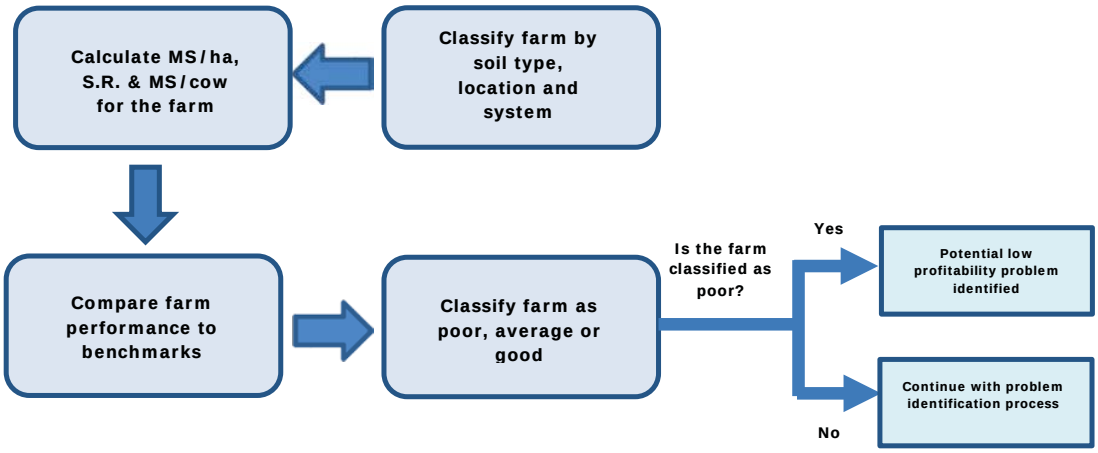

Figure 4. The problem identification process using milksolids production and stocking rate indicators.

3.3.5.3 Using high levels of supplementary feeds and high cost feed use as an indicator of a low profitability problem

Another indirect indicator of a low profitability problem is a client's use of supplements and the cost of those supplements. To identify if this is a problem, the consultant considers how much bought-in feed is used by a client, and then he considers this in terms of the amount of feed fed per cow (Figure 5). For the consultant, high feed use occurs when a client feeds 1.0 tonnes DM/cow or more. As such, he is using a classification process (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013) again to help identify a potential problem. In the client's region, the average dairy farm would be feeding 0.5 – 0.8 t DM/cow. If a client is using a high level of bought-in feed (≥ 1.0 t DM/cow), the consultant will assess if this is being used efficiently in terms of either wastage or more importantly impact on pasture residuals and dry matter harvested per hectare. The next step for the consultant is to determine what feeds make up the supplement ration. He asks the client what specific feeds are being fed to the herd. From this information, he determines if the client is using high cost feeds and expensive additives. For example, they might be feeding high protein feeds and a range of different minerals. Net imported supplements (t DM/cow) was found to be a poor indicator of operating profit (R^2 = 0.02 – 0.10) in a review of New Zealand studies by Ho *et al*. (2013). Savage and Lewis (2005) in a study of their Dairy System Monitoring farmers also reported that supplement fed per cow and supplement type had little impact on profitability. Rather it was the farmer's ability to turn supplements into milk that impacted on profitability. Silva-Villacorta *et al*. (2005) in a study of 600 New Zealand dairy farms also concluded that the efficiency with which farmers were able to convert additional inputs into profit varied and that this was influenced by their goals and management capability. The consultant in this study is also focused on management capability, but he does believe that farmers can achieve similar

levels of productivity and higher levels of profitability with less expensive supplements rather than buying in high cost feeds.

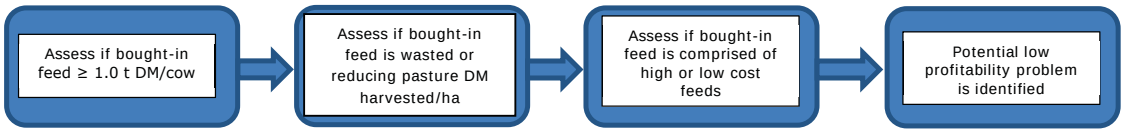

Figure 5. Using bought-in feed data to identify a potential low profitability problem.

The consultant uses key people in his networks for advice on what is correct when using bought-in feeds. He uses a DairyNZ nutritionist as an important source of information about supplement feeding. However, his other key source is a local farmer who runs a high input system and is one of the most profitable farms in the lower North Island based on Dairybase analysis. The consultant knows what feeds this farmer uses and what feeds he does not use. This farmer mainly feeds maize silage and palm kernel with a few other things. He is the consultant's mentor in this area and is used as a sounding board. Importantly this shows that the consultant is using actors that can provide both explicit (what & why knowledge) and tacit (How to knowledge) knowledge in his networks (Klerkx and Proctor 2013). The consultant chose the farmer as a mentor, but stated that he had to prove himself first and the consultant used Dairybase data to check that the farmer was as good as he made out. This farmer also responds to milk price and adjusts his feeding levels accordingly. The consultant stated that the difference between the various feeds is basically the cost of energy (cents/MJ ME). The cost difference between a low cost and high cost feed could be 3 – 5 cents/MJ ME, but this adds up over a season and can reduce profitability considerably. As such, the consultant is looking at firstly the amount of bought-in feed fed per cow and then the types of feed fed to the herd. The consultant is also suspicious of clients that use meal feeders because there is a good chance that they are losing money. Where a client has just outlaid $80,000 on a meal feeder, he will not want to admit that it is not profitable so the consultant has to be careful when he explores **sensitive** areas such as this. Farmers argue that with a meal feeder they will obtain better herd reproductive performance. However, the consultant has data from a trial that showed feeding 150 kg of grain over the early lactation and mating period only increased the number of cows in-calf by 1%. This demonstrates how the consultant is using evidence-based research to assess farmers' practice.

3.3.5.4 Using reproductive performance and the quality of replacement stock as an indicator of low profitability

The consultant also uses reproductive performance as an indicator of a low profitability problem. Key indicators that the consultant will obtain information about during his first visit include: calving spread, 6 week in-calf rate and empty rate (Table 2). He will also observe the quality of the farmer's heifer calves and the size of the farmer's two year old heifers because this influences milksolids production. On a first visit, he may not gather information on all of these indicators. As such, his understanding of the client's farm is always evolving as he gathers more information. In some instances, a low profitability problem might be indicated where a client is buying in a large amount of supplement, but his herd is achieving poor levels of reproductive performance. Similarly, if a client has a 15 – 20% empty rate consistently, this identifies a potential problem.

The consultant stated that one has to be careful when assessing reproductive performance. This is because for some farmers, low reproductive performance may be a consequence of disease, poor mating management skills or because they do not pay enough attention to detail during this period (have the knowledge, but do not act on it). If a client has high feeding levels and poor reproductive performance, the consultant considers this a poor combination. However, reproductive performance is a minor indicator of a low profitability problem and the consultant always goes back to his diagnostic tree to consider the main drivers of profitability. In effect, he is assessing if the other more important indicators of a low profitability problem (e.g. pasture dry matter harvested per hectare) are also indicating that a the problem exists. It is another piece of information that he uses in his sense-making process (Klein *et al*., 2006).

The consultant stated that the most important indicator for him when looking at the client's reproductive performance is the six week in-calf rate (Table 2). This is more important than empty rate because empty rate depends upon how long a farmer leaves the bull out with the herd. He said that most farmers do not achieve the target of 78% for the six week in-calf rate and that a lot of farmers have rates that are in the 60s. He considers clients that are achieving six week in-calf rates in the 70's as pretty good. He would rate a client as poor if they scored in the low 60's and someone as average if they were in the mid to high 60's. He also has to be careful about seasonal effects. For example in 2014, empty rates were very high. The consultant is unsure of why this was the case, but postulates that it may have been because cows peaked 15% higher than normal in that year and even some of his very best farmers had record empty rates of around 20%.

Table 2. Indicators of low profitability in relation to reproductive performance and herd replacements

Primary indicator	Secondary indicators
Six week in-calf rate	Other reproductive performance measures - calving spread - empty rate Herd replacement quality - calf size - R2yr heifer size High supplement use and poor reproductive performance

3.3.5.5 Using efficiency of feed conversion as an indicator of a low profitability problem

Feed conversion efficiency is another lower level indicator the consultant considers, but it is not as important as pasture dry matter harvested per hectare. The consultant has ranges that he considers in terms of feed conversion efficiency. For example, within his region, a feed conversion efficiency of 16 kg DM/kg MS is poor, 13 – 14 kg DM/kg MS is about average and 11 – 12 kg DM/kg MS is good. As such, the consultant is again using a benchmarking and classification process to identify a potential problem (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013). Because this indicator is lower down his profitability tree, the consultant is very careful about the conclusions he draws from it. This is because there are a range of drivers and they differ in their weighting in terms of impact on profitability. Ho *et al.* (2013) found no meaningful relationship between profitability and feed conversion efficiency in a review of Australian studies. Problems occur when he considers such indicators without considering what he calls his **profitability tree** which has return on assets at the top and other drivers such as pasture dry matter harvested per hectare, cost of milk production and feed conversion efficiency as lower level drivers of this. The consultant pointed out that as one comes down the profitability tree to the lower level indicators, one has to be careful what inferences are drawn. The interpretation of feed conversion efficiency also depends upon what type of dry matter the client is feeding. Again, the consultant stressed that such indicators cannot be used in isolation, the context must be taken into account.

3.3.5.6 Using cost of milk production as an indicator of a low profitability problem

A key indicator of a low profitability problem for the consultant is the cost of milk production. However, on a first visit, when the consultant does not have access

to the client's accounts, he must use physical indicators to identify if the cost of milk production is a problem on a client's farm. Miller and Savage (2016) reported a high correlation (R^2 = 0.8) between operating expenses ($/kg MS) and operating profit ($/ha) for a group of dairy farmer clients from the Mcfarlane Rural Business Centre with farms located in Canterbury, Tasman and Otago for the 2015/16. An obvious indicator of a high cost of milk production is a client's use of high cost feeds (Table 3). Other indicators include a low levels of milksolids production for 1) the resource bundle and/or 2) the amount of bought-in feed used (Table 3). The consultant will also obtain an indication from the client during the visit about the level of cost control they exert over their business as poor cost control is likely to be reflected in their cost of milk production. This is reflected in the discourse of the client in relation to cost control (Table 3). Although the importance of discourse has been highlighted in relation to extension (Fleming and Vanclay, 2009), little has been written about the role of discourse in problem diagnosis in consultancy.

Because the cost of milk production per kilogramme of milksolids is a ratio, it is affected by both the denominator and the enumerator (Shadbolt, 2012). As such, a client could have a high cost of milk production because he has a high cost structure and an average level of milk production, an average cost structure and a low level of milk production or a very high cost structure with a high level of milk production. This is why access to the client's accounts is important for verifying the consultant's initial identification of the client having a problem with his high cost of milk production. This area is covered in more detail when the consultant's use of Dairybase data is described.

Table 3. Indicators of low profitability in relation to cost of milk production

Primary indicator	Secondary indicators
Use of high cost feeds	Low level of milksolids production for - the resource bundle, and/or - the amount of bought-in feed The level of cost control that the client has - client's discourse on cost control

3.3.6 Problem identification

Once the consultant has worked through the indirect primary and secondary indicators of low profitability, benchmarked the client's performance and classified him as poor, average or good across the range of factors covered above, he will then assess, based on this process if the client has a potential low profitability problem. In effect, the consultant is using a sense making process (Klein *et al*., 2006a,b) drawing on all the information from this benchmarking and classification process to determine if the client has a potential problem. As

with other studies (e.g. Gray *et al*., 1999a,b), the consultant kept an open mind about the nature of the problem. Although the indicators may have indicated a low profitability problem, there may be contextual reasons for the poor performance of the client in some areas that do not reflect a profitability problem. As such, the consultant remains open to the possibility that his preliminary diagnosis is incorrect. It is not until he has completed a full accounts analysis that he can confirm that the client has a low profitability problem.

3.3.6.1 Benchmarking higher input systems

Because lower input systems use little in the way of bought-in feed, the consultant stated that profitability is a function of pasture dry matter harvested per hectare and the conversion of this into milksolids production. As farmers move into higher input systems that bring additional supplements into the dairy system, this bought-in feed can have an influence on pasture utilisation and hence pasture dry matter harvested per hectare. The type of feed purchased (expensive versus inexpensive) can also have an important impact on profitability. As such, if the consultant is looking at a system 4 or 5 farm, he will focus on the types of feed the client is using and also how good his pasture management is. One of the most profitable farmers in the lower North Island runs a system 4 – 5 and makes $9,000/ha compared to the average farmer at $3,000/ha. This farmer does not use expensive supplements and he is a very good pasture manager.

3.3.6.2 Problem identification and client preference for a farm system type

The consultant also reported that his clients have different production philosophies or preferences for different system types. Some farmers want to operate systems that are low input, totally self-contained and low cost in terms of feed. Some farmers want to run systems that achieve high levels of per cow production because it gives them status in the community and at discussion group. Other farmers want to be somewhere in the middle of these two extremes so that they have more flexibility. In good times they can use more bought-in feed and in bad times they can change to a lower cost system with less bought-in feed making them less reliant on bought-in feed. The consultant also has to consider whether his clients employ a manager. This is because it is difficult to find managers who can run system 5 farms effectively. He stated that the most difficult system to manage is the system 5. If he is diagnosing a system 5 farm, the consultant is interested in how the client is talking about their operation, the discourse they use. If the client is talking about pasture harvested and ensuring that he is obtaining the right pre- and post-grazing residuals, this will tell the consultant that the client is focused on the right areas of management to ensure the system is profitable. In contrast, if the client is talking about per cow production and whether or not he should feed the herd

more to increase this and the consultant can see that his post-grazing residuals are 100 – 200 kg DM/ha above what they should be, this will suggest there may be a low profitability problem. This again highlights the role played by the client's discourse in problem identification.

Normally the consultant will try to improve the profitability of the system the client has chosen to operate because it is their preferred system. However, this depends on the client's goals and constraints. They may only want to run a low input system 1 or 2. Alternatively, they may not be able to run more cows because of milking shed constraints. During the first visit, an important aspect of the problem identification process is to assess if the client is set in terms of what type of system he wants to operate. In situations where they are not managing a particular system very well, the consultant has to assess if they are determined to run that type of system or if they would be happy to change system to make more money. For example, he had a client who was running a system 4 farm, but he was not doing a particularly good job of it. The question he put to the client was, given the complexity of the system, would he be better changing to a system 3. Alternatively, if the client is fixed on operating a particular type of system, then the consultant must convince them to make changes that will improve the profitability of that system. Shadbolt (2012) found that there was little difference in the profitability of different dairy systems. As such, she concluded that there was little benefit from changing systems and as such, the choice of system a farmer makes could be based purely on personal preference and attitude to different sources of risk (production, market), a view also held by the consultant in this study.

As such, during this initial visit, the consultant is determining:

1. Does the client have a low profitability problem?
2. What system do they want to farm and what is driving this (goals, constraints)?
3. If they have a low profitability problem, can they improve the profitability of their existing system, or are they better changing systems?

3.3.6.3 Drawing inferences about the client from problem identification data

The consultant stressed that if he was going out to a new client's farm, he would focus on their grazing management because it tells him a lot about the client's skill levels, dedication and motivation and so-on. It is difficult for a client to hide one bad grazing, but there are times of the year (e.g. early spring) when feed is short and poor grazing management may be hidden. The consultant also has a look at the client's record keeping because this shows him what the client is tracking in relation to the feed situation on the farm. If a client is interested in something, the consultant believes he will track it. If a client does not monitor

something, then he cannot evaluate it and then they cannot change their practice. This also gives the consultant an indication of their dedication and motivation.

As such, the consultant uses a range of information to identify the client's:

1. skill levels,
2. interest and
3. dedication and motivation in different domains

From this information he can classify the client across these dimensions which will help him to firstly diagnose the nature of the problem (knowledge gap, attitude, social norm) and second, it will help him tailor the solution to the problem context. Other studies have identified how consultants have assessed the capability of clients in different domains (e.g. Bruce 2013), however little mention has been made in relation to interest, dedication and motivation within a particular domain.

3.3.6.4 Problem identification and problem ownership

The consultant stated that the most important outcome from the problem identification process is to convince the client that they have a problem, a point stressed by Kubr (2002). Normally, during this phase, the consultant has to persuade the client that they have a problem and that they need to change. This is a particular problem with consultancy because the consultant is not the problem owner, the client is (Rogers *et al*., 1996b). Buy-in is critical for motivation and commitment and this is more important for family farms. In contrast, corporate farms are normally driven by profit and buy-in is not a problem. On family farms there are a wide range of drivers that might motivate a client. For most clients, money or profit is not the driver, it is purely a means to an end. For example, business growth is normally only a means to an end and that might be so that the children can take over. The consultant believes that a lot of industry people would be surprised at how many farmers do not view profitability as an important driver. Rather the drivers might be education for their children or providing opportunities for their children, providing a holiday for the family each year and so-on (See the following section). The consultant believes that the industry over-rates profitability as a driver of behaviour. He stated that it changes with stage of the farm family life cycle and level of debt and a range of other factors. The consultant compared a client to an alcoholic, he stated: ***You haven't got him beat until he knows he has got a problem***". A consultant must get buy-in or convince the client to have buy-in otherwise the client may not even believe he has a problem.

3.3.7 Diagnosis

Once the consultant has identified a problem and ensured problem ownership by the client, he then investigates it in more depth to determine what caused it, the

diagnostic process. However, the problem identification and diagnostic processes are closely interlinked because they often use common cues and one leads to the other. The consultant also knows that the cause of an anomaly may be different from what he initially hypothesises e.g. he might think that poor reproductive performance is due to poor mating management, but he later finds out that it is due to a disease problem. He stressed that a consultant has to be careful when diagnosing the cause of a problem "you have to be careful you don't draw too concrete a conclusion too quickly". This was also reported in other studies of the problem solving process (Gray *et al*., 1999a,b). Once the consultant has identified a potential problem, he hypothesises possible causes of the problem, **ranks** them in order of likelihood and then investigates the most likely ones first (Figure 6). Different causes have different indicators or cues (e.g. symptoms of diseases that affect reproductive performance), so the consultant determines the specific set of indicators or cues he need to use to test that the hypothesised cause is in fact the source of the problem. He then collects data to test or refute the hypothesis. If the hypothesis is refuted, he will then move to the next highest ranked likely cause and test that and so-on until the cause of the problem is diagnosed.

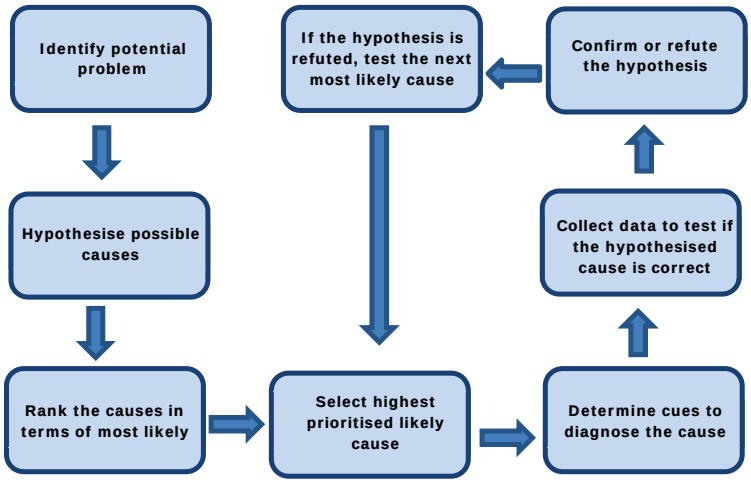

Figure 6. The diagnostic process used by the consultant.

The diagnostic process used by the consultant (Figure 6) is similar to that reported in other studies (Gray *et al*., 1999a, 2000). Gray *et al*. (1999a, 2000) compared a consultant's diagnostic process to the process of "feature mapping" proposed by Klein (1997). They reported that the consultants in their study recognised a particular feature (cue or symptom) that suggested the existence of a particular high level problem type (e.g. a low profitability problem). The consultants then used the typology structure of their mental schema to hypothesise the likely problem (or cause of the high level problem). Each

problem "type" had a set of features (relevant cues or symptoms) which set out the information the consultants had to collect to confirm or refute the hypothesis. One of the consultants compared this process to "working down a diagnostic tree". However, neither of these studies mentioned that the consultants ranked the possible causes of the problem and used this to target the diagnostic process with the most likely causes investigated first. Gray *et al*. (2003) reported a similar diagnostic process that was used by expert farmers to diagnose the cause of the outcome of their plan deviating significantly from their expectations. The following sections describe how the consultant diagnoses what he believes are key causes of low profitability on his clients' farms. This relates to his diagnosis of physical indicators during the first visit and then his use of accounts analysis during the second visit.

3.3.7.1 Diagnosis of the cause of low levels of pasture dry matter harvested per hectare

The consultant believes that the amount of pasture dry matter per hectare harvested per annum is a key indicator of a low profitability problem. This is because research has indicated that it is an important driver of profitability (R^2 = 0.68). Once the consultant has identified that the client has a problem in relation to pasture dry matter harvested, he then needs to diagnose the causes of this problem. He has a mental checklist of factors he reviews in relation to this problem type. The consultant also distinguishing between **tactical and operational management** reasons for a low level of pasture dry matter harvested per hectare and **strategic decisions** related to **infra-structure** and **the production system**. Ho *et al*. (2013) stress that output is a result of a whole mix of inputs and that drivers of profitability like milksolids production per hectare or pasture consumption per hectare are also a function of many inputs.

Tactical management relates to the monitoring of average pasture cover levels and pre- and post-grazing residuals and the decision making around this that influences the amount of pasture produced and/or harvested. Strategic decisions related to **infra-structure** include those that affect the amount of pasture produced and/or harvested such as: pasture species, level of soil fertility, drainage, irrigation and so-on. The consultant also includes the quality of the herd as part of "infra-structure" because this will influence how much milk the client produces. He also considers strategic decisions in relation to the **production system** because these will influence how much milksolids production the farm produces for the feed produced. The diagnosis of whether or not tactical and operational or strategic decisions are influencing the amount of pasture dry matter harvested per hectare on the client's farm are described below.

3.3.7.1.1 Tactical and operational management decisions that influence pasture dry matter harvested per hectare

To determine why a client is harvesting low levels of pasture dry matter per hectare, the consultant will first focus on the client's tactical and operational decisions around grazing management. Sometimes it is difficult to identify if the client's grazing management is poor because in periods like winter and early spring when feed is short, poor grazing management decisions may be hidden. The consultant also has a look at the client's record keeping because this shows him what the client is tracking in relation to the feed situation on the farm. Normally the existence of a pasture monitoring system indicates that the client is interested in grazing management. This is also reflected in the discourse the client uses when talking about grazing management. In contrast, if a client is not monitoring pasture cover levels, then it is difficult for them to evaluate their own practice and improve it. However, the consultant has to be careful making such inferences because some farmers use non-formal intuitive processes for managing their pastures and these farmers can be very good at it. The consultant has to assess which of his clients have this innate ability to allocate feed based on a visual observation and who are the clients who need to use more formal measuring systems to ensure they allocate feed accurately and achieve the desired post-grazing residual levels.

The consultant stated that there are a large number of cues that he can use that indicate "wasted feed". This is also indicated by the processes and procedures the client uses when they are allocating feed. Some clients plan their grazing rotation on the basis of time since last grazing. These farmers just put the herd into the next paddock based on the time since last grazing. This type of farmer will not use a fence to refine his feed allocation if there is too much feed in the next paddock. As such, they will tend to leave higher post-grazing residuals in their larger paddocks and may over-graze their smaller paddocks. The consultant will also observe other cues such as surplus feed in paddocks, the level of supplement wastage, and above optimal post-grazing residuals.

Other indicators may also indicate this problem such as the level of per cow and per hectare production and also a high empty rate, a poor six week in-calf rate and so-on. Reproductive performance often indicates a problem with pasture dry matter harvest per hectare. The consultant will also use other reproductive indicators such as mean calving date, calving spread, days in milk, days in milk before Xmas and so-on. Alternatively, if these indicators are in the top 10%, then the consultant knows that he is dealing with a pretty sharp operator. High performing farmers have a cluster of indicators that reflect their high performance and the poor performing farmers have a cluster of indicators that reflects their low levels of performance. These clusters of indicators are used to make sense of the situation (Klein *et al*., 2006). However, the consultant does

identify aberrations. For example, a client's herd may have low reproductive performance because of disease.

The consultant admits that there is some debate within the dairy industry about what are the correct pre- and post-grazing residuals to optimise pasture dry matter harvested per hectare. Some consultants advocate higher levels than DairyNZ recommends and the consultant believes that both parties cannot be right. He stated that the correct pre-grazing residual can depend upon round length and stocking rate. He likes his clients to aim for a post-grazing residual of 15 – 1600 kg DM/ha. If a client gets their post-grazing residual and round length right, they can work out what their pre-grazing pasture cover levels needs to be. Ideally, the consultant believes that a farmer does not want pre-grazing pasture cover levels to exceed 3000 kg DM/ha. However, he has some clients that run high stocking rate systems of around 4.0 cows per hectare that operate with pre-grazing residuals that are slightly above 3000 kg DM/ha.

The consultant admits that the post-grazing residual targets have changed over time. In the past, they were 1500 – 1600 kg DM/ha and then a Massey University agronomist suggested they should be 1700 – 1800 kg DM/ha and this was the norm for a number of years. Then Lincoln University dairy farm did some research into pre- and post-grazing residuals and found that the post-grazing residuals should be reduced back to 15 – 1600 kg DM/ha. The Lincoln dairy farm's ideal target is 1600 kg DM/ha, but they have stressed 1500 kg DM/ha because they believe farmers tend to graze too laxly, so they have targeted the lower figure. The Lincoln dairy farm was one of the top farms in the South Island in terms of profitability. In terms of pre-grazing pasture cover levels, the consultant said that this target depends upon stocking rate. His clients range from 2500 kg DM/ha to 3000 kg DM/ha and even higher when stocking rates are around 4.0 cows/ha[2]. As such, the lower the stocking rate, the lower the required pre-grazing pasture cover level.

The consultant also stated that round length should be based on leaf stage. He also considers the normal round lengths for the district. The consultant will look at leaf stage once or twice a week at different locations within his area to help him determine suitable round lengths for his clients. He also has clients that are checking leaf stage from whom he can obtain this information. The consultant believes that 50% of farmers get their grazing events wrong. He stated that "***we think New Zealand farmers are very good farmers, but maybe we are not as good as what we think we are***". The consultant believes that part of the problem is that all farmers are not motivated to achieve these high levels of performance and as such, they tend to lose focus in relation to grazing management. He believes that not all farmers are motivated by profit and that

[2] DairyNZ formula - pre-grazing pasture cover =S.R. x round length x cow intake + residual

they are quite happy achieving 80% of potential for the amount of effort and work they have to put in.

Important indicators of pasture dry matter harvested per hectare are the pre-grazing and post-grazing residuals the client achieves and the consistency with which they achieve these over time (Table 5). He stressed that one has to be careful when assessing these because at any one visit he may only be able to observe 3 – 4 paddocks that demonstrate the pre-grazing pasture cover levels the client's herd is going into and the post-grazing residuals they are leaving behind. There is a risk that the pre-and post-grazing residuals were abnormal for the period he observed the farm due to particular circumstances. However, the consultant stated that if he sees a client has left very high post-grazing residuals over a number of paddock grazings, then this will indicate that there is a potential problem. This will then raise a number of questions in the consultant's mind, e.g. does the client think they have a surplus at the moment, has the client made any silage recently, or is he thinking about making silage?

Table 5. The process used to diagnose if a client's tactical and operational grazing management is limiting pasture dry matter harvested per hectare.

1	Compare indicators against standards (pre- and post-grazing residuals, round length, supplement wastage)	a. During a visit and across paddocks b. Across visits
2	Assess if indicators are normal or an aberration	
3	Assess the reason for the aberration	
4	Assess the client's knowledge in relation to the indicators	a. If too low or too high, does he recognise that this is the case b. If too low or too high, has the client taken action or is he preparing to take action to remedy the situation c. Assess if the client using three-leaf principles to manage his grazing round
5	Assess how the client is allocating feed (area and supplement) in terms of:	a. Variable paddock sizes b. Variable topography c. Variable pre-grazing pasture cover levels
6	Assess if the farmer understands what grazing rotation the herd is on	
7	Assess the client's interest in grazing management	a. Assess their monitoring system b. Assess the discourse they use about grazing management
8	Assess if using non-formal intuitive processes to manage their pastures effectively	

The consultant uses these questions to assess if the client **recognises** that he has **a problem** and is working to solve it (or not). He will also assess if clients are using leaf stage principles to manage their rotation length. As such, he is also assessing their capability in relation to grazing management and **identifying knowledge gaps**. Bruce (2013) reported where the consultant in her study used a range of indicators to assess the capability of a new client. Her indicators were related to the client's ability to assess the state of the resource, their understanding of important principles and an assessment of their performance levels in the domain of interest. The consultant has already assessed the clients performance in terms of pasture dry matter harvested per hectare to identify that there is a problem. He also evaluates their ability to assess the state of the resource and their knowledge, but not in terms of principles, but rather in relation to their ability to use the principles to manage their pastures and identify if they have a problem and also put in place actions to remedy this.

The consultant stated that the other important factor he is looking at to assess if the client is harvesting high levels of pasture dry matter per hectare is **how the client allocates feed** in response to the number of paddocks he has, evenness of paddock size, the topography and the feed available in a paddock. For example, will the client use an electric fence to provide 1.3 paddocks per grazing to ensure the herd is fed to requirements and the desired post-grazing residuals are achieved? The consultant is also observing if the post-grazing residuals "look right". This has to be moderated by time of year, e.g. in mid-winter the post-grazing residuals will tend to be low.

If a farmer has un-even paddock sizes or a varied topography (flats, rolling country and some hills), this triggers the consultant to ask them how they allocate feed because it is difficult to achieve consistent post-grazing residuals and herd feeding levels without adjusting the area grazed per day under such conditions. When asking about an area such as feed allocation, the consultant stressed that he does not want to ask a leading question or he will end up with the answer he wants. Rather, he will ask an open question such as "***How do you handle these variable sized paddocks***?" The client may say that he grazes the larger paddocks early in the round or he uses a fence to split them up and so-on. The consultant will also make observations of the post-grazing residuals in a range of paddocks. For example, in a large paddock where the farmer might obtain 4 – 5 feeds for the herd, he will go to the back of the paddock and assess if the post-grazing residual is the same as the front of the paddock or not. If it is not the same, for example, the post-grazing residual at the front is 1600 kg DM/ha, but the post-grazing residual at the back of the paddock is 2000 kg DM/ha, then this suggests the client is not allocating pasture effectively.

The consultant also assesses if the client understands what rotation length the herd is on. He does this by asking three questions: "1) What is your rotation length? 2) How much area have you got in grass? and 3) What area are you giving them per day?" The consultant uses questions 1 and 2 to estimate the area the client should be feeding the herd per day and then compares this with what he is actually feeding them to see if the two numbers match. This will tell him if he really understand what grazing rotation the herd is on. The consultant also assesses the client's interest in grazing management by finding out about his pasture monitoring system and also from the client's discourse around the topic. The final step in the process is to assess if the client is using non-formal intuitive processes for his grazing management. Table 5 summarises the main factors the consultant considers when diagnosing if the client's tactical and operational grazing management is limiting the level of pasture dry matter harvested per hectare from the farm. Once he has done this, the consultant considers the strategic decisions that might influence pasture dry matter harvested per hectare. This is discussed in the following section.

3.3.7.1.2 Strategic decisions that influence pasture dry matter harvested per hectare

Once the consultant has assessed if the client's tactical and operational management is affecting the amount of pasture dry matter harvested per hectare, he then moves on to assess if any of the client's strategic decisions are limiting pasture dry matter harvested per hectare. These include decisions associated with infra-structure and system design. This is discussed in the following sections.

3.3.7.1.2.1 Strategic decisions in terms of infra-structure that influence pasture dry matter harvested per hectare

To diagnose why a client might be producing low levels of pasture dry matter harvested per hectare, the consultant assesses the infra-structure of a farm (Table 6) during the visit. In effect, the consultant is assessing if the client has the required infra-structure to optimise pasture production or if there is scope for improving it in a profitable manner. The consultant will assess the soil fertility of the property. In terms of pasture species, the consultant would assess the area the client is regrassing per annum and the species they are sowing. He would also assess the proportion of native pasture species versus ryegrass/white clover and also if they have specialty pastures such as tall fescue. He noted that he did not think plantain or chicory were "***game breakers***" in terms of pasture dry matter harvested per hectare.

The consultant also considers if the farm has heavy soils and if it does, he considers infra-structure in relation to drainage and whether there is a standoff pad on the property. These are all factors that influence the amount of pasture dry matter harvested per hectare. Other infra-structure items include irrigation

because this will improve the level of pasture harvested per hectare on farms with low rainfall and/or soil types that have a low water holding capacity (e.g. sand or poorly developed river silts). Importantly some of these infra-structure items are generic across all farms (soil fertility and pasture species), whereas others are specific to farms with particular climatic and/or soil conditions (the need for drainage or irrigation).

The consultant was asked if subdivision was an important element of infra-structure that influenced how much pasture dry matter per hectare is harvested by a client's herd. He stated that it was not the level of subdivision that was important, it is how the client allocates feed in response to the number of paddocks he has and the feed available in a paddock. As such, he is looking to see if the client adjusts the area he allocates to his herd based on the feed that is available in a paddock. The consultant noted that the physical infra-structure (soil fertility, drainage, feed pad, pasture species, irrigation) drives the amount of pasture dry matter harvested, but this is further influenced by the client's grazing management and the pre- and post-grazing residuals he achieves.

The consultant links the farm context to the infra-structure to see if there are opportunities related to infra-structure to improve the amount of pasture dry matter harvested per hectare. For example, if the farm has heavy wet soils, the consultant will assess the scope for introducing additional drainage and/or a feed pad to improve performance. Although not part of the diagnosis of the reasons for low levels of pasture dry matter harvested, the consultant considers herd genetics as another element of **infra-structure** that he will assess. This factor affects milksolids production and feed conversion efficiency.

The process the consultant uses to diagnose if the client's infrastructure is limiting pasture dry matter harvested per hectare is to compare the client's resource quality with industry standards. For example, he will compare the client's Olsen P and pH values for the soils on the property with the optimum levels recommended for dairy farms. If the client's values are sub-optimal, he will assess the scope for improving the levels and the likely impact of this investment on pasture dry matter harvested per hectare and profitability. For options like drainage or irrigation, he will take into account the soils and the climate and assess the scope for improving pasture dry matter harvested through investment in either drainage or irrigation. As such, the client has a mental model of what pasture dry matter can be harvested from resources in different states and how much more dry matter might be harvested if the resource quality is improved through investment in infra-structure.

Table 6. Key infra-structure categories that influence pasture dry matter harvested per hectare.

1	Soil fertility	
2	Pasture species and area regrassed per annum	
3	For farms with wet poorly drained soils	• Drainage • Stand-off or feed pad
4	For farms in low rainfall areas and/or with soils with low water holding capacities	• Irrigation
5	Herd genetics	

3.3.7.1.2.2 Strategic decisions in terms of the production system that influence pasture dry matter harvested per hectare

The consultant also considers some of the strategic decisions associated with the client's production system that may affect pasture dry matter harvested per hectare. These include stocking rate, calving date, drying off date, feed input levels in relation to bought in supplements and forage crop use. These are discussed in the following sub-sections:

Stocking rate

Stocking rate is a useful indicator of likely pasture dry matter harvested per hectare. If a client has a high stocking rate, there is a high probability that they will be harvesting a high level of pasture dry matter per hectare. In contrast, if a client has a low stocking rate, then their grazing management has to be very good for them to achieve a high level of pasture dry matter harvested per hectare. The consultant also views stocking rate as an indicator of risk around pasture dry matter harvested per hectare. The process he uses to assess if stocking rate is limiting pasture dry matter harvested per hectare is shown in Figure 7. The first step is to calculate the stocking rate the client runs on the farm. The consultant then assesses if the stocking rate is too low or too high for the resource. If the consultant has a client with a low stocking rate (e.g. ≤ 2.2 cows/ha), this may suggest the farm is understocked because it is difficult to run a low stocking rate without wasting pasture. Alternatively, at high stocking rates (≥ 3.2 cows/ha) the client runs the risk of over-grazing pastures and/or creating problems with pugging and soil compaction during a wet spring. If the consultant thought the stocking rate was too low or too high, he calculates the farms' comparative stocking rate (kilograms of live weight per tonne of dry matter eaten). When doing this, he also takes into account the system type. He noted that a client can run a very high stocking rate if he brings enough feed into the system. As such, the consultant is assessing if the stocking rate is right for the situation and farm system type.

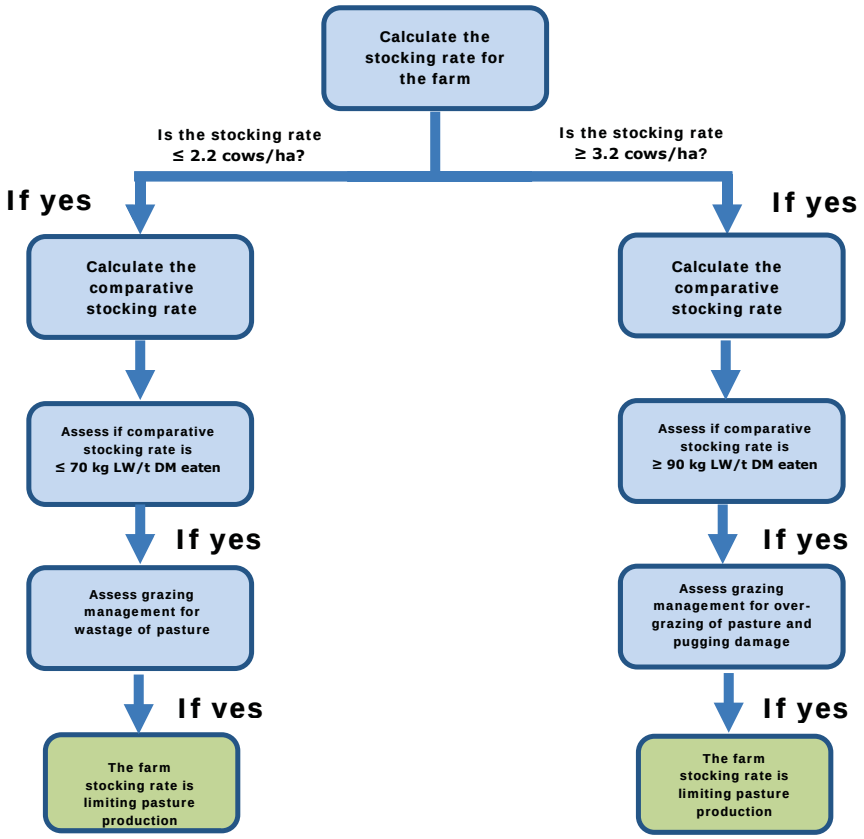

Figure 7. Process used to assess if stocking rate is limiting pasture dry matter harvested per hectare.

When using comparative stocking rate as an indicator, the consultant stressed that one needs to be careful because the response surface has a fairly flat top to it. In the region, farms that are in the range of 80 – 85 kg LW/tonne DM eaten tend to be efficient. However, if a client is found to be operating at a low stocking rate of say 70 kg LW/tonne DM eaten, the consultant will investigate their grazing management because this level suggests a low stocking rate farm (2.2 cows/ha) where grazing management needs to be very good to achieve high levels of pasture dry matter harvested per hectare. At the other extreme, if a client is in the range 90 – 95+ kg LW/tonne DM eaten, the consultant is then assessing if the client needs to add more feed into the system or alternatively reduce stocking rate. The decision of which way to go will depend upon what type of system the client wants to operate. Breed is not an issue with this calculation because it is multiplied out in the live weight calculation. A farm might run a higher stocking rate of lighter Jersey cows (400 kg x 3.0 cows/ha = 1200 kg LW/ha) or a lower stocking rate of heavier Friesian cows (500 kg x 2.4 cows/ha = 1200 kg LW/ha).

Macdonald *et al. (2008, p. 2162) after completing a stocking rate trial at Ruakura* argued that "*stocking rate should balance the dual objectives of generous feeding to achieve high levels of efficiency of milk production per cow while maintaining high levels of pasture utilization to meet the overall objective of optimizing farm profitability*". Savage and Lewis (2005, p. 63) made a similar point stating that "*Selecting the appropriate SR is a crucial factor. This SR needs to ensure that the cows can express their MS production potential for the season, while having enough mouths/ha to harvest as much feed as possible*". On the basis of Macdonald *et al*.'s (2008) trial they identified limitations to using stocking rate in comparisons across dairy farms. This was because differences between farms in terms of land class, soil fertility, climate, climate variability, and the availability and price of supplements influence the amount of feed available per hectare. These differences were further compounded by differences in cow breed and genetic merit. Macdonald *et al*. (2008) argued that these variables make it difficult to extrapolate and compare results from different stocking rate experiments. To overcome this, Macdonald *et al*. (2008) proposed the concept of comparative stocking rate (CSR). It is defined as kilograms of cow body weight at a standard body condition score per tonne of dry matter available. Previous to this work, Hedley *et al*. (2006) had advocated an optimum comparative stocking rate of 80 – 90 kg BW/t DM for New Zealand dairy farms. The added the caveat that the optimum stocking rate for a specific farm is heavily influenced by the marginal costs associated with increasing or reducing stocking rate because although more cows will harvest more pasture, this occurs at a cost.

Drawing on the work of Dillon *et al*. (2005) who argued that the profitability of pasture-based dairy systems depends on the efficiency of pasture use coupled with reasonable production per cow, Macdonald *et al*. (2008) having identified decreasing milk yield per cow, but increasing milk production per hectare with increasing stocking rate, hypothesised that there is likely to be a comparative stocking rate that maximizes profitability. To test this hypothesis Macdonald et al. (2011) used production data from their trial, associated operating expenses and a range of milk prices evaluate the economic implications of altering comparative stocking rate. They reported that for the environment investigated in the 2008 study, operating profit declined above a stocking rate of 3.3 cows/ha or a comparative stocking rate of 77 kg of body weight per tonne of dry matter. They also reported that a decrease or increase in comparative stocking rate of 10 kg of body weight per tonne of dry matter from the optimum of 77 kg of body weight per tonne of dry matter (67 kg WM/t DM or 87 kg BW/t DM) reduced operating profit per hectare by 4%. This relationship was consistent across three milk prices ($4.30/kg MS, $5.30/kg MS and $6.30/kg MS). This work formed the basis of DairyNZ's (2016b) recommendations that New Zealand dairy farms run a comparative stocking rate of between 75 – 80 kg BW/t DM. The

consultant's target comparative stocking rate for the Manawatu based on his experience is 80 – 85 kg BW/t DM. This is higher than those recommended by Macdonald *et al*. (2008), but lower than those advocated by Hedley *et al*. (2006). Like the consultant, DairyNZ (2016b) also suggest that managing low comparative stocking rates (< 75 kg BW/t DM) can be difficult and requires changes to pasture management and feed allocation.

Calving date

In terms of calving date, the consultant stated that clients can be calving too early and they can be calving too late. In general, he tends to err on having clients' herds calving slightly earlier rather than slightly later. This is because if a farmer calves too late, the season is up and running before there is sufficient feed demand to control and utilise the spring flush. He stressed that the most reliable milksolids production occurs from calving until Xmas, but after Xmas milksolids production can be highly variable. The consultant has rough rules of thumb for calving dates by district in combination with soil type. For example, farms on the drier sand country where pugging is not a problem, will tend to calve early (e.g. in July). The risk on such farms is calving too late because they dry out over summer. At the other extreme, two of the later calving districts would be Apiti where farms are at a higher altitude than most others in the Manawatu and also Eketahuna. The consultant noted that calving date is also a function of stocking rate and the amount of bought-in feed a client uses. Within the Manawatu, planned start of calving dates would range from the 5th – 10th July on the early sand country through to the 5th – 10th August on the later country such as that around Apiti. The consultant stated that 70 – 80% of farms in the Manawatu would calve between the 20th July and 1st August.

Supplement use

In terms of supplement use, the consultant reiterates that if a client mentions that they are using 1.0 tonne DM/cow of supplement or more, this triggers him to investigate the farmer's supplement use (Figure 8). He will ask the client how it is being fed and he will also calculate the comparative stocking rate (kg LW per tonne dry matter eaten) to assess if it sits outside the optimum range (80 – 85 kg LW/tonne DM eaten). The consultant will also look at the types of feed the client is feeding. He will also ask the client how they decided upon which feed types to use. The answers range from a decision based on the cost of energy through to the need to balance the herd's diet. Terms such as "***needing this protein***" or "***using an energy dense feed***" are often used. As such, the consultant is again assessing the client's knowledge of the domain and their **discourse** to diagnose a potential problem. Depending upon the client's answers, the consultant may investigate the client's use of supplements in more detail.

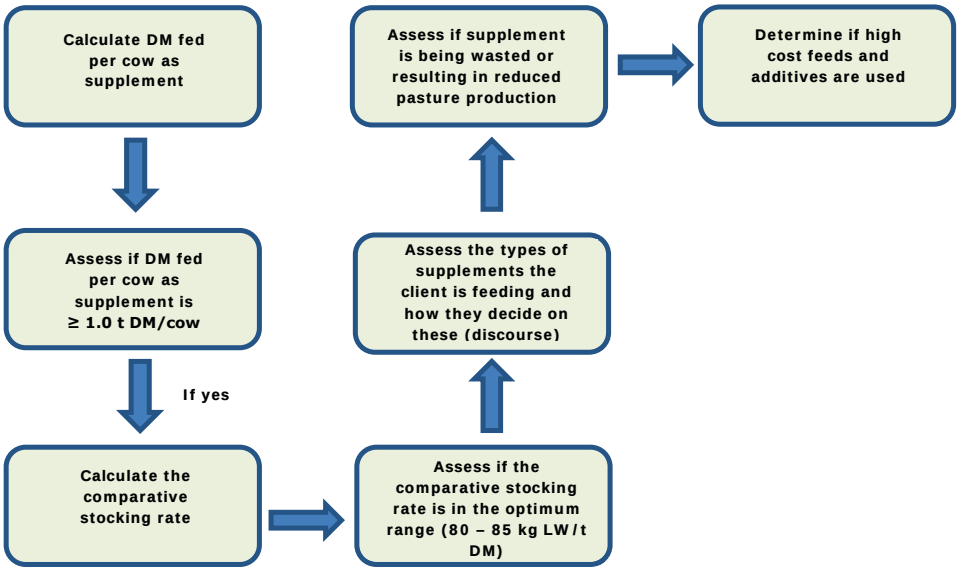

Figure 8. Process used to assess if supplement is limiting pasture dry matter harvested per hectare.

The consultant provided an example where a client stated that they were buying in supplement on the basis of the least cost for energy and that the feed they were using is palm kernel. Palm kernel is normally one of the cheaper supplements that dairy farmers can use. In contrast, he might have a client who is talking about "***balancing the diet***" and that they are using some soya to make sure the herd is getting enough protein and he is buying in a lot of maize grain and so-on. The consultant stressed that normally when a client starts talking about balancing the diet, this is a warning sign that their cost of supplement will be quite high. The consultant has yet to see this approach work profitably in the Manawatu.

Another warning sign is if the farmer or another of his advisors quotes "***overseas work***". Often overseas systems are not applicable to New Zealand's pastoral-based systems. The consultant will read the material and assess if it is relevant to the client. He stressed that one of the things he is paid to do by a client is a) keep them up to date on new developments and b) identify for them what is relevant and what is not to their business. The consultant plays an important role as a knowledge gatekeeper (or broker) (Klerkx *et al*., 2009; Klerkx and Proctor 2013).

Phillipson *et al*. (2016) investigated the situation where farmers in the United Kingdom relied on a range of expert advisors for advice on different aspects of production management in relation to sustainability. They found that advisors needed skills in the art of deference. That is they needed to be aware of the expertise of different types of advisors and acknowledge the superior expertise

of another profession in a particular area. As such, advisors needed to know when and how to defer to the expertise of others. Through this process, they provide a "reputational endorsement" to another profession. This strengthens relationships between the advisors and makes future reciprocations more likely. The consultant did recognise when he was moving into an area outside his expertise and would recommend that the client consult with another rural professional who had the required knowledge. However, his main concern was about competition over knowledge territories with advisors from rival professions. Phillipson *et al*. (2016) reported that where different advisors work together with farmers, they compete with each other over knowledge territories and challenge each other in terms of the legitimacy of their expertise.

Phillipson *et al*. (2016) investigated the strategies advisors used to cope with the competition that occurred between them. Some advisors took a central role in these extended networks and occupied a brokering role as a way of asserting their centrality. They found that land agents in their study took this role and acted as trusted intermediary between the farmer and the inter-professional networks. Phillipson *et al*. (2016) found that the land agents acted as gatekeepers, guarding access to their farmer clients. This approach was also taken by the consultant in this study. The alternative strategy used by advisors was to play a secondary role (Phillipson *et al*., 2016). The veterinarians in this study used this strategy and did not manage inter-professional teams on their farmer clients' behalf. Rather, their focus was helping the farmer with his veterinarian health planning. However, they also played the role of "ringmasters" advising the farmer about when to bring in other technical advisors when required. The focus here however was around the management of the farmers' livestock, not the whole business as was the case with the land agents. As such, within an extended network there are hierarchies of expertise, but Phillipson *et al*. (2016) found that these hierarchies are not fixed and that they are subject to constant negotiation. Phillipson *et al*. (2016) also reported that some professions can limit competition because of their exclusive skillset (e.g. the diagnostic skills of veterinarians), but other professions may face competition because they have similar skillsets (e.g. land agents have long faced competition from other professions in relation to valuations skills). Phillipson *et al*. (2016) found that this competition has driven land agents to extend their services into new domains such as agr-environmental management. The consultant in this study has found that other professions (e.g. veterinarians) are now offering animal nutrition advice. However, because these advisors often lack business management skills, their advice can prove costly to the client. As such, the consultant had to work to ensure his clients acknowledged his expertise as paramount over that of other advisors. Phillipson *et al*.'s (2016) work suggests that with the increasingly pluralistic nature of the advisory area, such competition for knowledge territories will intensify.

Another major concern to the consultant is that knowledge is being brought into the country with little thought about the New Zealand context or whether the **knowledge is relevant to New Zealand farming systems**. Famers need to understand the relevance of the nature of the New Zealand farming system relative to the context of the overseas farming systems from which the research has come from. Some overseas technologies are relevant, appropriate and useful to New Zealand systems and some are not. The translation of knowledge from one context to another has been identified as a problem in "translation theory" (Estabrooks *et al*., 2006) and this appears to be a problem in the New Zealand dairy industry where farmers and advisors are advocating the use of technologies that are not suitable or relevant to the New Zealand context where cows are fed primarily pasture that has a high protein content.

The consultant then assesses if the supplement is being wasted or if its use has resulted in high post-grazing residuals and loss of pasture quality or excessive topping and hay, silage or balage making on the milking platform. He also finds out the types of feeds and associated additives that are being used to identify if the cost of the feed (cents/kg DM and cents/MJ ME) could be limiting profitability.

Forage crop use

The use of forage crops within a dairy system does **not** tend to influence pasture dry matter harvested per hectare to any major degree, primarily because of the relatively small areas grown in comparison to pasture. However, the consultant knows of a small number of farmers who use forage crops to obtain high levels of forage dry matter harvested per hectare. He interacts with a farmer who harvests over 20 tonnes DM/ha and to do this he has 25% of his farm in maize growing 28 tonnes DM/ha. The client runs 1050 cows on 255 ha producing 500 kg MS/cow at a stocking rate of 4.1 cows/ha, therefore producing over 2000 kg MS/ha.

3.3.7.2 Diagnosis of the cause of low levels of milksolids production problems

The second cause of low profitability for a client is due to low levels of productivity (MS/ha and MS/cow). As previously stated, the consultant compares the client's milksolids production per hectare, stocking rate and milksolids per cow against a benchmarking matrix he has developed based on farm location, soil type and system type (See section 3.3.1.2.2). The consultant then investigates the level of milksolids per cow that the client is producing (Figure 9). As a rough rule of thumb, he believes that good farmers produce around 400 kg MS/cow and poor farmers produce around 300 kg MS/cow. If per cow performance is low (e.g. 300 – 320 kg MS/cow), then this will trigger him to investigate this further. At this level of production, a client is "***really constraining a cow***" and the consultant will question if the client has been

offering the wrong amount of feed for the body weight of the cow. Other authors have stressed the importance of balancing stocking rate and per cow production to ensure that the herd can express their milksolids production potential without significantly reducing pasture dry matter harvested per hectare and farm profitability (Savage and Lewis, 2005; Hedley *et al*., 2006; Macdonald *et al*., 2008)

The consultant believes that 400 kg MS/cow is a good level of production, however he has the proviso that this can depend upon the days in milk and other factors. Some farmers are producing 500 kg MS/cow, but at these levels, the consultant checks how such high levels of production are being achieved. It may be that the farmer is buying in expensive feed to achieve this. As such, when considering productivity data, the consultant must always consider the context (e.g. soil type, location (climate) and system) and other factors that may be influencing the level of production the farmer is achieving. For each **district,** the consultant has benchmarks for average levels of physical efficiency such as milk solids production. He then adjusts these for the level of **bought-in feed** (t DM/cow), or the system type, to classify the farmer as good, average or poor.

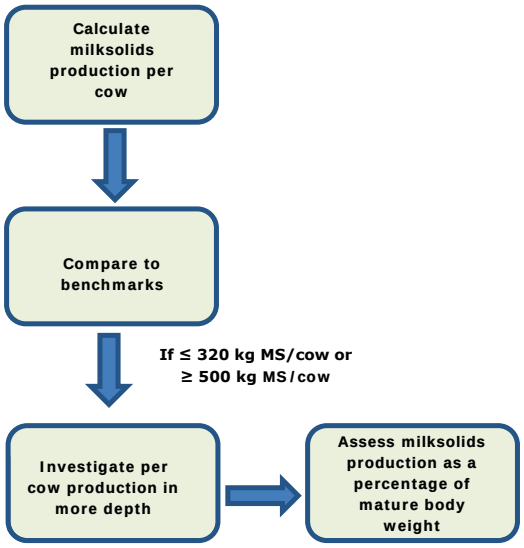

Figure 9. Process used to assess if milksolids per cow production is optimal.

When considering performance in relation to bought-in feed, the consultant uses DairyNZ guidelines about how much milksolids as a **percentage of mature body weight**, a cow should produce under the different system types (1 – 5). He works on a cow producing 100% of her mature body weight as milksolids in a system 5, 85 – 90% for a system 3 and 70 – 75% for a cow in a system 1. He believes that this measure is more useful than milksolids per cow because it takes into account the mature body weight of the herd. For example, he does

not expect a 350 kg LW Jersey cow to produce the same as a 550 kg LW Friesian cow given relative feeding levels. He also takes into account the **types of feed** the client is providing and if the feeds are energy rich, he will expect more milksolids production than if the client was feeding less energy rich feeds. This demonstrates that although the consultant considers three basic parameters when benchmarking milksolids production (soil type, location and system type), he is also taking into account a range of other factors such as cow body weight, and the energy content of bought in feeds. As such, the consultant has a multi-dimensional matrix that is based around location (climate), soil type, and system type, but also incorporates other dimensions such as cow body weight and the energy content of bought in feed.

If a client asks the consultant if he should be producing more milksolids per cow, the consultant will work out the milksolids production per kilogramme of live weight to determine if, for the system the client is running, milksolids production can be improved. The consultant would then use the DairyNZ guidelines of percentage of mature body weight by system to assess if the client had scope to improve per cow production. In the example the consultant provided, the client wanted to produce 450 kg MS/cow from a herd with a body weight of 450 kg LW. The client was operating a system 3 farm and based on the DairyNZ guidelines the consultant expected this farm to achieve a milksolids per cow production of 85 – 90% of mature body weight. As such, the consultant asked the client if he would be happy feeding more supplement to achieve his target of 450 kg MS/cow. When the client stated that he would not want to do this, the consultant pointed out that without additional supplement, he would be unable to reach this target of 450 kg MS/cow. The consultant noted that this level of performance is not impossible, but it is very difficult to achieve without using high levels of supplement.

The consultant also uses comparative stocking rate to assess if the farm is over-stocked and there is insufficient feed going into production or alternatively if it is understocked and pasture is being wasted and pasture quality is being compromised with milksolids production per hectare limited because of this. The consultant stated that in the region, farms that are in the range of 80 – 85 kg LW/tonne DM eaten tend to be efficient. However, if a client is outside this range he will assess possible changes to improve profitability. Options may be to 1) increase supplement or reduce stocking rate or 2) reduce supplement or increase stocking rate. The decision of which way to go will depend upon what type of system the client wants to operate.

Another indicator the consultant uses is “days in milk”. However, this indicator is a lower level indicator within the consultant’s profitability tree and as such is very context dependent. For example, the consultant stated that if a farm is in Eketahuna, he knows that the herd will have less days in milk than another farm

that is in a better area for pasture production because Eketahuna has a short growing season. The consultant has rough averages for his different districts or areas. In general, it is difficult to achieve 300 days in milk, so this is at the top end. Farms achieving 270 days in milk are pretty good whereas 230 days in milk is considered poor. The New Zealand average is around 240 days in milk. In general terms, the consultant stated that a cow is more efficient if it is milking for longer and any response to supplement is good for a milking cow compared to a dry cow. By this, he means that using supplement is often profitable where it is used to extend the lactation because the maintenance costs of the cow are already covered if it is dry. Any supplement that is fed will be used purely for production as the maintenance cost is already covered. This provides a very good marginal response to supplement feeding provided the milk price is reasonable.

If a client has a low days in milk figure, the consultant will ask why this is the case. Is the farmer's calving late, or is he drying off early and why is this? The consultant also compares the days in milk to the milksolids production per cow. For example, a herd in Eketahuna that was milking for 230 days would be expected to produce 350 kg MS/cow, whereas a herd milking in a better area with 280 days in milk would be expected to produce 380 – 400 kg MS/cow. As such, days in milk and milksolids per cow have to be considered in relation to the district the farm is in and the pattern of pasture growth in that district. In Eketahuna or Apiti, both high altitude areas, a farmer would need to calve later and dry off earlier in comparison to a farm in a low altitude area such as Kairanga or Opiki. The consultant also pointed out that the farm in Eketahuna or Apiti would also have cost less in terms of the capital cost per hectare because of its production limitations. As such, a farm producing 850 – 900 kg MS/ha in Apiti may provide as good a return on capital as a farm producing 1000 – 1100 kg MS/ha in Opiki.

In relation to milksolids production, one of the elements the consultant looks at is herd genetics. He classifies it as another element of **infra-structure**, but one that cannot be changed quickly. He gave the example of a high quality herd that would produce 1.65 kg MS/cow/day when more average herds were producing 1.4 kg MS/cow/day. Although it is very important, it is difficult to change quickly and as such, the consultant stressed that over the short-term he has to work with the herd that the client has. The consultant uses BW and PW values to assess a herd, but these numbers change over time so he does not have a set of specific indicators. If he wants to know where a client's herd sits in relation to its genetic merit, he will contact the local LIC staff member and ask her for her values for poor, average and good BW and PW indicators. The consultant does look at the history of the herd in relation to its genetics. For example, has the herd been expanding and as such, there has been limited

selection. In contrast there might be a client who has been farming a herd of 400 cows for the last decade and he has been able to do a lot of selection.

3.3.7.3 Diagnosis of high cost of milk production problems

Another important cause of low profitability is where a client has a high cost of milk production. During the first visit, the consultant focuses primarily on identifying if the cost of milk production is a problem. Indicators of this include the client's high use of supplements relative to the herd's production, those that suggest supplement and pasture is being wasted (supplement left on the ground in a paddock, high post-grazing residuals, excessive topping and supplement making) and also the client's discourse around supplement use and cost control. More in-depth diagnosis of the problem does not occur until the consultant can access the client's accounts and look at his actual cost structure (see the Dairybase section).

During the first visit, the client may mention his cost of milk production ($/kg MS). The consultant stressed that he always verifies a client's cost of milk production because of the problems of calculating it correctly and issues with accounting procedures for taxation purposes. He has also found that farmers often exaggerate their performance (cost of milk production) because of ego or to gain mana or status. As such, he always asks cross-checking questions to verify their cost structure along with assessing it through Dairybase, a process of **triangulation**.

3.3.7.4 Diagnosis and system type

The consultant was asked if the indicators he uses to assess farm profitability differ with farming system types (e.g. system 1 – 5). He stated that they do not differ in terms of the high level indicators of profitability such as return on capital because he knows work by Professor Nicola Shadbolt found that the different system types had similar levels of profitability (See Shadbolt, 2012). A system 5 might have gross farm revenue per hectare of $16,000 and operating expense per hectare of $8,000 to generate and operating profit per hectare of $8,000/ha. However, for this system type, if the milk price comes back, the farm may only generate a gross farm revenue per hectare of $10,000/ha and the operating profit per hectare will fall to $2,000/ha. However, as he moves down his "profitability tree" he has to be careful how he assesses the lower level indicators. For example, a system 4 – 5 farm might have an average cost of milk production ($/kg MS), but high levels of milksolids production per hectare. As such, one indicator suggests the client is about average, but because of his high levels of milksolids production, he achieves a high level of profitability.

The consultant stated that for different farm system types, some factors will increase and some will be reduced as one moves from system 1 to system 5. For example, total feed costs will increase as one moves from system 1 to system 5. Labour costs may be higher and so-on. The consultant needs to

know the impact of different farm system types on the cost structure of a farm business. On the income side, milksolids production per cow and per hectare tends to increase as one moves from system 1 to system 5, and as such, indicators that have an enumerator and a denominator effect are then a function of both the costs and the production levels.

The consultant pointed out that within a system type, if the client can increase milksolids production per cow and per hectare while controlling costs, he will be more profitable. He also knows that across system types, if a farm has a high cost of milk production, then to be profitable, the client would have to produce a high level of milk production per hectare to counter the high cost effect. He gave the example of a client who has a cost of milk production of $5.50/kg MS. This farmer would have to be producing a very high level of milksolids per hectare to be profitable. As such, the consultant takes into account these factors when looking at different farm system types. He knows that to be highly profitable, clients farming system 1 and 2 need to have a low cost of milk production because their level of milksolids production per hectare will be constrained by input levels. In contrast, some clients farming systems 4 and 5 may have an average cost of milk production, but be highly profitable because they achieve very high levels of milksolids production per hectare. The consultant also knows that a client farming system 1 or 2 with an average cost of milk production, will not be highly profitable and is likely to be below average in terms of profitability. This process is based on **logic** and in consultancy "***logical analysis is important***".

In terms of different farming systems, the consultant expects a system 5 to have a higher gross farm revenue per hectare than a system 3 or system 1. However, on the cost side, he notes that one has to be careful because the higher production levels of a system 5 dilute the costs from a cost per kilogram milksolids produced perspective. As such, some of these system 5 farms have low to average milk production costs. This reflects the **numerator/denominator** effect, a point stressed by Shadbolt (2012). The higher milksolids production levels will dilute labour costs, other farm working expenses and overhead costs. The consultant provided the example of a farmer with 180 cows and the impact of him producing 350 kg MS/cow, 400 kg MS/cow and 500 kg MS/cow. As the farmer increases his production per cow, he is diluting his cost of milk production. To dilute the farm working expenses, a farmer has to use his feed efficiently and make sure that he is harvesting his pasture efficiently. The consultant noted that many farmers are not doing this. He quoted John Roche, a nutritionist with DairyNZ who reported that about 10 – 20% of farmers have increased their use of supplements profitably, but the rest have not.

Shadbolt (2012) stated that both the external environment and the on-farm competitive strategy (low cost) are the same for all New Zealand dairy farms. However, the organisational design or the resource configuration differs between farms. She differentiated between low-input farms who achieve low cost production through cost control, the **numerator** effect and high-input farms who achieve it through improved outputs, the **denominator** effect. Shadbolt (2012) stated that there is much debate within the industry over which system is the right one for the industry. However, she argues that much of the debate is fuelled by conflicting opinion and mis-leading metrics. The prevailing view in this debate is that New Zealand's low cost advantage "is being eroded by more intensive production systems that require greater use of purchased supplements and significant investment in depreciating assets" (Shadbolt, 2012, p. 20). The shift from a low-input to a high-input system reduces production risk from climatic variation, but increases market risk from purchased feed (Shadbolt, 2012). Higher input systems are also more complex to manage (Hedley and Kolver (2006), a point made by the consultant.

The most commonly used metric to assess farm profitability is operating profit per hectare (Shadbolt, 2012) and it is advocated by some leading researchers as the most relevant measure of profitability (Roche and Newman, 2008). However, this is a mis-leading financial metric because it does not reflect that when comparing farms, not all hectares are equal in terms of quality and hence value. As such it does not reflect the additional capital invested in a farm as it intensifies (Shadbolt, 2012). As such, Shadbolt (2012) strongly argues that the most relevant measure of farm profitability is return on equity as it determines how effectively management utilises their capital. The consultant does not use return on equity as his key measure of profitability. However, he does use return on assets which does take into account the total capital tied up in the business. Importantly, Shadbolt (2012) used both return on equity and return on capital to assess the profitability of different farming systems. Shadbolt (2012) also pointed out that the other commonly used financial metric, cost of production also fails to take into account the asset base required to deliver the production in each system. As such, a better long-term measure of the cost of production should take into account the cost of the asset base. She recommended that the cost of production should combine the operating expenses and the cost of funds. Shadbolt (2012) argues that operating expenses per kilogramme of milksolids is a useful measure of the short to medium term measure of the competitiveness of the business, whilst the cost of production per kilogramme milksolids that includes the cost of funds is a better measure of the future or long-term competitiveness of the business.

Shadbolt's (2012, p. 25) study found that over the three years that were analysed, "*the resource configuration of each system [system type] in most years led to no significant difference in either operating profit margin or asset*

turnover ratio, the drivers of return on assets and return on equity. This similarity is in stark contrast to the conclusions drawn when examining the commonly used metrics of production and operating profit per hectare and demonstrates how misleading they are". As such, Shadbolt (2012) concludes that there is little benefit to farmers in changing farm system and that they should choose their farming system on the basis of preference and attitude towards the various sources of risk. The consultant in this study would agree with these conclusions except where farmers lacked the capability to manage the more complex high input systems, a point highlighted by Hedley and Kolver (2006). Shadbolt (2012) also identified that in one of the years when milk price fell, the operating expenses per kilogram of milksolids of the higher input systems were significantly higher than the lower input systems due to a factor called "stickiness of costs". This is where there is little mobility in costs and farmers have a limited ability to manage costs down. Shadbolt (2012) stated that this was partly because the forecasted milk price decrease did not occur until late in the season, giving the high input systems little time to adjust their cost structure. By this point in time, the majority of these farmers spending had been undertaken and had been based on a much higher forecasted milk price.

3.3.8 Using Dairybase to further diagnose low profitability problems

At the end of the first visit, if the consultant has identified that a client has a low profitability problem and he has persuaded them that they do indeed have a problem, his next step is to convince them to have their accounts analysed. Many of his clients do not want to do this, and are not interested in improving profitability because they have low levels of debt and are in a comfortable financial position. As such, it is quite important for the consultant to convince his client to undertake the analysis. If the client is interested in undertaking a financial analysis of his business, the consultant will ask him to put his accounts through Dairybase. The following sections describe the process the consultant works through with a client in relation to Dairybase (See Shadbolt, 2007). This involves several steps. First the consultant must convince the client to have his accounts analysed. Second the client has to organise for his accounts to be analysed by Dairybase and for the consultant to gain access to the results. Third, the consultant interprets the results of the client's Dairybase analysis prior to his second visit. The consultant then organises a second visit with the client and works through the Dairybase data with the client to confirm that the client does indeed have a low profitability problem. He will also further diagnose the causes of the problem and then tailor appropriate solutions to the client's context.

If the client does not want to undertake any financial analysis, the consultant can still help them improve their profitability by improving the areas that he has diagnosed to be limiting business performance. This less formal and indirect diagnosis of a low profitability problem is not the same as a formal analysis of

the client's accounts. However, it can point clients in the right direction to help them improve profitability. The other problem with this less formal, indirect assessment of a low profitability problem is that the consultant does not have access to a full analysis of the financial performance of the client's business. He, in effect, only has a ***partial view*** of the profitability of the client's business.

3.3.8.1 Dairybase and the standardization of benchmarking

In the Dairybase database, farms are sorted by system, region and ownership structure (e.g. owner-operator, 50/50 sharemilker). However, the consultant stated that often there are only a limited number of farms in each category because until recently, Dairybase has not been well subscribed by New Zealand dairy farmers. As such, for some categories, Dairybase may have to provide data for the North Island rather than by region. The problem with this is that the farms cover a broad range of soil types, climatic conditions and infra-structure (e.g. irrigated and non-irrigated). Some of the best data can be sourced from LIC such as herd numbers, production levels per herd, average herd size etc. Dairy companies can provide data about what dairy farms are producing across the different soil types within a region by month to date. However, this data lags in real time by about a month. To source financial data, the consultant can use Dairybase, or he can obtain data from a local accountant. Some consultants have their own financial data-bases which they use to compare client performance (e.g. Baker and Associates).

The consultant stated that one of the problems for benchmarking dairy farmers is that different service providers use different measures when calculating benchmarks. A good example of this is cost of milk production and what different service providers include or don't include in the calculation. For example, Dairybase includes the cost of depreciation, adjustments for runoffs and the wages of management. The consultant has found that when some farmers or rural professionals quote cost of milk production figures, they have not made these adjustments.

Rather than calculate his own figures, the consultant uses the information calculated by Dairybase. He prefers to do this because the Dairybase staff calculate the figures for him and they are all standardised. The figures in Dairybase are adjusted for non-book items, something that other service providers may not do. The consultant is concerned about the lack of standardisation because the cost of milk production has become another status symbol like per cow production. As such, figures can be "fudged" and the consultant is always suspicious of data that shows an extremely low cost of milk production. Non-cash costs are often ignored and some of the cash costs may be underestimated. Ignoring some expenses in the calculation can have a major impact on the final figure. For example, ignoring the wages of management component can reduce the cost of milk production by 50 – 70 cents/kg MS. Not

adjusting for the ownership of a runoff can reduce the cost of milk production by 30 cents/kg MS and not adjusting for changes in supplement inventory on-hand change the cost by 20 – 30 cents/kg MS.

3.3.8.2 Financial analysis (liquidity, profitability and solvency)

Once the consultant obtains permission from the client to analyse his accounts, he will normally analyse **three years** of accounts data. One set of accounts provides a snapshot in time, and the consultant wants to see what has changed over time for his client. This allows trends to be evaluated in terms of asset value, debt and so-on. Other studies (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; Bruce 2013) of consultants have reported that they use trend data to help diagnose problems. However the consultant noted that he has to be careful when looking at trends because it could reflect factors in the external environment rather than the farmer's management. For example, valuations of the herd or dairy company shares may be low that year. If there are changes in financial performance, an important task for the consultant is to assess why these changes have occurred e.g. because cow prices are low in that year. Accountants have different practices in relation to the valuation of assets and the consultant needs to know this when looking at trends. For example, does the client's accountant value land and buildings every year or not and so-on. A lot of accountants use quotable values and this value will sit in the books over a number of years until a new valuation is undertaken on the farm. Others have adopted a more corporate approach and value the assets every two years.

The consultant then looks at three important indicators – **profitability**, **liquidity** and **solvency.** These tend to be the core concepts in farm financial management (Jackson Smith *et al*., 2015). Shadbolt and Gardner (2005) identify these as the critical indicators of farm business performance. However, they make an important distinction in relation to solvency. They view solvency as one of two indicators of "**wealth**". **Equity** is a measure of **wealth** and they separate this indicator into **wealth creation** and **ownership risk** or **solvency**. The consultant does however look at wealth creation. He does not look at these indicators in isolation, he considers them together. The reason for this is because a farm can be highly profitable, but insolvent. As such, to obtain a holistic picture of the business, the consultant assesses each of the measures of financial performance. In his analysis of **profitability**, he will look at **economic farm surplus** (EFS) and **return on assets**. He then looks at **liquidity** which he thinks is becoming an increasingly **important issue** in the **industry** along with low profitability. The consultant believes that farmers will not be able to operate like they did ten years ago because the amount of variability they face now is much greater. The final indicator used by the consultant is **solvency**. If the consultant wants to investigate the client's financial position in more depth, he may draw on the expertise of another rural professional who has a Masters in

Agricultural Economics. He may also consult with an academic who has expertise in this area from the local university, but to a lesser degree.

In terms of profitability, the consultant will assess operating return on dairy assets[3], operating profit per hectare[4] and operating profit margin[5]. He will also use a couple of other profitability measures from the Dairybase suite including the cost of milk production (operating expenses per kilogram milksolids[6]). The consultant noted that he is very aware of what constitutes the formulae of various indices, i.e. what is included and what is not and how the figures are "**adjusted**". This is why Dairybase is so important when the consultant is benchmarking a farm because he knows that he is comparing "***apples with apples***" because each farm is analysed using the same formulae.

The consultant believes that return on assets is the best measure of profitability because it take into account the capital tied up in the business and this is important when comparing different dairy farms that have different amounts of capital tied up in their system e.g. irrigation versus no irrigation, a well-drained property versus a property with no drainage and so-on. Consultants have to be aware of differences in the capital that makes up a farm business. For example, one farm might have irrigation and grow 4.0 t DM/ha more than an unirrigated farm, a second might buy in supplement, a third might graze-off, and another might own a runoff. These differences in capital structure must be taken into account when benchmarking a farm. Shadbolt and Gardner (2005) stressed the importance of separating out assets that are owned from leased capital when calculating the profitability of a farm business.

Other measures on Dairybase in terms of profitability for the dairy business include:

1. Gross farm revenue per hectare
2. Operating expenses per hectare
3. Gross farm revenue per kilogram milksolids
4. Operating profit per kilogram milksolids
5. Farm working expenses per kilogram milksolids[7]
6. Asset turnover percentage (%)[8]

[3] (Operating profit – Rent)/(Total capital employed – Non-owned capital).
[4] (Gross farm income – Operating expenses)/effective area of the farm.
[5] Operating profit margin/Gross farm income.
[6] The cash farm working expenses plus the lease for run-off land or a capital cost of 5% of the value of a runoff if owned by the farmer, plus non-cash adjustments for changes in feed inventory on-hand, family labour or extraordinary expenses divided by the kilograms of milksolids produced in the financial year.
[7] This is the cash farm working expenses divided by the effective area. It does not include non-cash adjustments for changes in feed inventory on-hand, family labour or extraordinary expenses. It does include the lease for run-off land or a capital cost of 5% of the value of a runoff if owned by the farmer.
[8] Gross farm income/Total value of the dairy assets

Dairybase also has “Total Business” profitability measures and these include:

1. Interest and rent/Total revenue (%)
2. Interest and rent/kg milksolids
3. Total return on assets (%)
4. Return on equity (%) excluding the change in capital
5. Total return on equity (%)

A key indicator that the consultant looks at in terms of profitability is operating profit per hectare. However, the consultant stressed that even some of the high level indicators he uses have “***fish hooks***” or problems associated with them. The consultant refers to a farmer with a $4.50/kg MS cost of milk production versus a farmer with cost of $4.20/kg MS. However, the former is producing 1500 kg MS/ha and the latter is only producing 1000 kg MS/ha (see example in Figure 12). As such, he has to be aware of the “***fish hooks***” associated with his different benchmarking indicators, a point made by Shadbolt (2012) about the dangers of using partial and misleading metrics.

In terms of liquidity, the consultant assesses interest times cover and a few other indicators. Other measures on Dairybase in terms of liquidity include:

1. Net cash income[9]
2. Farm working expenses
3. Cash Operating surplus
4. Discretionary cash[10]
5. Cash surplus/deficit

In terms of solvency, the consultant uses the indicators: debt to equity ratio, debt as dollars per kilogram milksolids and so-on. The consultant also looks at business growth using indicators such as change in equity over time. The consultant did not mention the use of **Economic Value Added** (EVA™), a now frequently quoted measure of wealth creation (Shadbolt and Gardner, 2005). This is the difference between **net operating profit after tax** (NOPAT) and the **weighted average cost of capital** (WACC). In Dairybase, they have the following measures under the heading “Wealth”:

1. Closing dairy assets
2. Closing total assets
3. Closing total liabilities
4. Closing total equity
5. Growth in equity
6. Growth from profit
7. Growth from capital

[9] Total cash income from the farming operation.
[10] Cash income less cash farm working expenses, tax paid, interest and rent. Money left to pay for debt repayment (principle), capital items, off-farm investments and drawings.

8. Growth in equity (%)
9. Debt to asset ratio (%)
10. Opening liabilities/kg MS
11. Closing liabilities/kg MS

3.3.8.3 Industry problems in relation to financial literacy

The consultant believes that **profitability**, **liquidity** and **solvency** are fundamental issues for the dairy industry and that it should put more emphasis on business management. He also believes that a lot of advisors in the industry are not focused on business management or profitability. They may say that their aim is to help farmers improve profitability, but their advice is often in conflict with this goal. He is concerned that there are now a number of advisors in the dairy sector who are advocating systems and practices that do not play to New Zealand's strengths in pastoral systems. These are advisors that focus on high per cow production to the detriment of pasture management and profitability. The consultant includes nutritionists and veterinarians in this group. Often these advisors are advocating high feeding levels for herds using bought-in feed and additives. The consultant believes that a lot of farmers like this advice because it fits with the prevailing **social norms** that "good farmers" achieve high levels of per cow production and have cows in good condition year round ("***fat cows***"). The consultant believes that this attitude is reflected in the poor uptake of Dairybase and that if it had not been levy funded it would not have survived as a service provider.

The consultant believes that part of the problem is that farmers "don't know what they don't know". As such, the majority of dairy farmers are not demanding this service from their farm management consultants because they are not aware of the importance of this information to their business. He believes that farm business management is not valued by the dairy industry so farmers are not demanding these services in the same way that they demand technical services around production management (e.g. grazing management and herd management). However, he also believes that the skill levels of farm management consultants and other advisors are not high in this area. Similarly, farmers' knowledge and skills in this are relatively poor. The lack of demand for farm business management advice is also a problem for farm management consultants. He believes that for this area to strengthen, there has to be demand for those services from farmers. The consultant stated that discussion groups have traditionally focused on production management; however, in more recent times they have begun to introduce farm business management training. The consultant believes that DairyNZ do respond to issues such as the unprofitable use of supplements in the industry. However, he believes it takes them too long to develop programmes to counter such problems and by they have been introduced "***the horse has bolted***". Overall, the consultant believes that the industry is weak in relation to farm business management and that

there are only a limited number of farm management consultants that provide advice in this area. He believes that because of this weakness in the industry there is scope for training and accreditation in the area of farm business management. The industry also has the advantage that rural professionals have access to Dairybase that can undertake financial analysis of accounts for farmers.

3.3.8.4 Organising accounts analysis through the Dairybase service

As stated previously, prior to having his new client's accounts analysed, the consultant insists that he has buy-in, otherwise he sees little point in undertaking a detailed accounts analysis. The consultant may help the client fill in the Dairybase form so that his accounts are analysed through Dairybase. However, he does not do the analysis, rather he asks his client to get his accountant to submit the accounts to the Dairybase team. The consultant believes that it is not good use of his time to undertake the analysis when the Dairybase team can provide a standardised analysis of his client's accounts along with benchmarking data. By asking the client to organise for the accounts analysis, the consultant assesses the degree of buy-in he has with the client. If the client fails to contact the accountant, then he knows he does not have buy-in. The consultant will contact them to remind them and "give them a push" but he will not "hound them to death". If they do not want to do it, he will step back.

Most of the accountants the consultant works with are signed up to Dairybase. Some of these accountants promote Dairybase and others do not. Dairybase has two levels: at level one it provides basic financial benchmarking and at level two physical productivity data is also analysed such as pasture dry matter harvested per hectare and herd reproductive performance. The consultant is not worried if they only do the analysis at level one because he can work out most of the physical productivity indices himself. However, if the client is keen to do the level two analysis, the consultant will help him fill in the associated form that is required for this more complex analysis.

The consultant normally asked the client to request that the last 2 – 3 years accounts are analysed because the consultant wants to observe trends such as changes in equity. The consultant does not do the last five years, because a lot of things can change in that time period such as cow numbers, pay out and so-on. Also, some of the historical data (e.g. "***debt servicing***" and "***interest times cover***"), is not relevant because the consultant wants to know what the client's current position is. Similarly, the cost of milk production five years ago is not really relevant because cost relativities change over time and with the pay out. However, the consultant does want to know about other trends such as the amount of debt the client has paid off over the last five years. The process the consultant uses with the client for each of these reports is described below:

3.3.8.5 Accounts analysis and interacting with the client

Once the accounts are analysed, the client then contacts the consultant to let him know that they are available. The consultant asks the client to print off a copy of the Dairybase report and go over it plus he organises a visit. The consultant has on-line access to Dairybase and reviews the client's report in his office to identify where the client is performing well, poorly or average. The consultant does not write a report about the accounts analysis at this stage, rather he waits until after the visit. Once the consultant has gone over the Dairybase data in his office, he then meets with the client. This meeting does not include a farm walk, the focus is purely on the accounts analysis.

On the previous visit, the consultant has assessed the **financial literacy** of the client and he then uses this information to **pitch** his discussion at the right level. Little has been written in the farm management literature about this, but Williams *et al*. (1997b) did report that the expert consultant in her study did tailor the vocabulary he used to the clients capability. For clients that are not very financially literate, there are a number of indicators that he will not discuss with them. He assesses the client's financial literacy by talking to them. He will find out what terms they know and understand in terms of financial analysis. The consultant stressed that he has **to pitch his discussion at the right level**. If he pitches it at the wrong level, he will lose them because they will not understand what he is talking about. If he loses the client, he will not be able to instigate change, so it is important that he pitches it at the right level.

For a farmer with a low level of financial literacy, the consultant would start off by explaining some of his key concepts: **liquidity**, **profitability** and **solvency** because these are the cornerstones of financial management and they have to understand these. He explains that a farmer can be highly profitable and yet they can go broke or become insolvent. The consultant stressed that it is important that the client understands these concepts if he is to have impact. At the most basic level, the consultant will discuss operating profit per hectare. For more financially literate clients he will also discuss interest times cover, operating profit margin, return on assets, return on equity and the level of gearing and so-on. He will also talk about how these indicators affect a farming system and its performance. As such, part of the consultant's role is to **educate** his clients in **financial management**. Hansen (2015) in a study of financial extension in Norway reported that for farmers to benefit from financial extension, they needed a certain level of prior knowledge. They found that this makes farmers better at noticing variation in their own practice and relating this variation to what they learn from consultants. They also found that farmers with a high level of knowledge are more able to utilise external knowledge through their networks. Of relevance to this area may also be the finding by Jackson-Smith *et al*. (2004) that although women play a crucial role in collecting and maintaining farm financial records in Wisconsin USA, they are much less

involved in financial analysis or farm financial training. This may be an area for further research in the future.

The consultant stated that farmers have a rough idea about the key financial components. For example, he said that "***they kind of know it but you know they know about profitability and they know when they find it difficult to pay the bills and liquidity and those kind of things. And they know whether they owe a lot or haven't got much equity so they kind of know it [solvency], but it's like really crystallising it for them into those components***". The consultant stated that the level of knowledge across his clients varies. Some clients would not understand why a highly "profitable" business might be insolvent, but others would. In a study of Wisconsin farmers, Jackson-Smith *et al*. (2004) reported that although the majority of farmers in their survey felt reasonably knowledgeable about farm financial management. However, this confidence was not strongly supported by the results of a farm financial management quiz conducted with the same farmers. The scores from the quiz were very low and did not reflect the self-reported assessment of the farmers' knowledge about the topic.

After this introduction to key financial indicators, the consultant will provide the client with a brief summary of the highlights of the accounts analysis and the main strengths and weaknesses he has identified. For example he might say that one of the client's strengths is that he has a high gross farm income per hectare. A weakness might be that the client has average to above average costs per hectare and so-on. He then goes through the more detailed material and points out to the client areas where he is good, poor or average. Where the client is average or weak, the consultant portrays these areas as opportunities for improving the profitability of the farm to avoid blaming the client for the farm's poor performance. Alternatively, he may say that this is an area we need to delve deeper into because the figures look high (or low) and he is not sure why this is the case. In this situation, the consultant needs the client to bring up their list of transactions so that he can see the cost categories in more detail. For example, the client's repairs and maintenance costs may be very high and the consultant will need to see what makes up the costs within that category. It may be that they have included some capital items or it was the year they painted all the farm buildings and so-on. It might be that the administration cost is high and it could be because they had setup some legal entity with their lawyer which cost a lot of money. Once the consultant has highlighted his key findings from the Dairybase analysis, he works through the report with the client in detail. The following sections describe this process.

3.3.8.6 The consultant's use of the Dairybase report with a client – An overview

When benchmarking the client's financial performance, the consultant considers the current milk price or **context** when assessing profitability. For example, last season an operating profit of $3,500/ha might have sounded good, but at the prevailing $8.40/kg MS milk price, this was an average level of profitability. In contrast the average operating profit for the year before might have been $2,500/ha when the payout was lower. As such, his benchmarks change depending upon the current milk price. The milk price dictates how he responds in a particular season because it changes the marginal revenue he can obtain from additional inputs. Changes in cost structure will also change the marginal cost of additional inputs. The consultant also goes into this session with **expectations** that he has built up from his previous visit to the client's farm. As with the study of farmer learning by Gray *et al*. (2003), the consultant compares his actual findings from his accounts analysis with his **expectations** to identify potential knowledge gaps. If this occurs, he has to explore such area further to understand why he had not expected this finding.

When the consultant works through the Dairybase report with the client, he starts with the front page of the report, the physical data summary. He will point out to the client that this is the basic material about his farm including balance date, land area, stock, milksolids production per cow and per hectare. Normally this page is of limited interest. After working through the first page, the consultant then moves onto the "Key Performance Indicator" page. First the consultant works through the "Farm Physical KPI's" and then he moves onto the "Profitability" section of the page. At this stage, the consultant explains the concepts of liquidity, profitability and solvency (or wealth) to the client. The consultant then works through the indices and he **tailors** what he covers to the client's **level of financial literacy**. As such, he may cover some indices and not others. He might say something like "***Yes, this is what we need to look at, let's not worry about this***". So he may look at operating profit per hectare, but ignore asset turnover because it is not commonly used in dairying. If the client has a high level of financial literacy, the consultant may go through all the indices. During this process, the consultant is highlighting strengths and weaknesses, identifying opportunities to improve the business and highlighting areas that he needs to delve into in more detail to understand what is happening in relation to that indicator.

During this session, the consultant wants the client to understand: a) How profitable his business is? 2) What is his liquidity like? and 3) What is his solvency? The consultant notes that most farmers talk about profitability, but rarely mention liquidity or solvency. Low levels of financial literacy in farming communities were reported by Jackson-Smith et al. (2004) for farmers in Wisconsin, USA, but little work has been undertaken in this area in New Zealand.

As they work through the indices, the consultant is saying: This is good, this is great, this is average, this is not so good. The advantage of Dairybase is that the client sees his numbers and he sees what the average for the Lower North Island is doing. It forces a **reality check** on the clients because it is not what they "feel" the business is doing, rather it is written down in **black and white**, this is how the business is performing relative to the regional average. The figures have also been adjusted so that the client is **comparing apples with apples**.

Often the consultant is clarifying the farm's financial position for the client. He may point out that their profitability is quite good, but their solvency is a problem. He may then tell them that to improve the situation they cannot do it by improving profitability because this is already quite good. Rather, the problem is structural around debt levels which are negatively impacting on the solvency of the business. As such, the consultant is doing a number of jobs during this discussion. First, he is **educating the client**, second his is **verifying the financial position** of the business with the client, third he is **delving into some areas in more depth** to **diagnose** the cause of their high or low values and finally and most importantly, he is **ensuring that the client takes on-board the actual financial position of the farm**. The consultant stressed that the latter point is critical because if the client does not accept that they have a financial problem, they are unlikely to change. In order for a client to change, they must know or understand their financial position and accept that this is the situation. To do this, the consultant uses the data and compares the farm to the benchmarks. The consultant is **monitoring** the client to see if he has **buy-in**. If he does not, then the best solution to this is to give the client time. The client might say something like: "I am not sure I agree with you about that". The consultant might tell them that they need to think about it. He may also say: "***Well this is what the analysis says, where do you think it is wrong***"? Often they say they don't know. The consultant might then give them a few days to think about it. Normally clients have a gut feeling that the farm business is not performing well. The consultant then tries to ensure there is the **realisation** that the business is not performing well and an **acceptance** that this is the situation. They may need time to go and talk to someone else about it before they fully accept the situation. Normally, this differs for different clients. However, the consultant points out that to have got this far, the clients must have been interested in improving their financial performance. Clients that are not interested would not put their accounts through Dairybase. If the consultant has given the client time to think about the Dairybase analysis, he will then ring them back in 4 – 5 days.

After the "**Key Performance Indicator**" page on Dairybase, the consultant moves to the "**Cash Flow and Profitability**" page and the "**Financial Detail**" page where he focuses on the breakdown of expenses. Again, he just works

through the categories with the client identifying what is good, bad or average. He will work through all the items. They are set out in groupings, so he works through the groupings and the categories within the various groups. Again he assesses if the client's figures are good, bad or average. If a cost category is **high**, the consultant might be alright with that if the client **knows why it is high** and that they are also **happy for the figure to be high**. For example, a client might be using nominated semen to obtain above average genetic gain. The cost of this semen is higher than other semen, but the client is happy to pay this to obtain the additional genetic gain. However, the consultant stressed that a client cannot have above average costs in all categories unless he has very high levels of income.

By the end of the Dairybase discussion, the client has a **good knowledge** of their **financial position** and **where they sit relative to other farmers** in the Lower North Island. They will know which areas they are good, poor or average and they will have an understanding of their **strengths** and **weaknesses**. They will also understand what the **threats** to their business are and what **opportunities** exist to improve it. If the client has **strengths**, the consultant "***tries to nail those down and repeat them***". If a client has **weaknesses,** the consultant "***tries to eliminate them***". If the consultant identifies **risks** (**threats**), he has to cater for these and if he identifies **opportunities**, he will try to capture them. He stated that at the end of the meeting "***So you should cover all four boxes [strengths, weaknesses, threats and opportunities]***". However, for this meeting, the aim is to ensure the client understands his financial position, his strengths and weaknesses and the threats and opportunities he is faced with. The next step is to address these and tailor solutions to do this. Often, because the consultant does not have detailed information about transactions, he will have to go back and delve into this data to explain some of the anomalies thrown up during the discussion. The next step after this is to develop an action plan and solutions tailored to the client's situation. The following sections describe how the consultant works through a Dairybase report with the client for each page of the report in more detail.

3.3.8.6.1 The key performance Indicator report

Once the consultant has provided an overview of the Dairybase analysis, he then works through the three components of the business (liquidity, profitability and solvency) using data from the "**Key performance Indicator**" page of the Dairybase report. The consultant would first work through the physical KPI's. He would look at the **pasture dry matter harvested per hectare** along with **milksolids per cow, stocking rate** and **milksolids per hectare**. The consultant reiterates that pasture dry matter harvested per hectare has a good correlation with profitability, but milksolids per cow and per hectare do not. He would also look at **cows per full time equivalent** to obtain an idea about the labour situation and also **kilogrammes of milksolids per full time**

equivalent. The consultant noted that a lot of factors drive **kilogrammes of milksolids per full time equivalent**. Importantly, for a level two Dairybase analysis **pasture dry matter harvested per hectare is calculated** whereas for the level 1 Dairybase analysis this is not included.

The consultant will also look at the reproductive performance indicators, but notes that this can be picked up from the client's "**Fertility Focus reports**". The reproductive performance is important, but again it is not highly correlated to profit because some farmers can be feeding a lot of high value supplements to ensure high levels of reproductive performance. It may however highlight a problem if reproductive performance is poor. However, for the physical indicators, the only one that the consultant takes seriously is **pasture dry matter harvested per hectare** because of its high correlation with profitability. If this figure is low, he deems it an opportunity, "***a huge opportunity***". If the level is average, the consultant still rates it as an opportunity, but not as large as the previous one. However, the consultant might shift the client from 50% of the potential of the farm to 70 – 75% of the potential, and this is still a large increase. In contrast, if the client is in the top 10% for **pasture dry matter harvested per hectare**, then it is going to be difficult for the consultant to improve their performance in this area. In this situation, the consultant may be able to "tweak" the system to obtain a slight improvement or he may look at a "***game changer***", which is a radical change or the introduction of a new technology to the client's system that may improve his profitability. For example, he might suggest introducing fodder beet that grows 40 t DM/ha to a farm that is harvesting 18 t DM/ha of pasture.

Once the consultant has looked at the physical performance of the farm on Dairybase, he then moves to the "***top of the tree***" and looks at the "**profitability table**" in the report. In terms of profitability, the consultant does not worry about what **system type** the client is operating because research by Professor Nicola Shadbolt at Massey University has shown that farmers can achieve similar levels of profitability across the five system types (Shadbolt, 2012 – see section 3.3.7.4) . As such, the consultant does not push his clients towards a certain types of system. He does note that systems 4 and 5 are more complex and difficult to manage well and it is easier to get management decisions wrong. The key KPI's the consultant discusses with his clients are: **operating profit/ha**, **gross farm revenue/ha**, **operating expenses/ha**, **operating profit/kg MS** and **operating expenses/kg MS**. His number one KPI is **operating profit per hectare** or **economic farm surplus per hectare**. The consultant wants to know how much profit the client is making per hectare before the other cost items (tax, debt servicing etc.) have to be deducted. There are a number of ways a client can generate high levels of profitability and this is why the consultant gets upset when other rural professionals focus solely on the cost of milk production or operating expenditure. It is important to know

what they have included in these figures and often they are not standardised. The consultant believes that the industry is "***losing the plot***" in relation to profitability. He also believes that DairyNZ is helping to confuse farmers. He believes that farmers are not being taught what to include in operating expenses per hectare so that it is a standardised measure across the industry.

The consultant views this as "***like the latest game in town to have the lowest operating costs per kilogramme of milksolids***". It is now replacing milksolids production per cow as the key indicator used by farmers to asses who is a "***good farmer***". These are examples of descriptive or practice norms (Minato et al., 2010) tat evolve over time. In this case, the social norm associated with a "good farmer" has changed from someone who achieves high levels of milksolids per cow to someone who has a low cost of milk production. The consultant gave the example of a client who has an "average" cost of milk production, but produces 1450 kg MS/ha, so that his farming system is highly profitable, despite his cost of milk production indicator suggesting he is only average. This highlights the danger of **partial indicators**. Alternatively, a farmer might have a low cost of milk production at around $2.50 - $3.00/kg MS, but also low milksolids production per hectare (600 – 700 kg MS/ha) so that when multiplied out, the farm is not very profitable. As such, the consultant highlights the dangers of using **partial** KPI's.

The consultant's primary profitability benchmark is **operating profit per hectare** because land is a farmer's largest investment. He then uses the other benchmarks to determine what has caused this level of operating profit per hectare (Working down his "***profitability tree***"). For example, has the client achieved average income (gross farm revenue per hectare) and low expenditure (operating expenses per hectare) or does he have high income and high expenditure. As such, the consultant thinks about the components of operating profit per hectare as a matrix of the two drivers (Table 8). This then identifies a range of ways in which a farmer can achieve either low or high levels of profitability.

In terms of **profitability**, the consultant compares the client's **operating profit/ha** to the average for the lower North Island on the Dairybase database. He does this because this is the only benchmarking data he has on profitability. This is an important limitation with the current system, because there are not enough dairy farmers on Dairybase to allow comparisons by district. As such, when the consultant obtains the client's data (e.g. operating profit/ha of $2,800/ha) and the average for the lower North Island is $2,500/ha, he then has to interpret those numbers taking into account the client's resource bundle relative to the average across the lower North Island. For example, if the client was on the Kairanga, one of the better soil types in New Zealand, then he would expect him to be generating a higher level of operating profit per hectare than

the average because that figure is made up of a range of farms in different locations, many of which (e.g. Apiti, coastal sand country and Eketahuna) have a poorer combination of soils and climate which restricts both pasture dry matter and milksolids production. As such, he would expect the average profitability of farms in the Kairanga to be above the $2,500/ha average for the lower North Island. Because of the nature of the benchmarking data (an average across a broad range of resource bundles and systems), the consultant has to make mental adjustments to interpret the information in a useful way. To what degree, the consultant could not specify. As such, the benchmark is just a starting point for his discussion with the client. For example, if the client's level of profitability is average or below average for his resource bundle, the consultant might then say to the client: "***Gee whiz, you are cruising, are you happy living with that***"? He then begins the process of discussing possible changes to the client's management practices.

Table 8. The impact of gross farm revenue/ha and operating expenses/ha on operating profit/ha

	Low gross farm revenue/ha	Average gross farm revenue/ha	High gross farm revenue/ha
High operating expenses/ha	**Very low**	**Low**	**Average**
Average operating expenses/ha	**Low**	**Average**	**High**
Low operating expenses/ha	**Average**	**Moderate**	**Very high**

The consultant also uses other data sources when benchmarking such as monitor farms that have been analysed and top 10% farms. These provide higher targets that help him think about where he might take the client. He noted that "***it's all very well having the average, but what's top***". For example, if he knows that the average operating profit/ha in a district is around $3,000/ha and the top performing farm is doing $9,000/ha, then that provides him with a range from the average to the top 5%. This is important because it tells him **what is possible** and if this farmer is not a client, the consultant may visit them to find out **how they are achieving such high levels of profitability**. As such, he not only seeks out physical and financial performance data on high performing farmers, but he also finds out what practices they are using to achieve these high levels of performance. Without this knowledge he would not be able to specify the likely changes a client might need to make to lift their performance towards that achieved by the high performing farmers in

the district. The consultant may also source such data from **other individuals** who have analysed the systems of these high performing farms.

The consultant's data on high performing farmers is useful when he has a client that is performing above average. For example, the client may be generating an operating profit of $3,500/ha when the average in Dairybase is $2,500/ha. So he might say to the client, "***Okay, so you are doing well, and it's good, great, but you know the top 5% are doing $8,500/ha and this is why they are doing it***". As such, he shows the client the scope for further increasing the profitability of his business ($5,000/ha) and also specifies how the client might change his practice to improve his profitability. Such information acts like **a carrot for the client and can motivate them to change**. The consultant then asks if they would like to try to achieve similar levels of profitability. However, the key point is that he can initiate change with the client that will lead to an improvement in the profitability of the business. The client may not capture all of the potential that is available, but he will capture a proportion of it and the consultant views this is a move in the right direction.

In terms of the other KPI's for profitability in Dairybase, the consultant does **not** use "**asset turnover %**" primarily because his clients do not understand its relevance. He does discuss their "**operating profit margin (%)**", but his primary focus is on "**operating profit margin/ha**" because he has found it is the profitability KPI "***that farmers can most identify with***". Because many of his clients are farming with a focus on production management rather than business management, the consultant tends to stick to the profitability KPI's that they best understand. "**Operating profit margin %**" provides him with an indication of the level of **risk exposure** or **vulnerability** for the business. If the operating profit margin is **20% or less**, the consultant would identify that the business was **exposed to risk**. This in effect tells the consultant how vulnerable the farm business is to a **change in milk price**. A farm with an operating profit margin of 40% is much more likely to survive a drop in milk price than a farm with a 10% operating profit margin. The operating profit margin also tends to be reflected in the other KPI's.

When thinking about income or **gross farm revenue/ha**, the consultant knows that if it is high, then this will be because the farm is producing high levels of milksolids/ha. This is because stock sales and other income sources make up a small proportion of gross farm revenue/ha. Similarly, if gross farm revenue/ha is low, then the consultant will expect that milksolids production per hectare is low. The consultant also evaluates the client's attitude towards **cost control**. He will **classify** his clients in terms of this. Some clients are **not** "***cost conscious***" and tend to have poor cost control and high operating expenses/ha. In this situation, the consultant will be looking for costs that he can remove from the system to improve profitability (Figure 10). For example, the client might be

using high cost feeds and feed additives that are not profitable or the client may be feeding out too much supplement at the expense of pasture quality and pasture growth rates (poor management of grazing residuals). Other clients may be cost conscious to the point that they spend very little in terms of operating expenses/ha and achieve moderate levels of milksolids production, but because of their low cost structure, they obtain a reasonable level of profitability. The consultant will look at the cost structure of these clients to see if their low cost structure is not limiting their profitability. He may be able to identify areas where additional costs will generate an increase in profitability (Figure 10). For each of these processes (Figure 10), the consultant will have a mental check list based on experience of potential areas that could be changed to either reduce costs and improve profitability or increase inputs to improve profitability. As such, the degree of cost control a client has will determine the intervention that the consultant might use to help them improve profitability. The consultant stated that there "***is not a right or wrong way***" to generate profit and that "***different farmers may have different pathways for achieving the same level of profitability***".

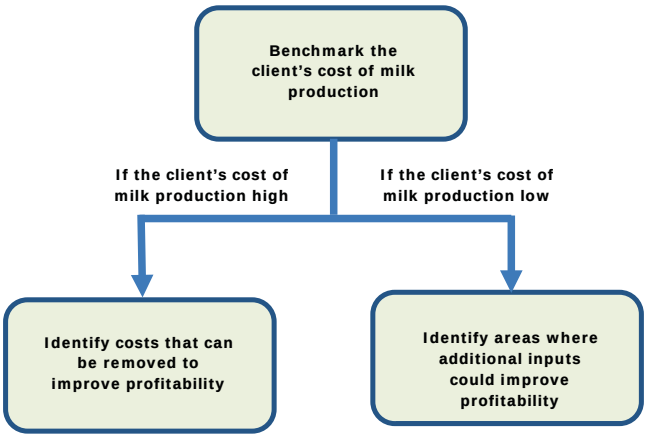

Figure 10. Analysis of opportunities to improve profitability in relation to the cost of milk production

For a client with a very low cost structure, the consultant will go back into the Dairybase data and look at the breakdown of operating expenses and work through these with the client in a general discussion to identify potential areas where additional inputs might increase profitability. He stated that "***it is amazing what you pick up in general discussion***". During this process, the consultant works through the cost categories and asks the client what they do for each of the categories. He will not only find out "***what they do***", but also "***what they don't do***" in relation to a cost category. Again, he states that there is no absolute "***right or wrong way***", but there are "***different ways to get to the same end point***", a good operating profit/ha. The consultant also takes

into account the impact of any changes in expenditure on pasture dry matter harvested per hectare. As such, the consultant is thinking about changes to the client's system as he works through the costs with the client and the impact any changes will have on operating profit/ha and pasture dry matter harvested per hectare.

The consultant stressed that clients prefer different pathways, so why change someone from their preferred way of operating if it leads to the same end point, a point made by Shadbolt (2012). For example, if a client does not like spending money, why would he encourage the client to shift to a higher input system when this might move the client outside their **comfort zone**. Alternatively, he may have clients that like well-fed cows and as such, he is not going to shift the client into a low input system. However, he may be able to achieve the same outcome with a much lower cost structure because he is aware of which factors and inputs impact on milksolids production and which factors don't or have limited impact. As such, the consultant is also assessing if he can **change a farmers approach** and **general philosophy** around their farm cost structure and farming system or if they prefer to operate pretty much as they are with the consultant making **changes at the margin**. The consultant's preference is to operate at the margin and try to improve the profitability of the client's current system rather than asking them to change system.

The consultant noted that one has to be careful comparing profitability across years because farmers' spending can often be a function of the milk price. He gave the example of where a client had the same level of profitability at a $6.15/kg MS milk price as for an $8.40/kg MS milk price. What the consultant found was that the client had spent a lot more in the high milk price year, particularly on R & M. The consultant also had clients who had put on double their normal rate of fertiliser in high milk price years so that they could reduce their expenditure in low milk price years. As such, this spending behaviour improved the **buffer capacity** (Shadbolt *et al*., 2011) of the farm to withstand low milk price years. **It is another form of risk management**. However, such behaviour is often not taken into account when assessing the profitability of a farm business.

Another key indicator is **operating expenses/kg MS** because this also provides the consultant with an indication of how exposed the business is to risk and in particular a fall in milk price. The higher this figure, the greater the risk exposure because this will limit the amount of cash available to cover non-operating costs such as drawings, debt servicing, taxation and capital expenditure. The consultant also looks at "**operating return on dairy assets**", another measure of profitability. Importantly, when considering dairy assets, the consultant prefers not to include dairy company shares because his clients do not have any control over the returns provided by these. As such, he treats

these as an off-farm investment because he has clients that do not have dairy company shares.

Once the consultant has worked through his key profitability indicators with the client, he moves to the "**Total Business**" section of the Dairybase report. The first indicator he looks at in this section is "**Interest and Rent/Total Revenue**" which gives him an idea of the level of pressure placed on the business from the costs associated with capital (interest on capital and the rental cost of leased land). If this figure is **30 – 35% or more**, this then indicates that the business is likely to be under pressure. If the figure is around 20%, then the business is normally at an acceptable level and if it is 10 – 15%, then this figure is considered low by the consultant. He also looks at the "**Interest and Rent/kg Milksolids**" and compares this to the average to see where the client sits. These figures basically reflect the level of **debt servicing** and the level of **risk exposure**.

The **most important indicator** for the consultant is "**Total Return on Assets**". He provides the example, "***I've got $5 M in assets tied up in cows, tractors and land, what is my return***"? The consultant compares this figure against the Dairybase benchmark and he also has a long-term rolling average that he compares it against which is 3 – 4 % with some periods reaching 7 – 10% (high milk price years). Interpretation of the figure is more complex. A client could have a 2% return on assets, but have no debt and survive quite comfortably whereas another client with a 4% return on assets and 80% debt may face insolvency problems. Often it depends on the situation and the balance between equity and debt. The milk price has a major impact on the return on assets. For example, in a low milk price year, a 2% return on assets might be quite good, but in a high milk price year, this figure might increase to 10% or more. In recent years, with the higher milk prices, the average return on assets has been 7 – 8%.

The Dairybase benchmark is quite important because it provides the average return on assets for each year for the farmers that have entered their data. The consultant points out that Dairybase does not currently provide an average for the Lower North Island because only a small sample of the total dairy farming population are on Dairybase. Based on the consultants assessment of survey data against Dairybase data, he believes that the farmers on Dairybase produce about 10% more than the actual lower North Island average (1050 kg MS/ha vs 950 kg MS/ha). As such, the consultant has to take this into account also when using Dairybase.

The consultant compares return on equity with return on assets to obtain an indication of which way the client's gearing is going. For example, if the return on equity is less than the return on assets, then the cost of debt is eroding the client's returns. This is reflected in the two formulae for the indicators:

$$\text{Return on Assets} = \frac{\text{(Operating profit – Rent)}}{\text{(Total Capital Employed – Non-Owned Capital)}}$$

$$\text{Return on Equity} = \frac{\text{(Operating Profit – Rent\_- Interest)}}{\text{(Total Capital Employed – Non-Owned Capital – Liabilities)}}$$

The consultant stated that he does not get too excited about these figures because return on assets has been low for farming over the last 100 years. He also pointed out that one has to be careful with these numbers because they are based on an estimated value for the farm. For example, is the farm worth $45,000/ha or $50,000/ha. A 10% difference in the valuation can have quite a marked effect on the return on assets and return on equity. The value of assets may be entered by a third party or obtained from the accounts. Accountants normally source the value of a farm from Quotable Values NZ. Some farmers obtain regular valuations from professional valuers. However, the consultant points out that land valuation is not a science, it is more of an art and the values are not that precise. The main value of obtaining the return on assets and return on equity figures is to get the client to think about whether he can improve this or whether he should sell the asset and buy another asset that might provide him with a better return.

After working through the Dairybase indicators within the "**Total Business**" section, the consultant will then look at the "**liquidity"** section. The first indicator the consultant looks at is "**Interest Times Cover**" which is earnings before interest and tax divided by the finance costs in terms of interest. This indicator tells the consultant if the client can pay his interest bill and what margin he has left after this to pay other costs. This is an important indicator for banks, **but it is not provided in Dairybase**, so the consultant calculates it himself. The consultant believes that a client who can quote his ***interest times cover*** knows what business is about and what is important in running a profitable business. This again demonstrates how the consultant uses the client's discourse to assess his capabilities in different domains. The banks like clients to have an interest times cover ratio of 1.3 and the consultant has a client who has a figure of 2.0. He stated that alarm bells ring if: 1) the client cannot cover his interest bill or 2) if the ratio is less than 1.3. A ratio of 1.3 provides the client with a 30% margin. The ratio also depends on the milk price. If a client has a ratio of 1.3 under a low milk price, then this reflects a strong business. In contrast, if a client has a ratio of 1.1 at an $8.40 milk price, then that business is **vulnerable**. As with many of the indicators, the consultant needs to consider the ratio in the light of the current milk price and other contextual factors. ***Interest times cover*** is a key banking indicator and the consultant is surprised it has not been incorporated into Dairybase.

The consultant pointed out that the liquidity measures in Dairybase (Net cash income, Farm working expenses, Cash operating surplus, Discretionary cash and Cash surplus/deficit) are all **absolute** numbers not **ratios**. The cash surplus and the farm working expenses provide an indication of likely liquidity. The other measure he uses is debt servicing per kilogramme milksolids because if that is low, then the farm should have relatively good liquidity. The problem with the "**cash surplus**" being an **absolute** figure means that it does not relate to scale. For example, he had a client that had a cash deficit of $500,000 which initially sounds bad, but the farm was producing 2.4 M kg MS. As such, the cash deficit in $/kg MS was only about 21 cents/kg MS. The consultant believes that a ratio is more useful as it shows the **scale effect**. However, on the **Cash Flow and Profitability** page of Dairybase, the report shows net cash income, discretionary cash, farm working expenses, cash operating surplus and cash surplus as a $/kg MS figure. This is the page where the consultant can look at the scale effect on a client's farm for the liquidity measures. However, the consultant would prefer these measures on the summary page under liquidity. The consultant stated that some farmers relate to these measures, but others do not. It may be that the team that setup the Dairybase indicators believed that these measures would be useful, but the consultant believes that they need to make the industry aware of them. Some of these measures are more generic business measures as opposed to farm business measures.

The final section on the **Key Performance Indicator** report is the **Total Wealth** section. The consultant believes that it is important to look at growth, wealth and equity for a dairy farm business. The growth in equity %, debt to asset ratio, opening and closing liabilities/kg MS are all important measures for the consultant. He looks at growth in equity as a percentage because that shows how much the client's wealth has increased within the financial year. For some of his large clients, this measure is their most important KPI, not necessarily over one year, but over a period of time. As such, **trend data** is useful here to see what is happening to the wealth of the business. Again, one needs to think about context because for a sharemilker, asset values can vary by a considerable margin because of changes in cow values. For example, cow values may have increased from $1500/hd to $2200/hd.

The **debt to asset ratio is** important because it is a good indicator of **risk** or how exposed the business is. The actual trigger figure varies over time, but the consultant believes that with this new level of volatility within the environment, farmers are going to have to run businesses with less debt. As such the consultant is suggesting **lower debt to asset ratios** for his clients. When they question him about this, he asks them if they want to lose their business. His main concern at the moment is **price volatility**. He believes that most dairy farmers are in a position to manage production risk.

The consultant also looks at **opening and closing liabilities** to gauge the client's debt levels. The consultant knows that debt levels in the region average around **$18.00/kg MS**, so this figure allows him to **classify** a client's farm in terms of its level of debt. Dairybase provides an absolute figure and also debt levels per kilogramme milksolids. The consultant will then compare this to his benchmark, so if a farm is $20.00/kg MS, this is not too bad, but if it is at $30.00/kg MS, this may indicate a problem. This high level also indicates that the business is **highly indebted** and that it is **at risk and vulnerable** to a drop in milk price. The consultant also looks at **the trend** in debt levels over time. If it has increased, he then finds out why this is and what has the client purchased to increase his debt levels. Alternatively, he may find out that it has increased because the business has made a loss. Because this is a **ratio** relative to the **level of milk production**, he also has to check that the increase has not occurred because **milk production has fallen**. The consultant also does a rough calculation of the interest that the client might be paying by multiplying the debt level per kilogramme milksolids by the current interest rate. For example, if a client has liabilities of $20.00/kg MS and the current interest rate is 6%, then the interest payments would be $1.20 /kg MS. The consultant can then add this to the cost of milk production to see how the business sits. So if the cost of milk production was $4.50/kg MS and the interest cost was $1.20/kg MS, then the client's interest and cost of milk production is $5.70/kg MS before tax, drawings, capital and so-on. In a low payout year, this farm would be in trouble. This sums up the main indicators the consultant looks at on the "**Key Performance Indicators**" report page of Dairybase. The next page of the report that the consultant looks at is the "**Cash Flow and Profitability**" page of the Dairybase report.

3.3.8.6.2 Cash flow and profitability report

The "**Cash Flow and Profitability**" report in Dairybase shows the cash situation for the business and the "**non-cash adjustments**" that are made to the cash items to calculate the adjusted figures. All of these figures are shown in more detail on the "**Financial Details**" report. When working through this page of the report with the client, the consultant starts with the "**Cash**" items. He does not spend a lot of time on these details, except for "**Net Milk**" where he looks to see if the client is earning a premium on his milk price. That is, is the client producing winter milk and obtaining a price premium on some of his milk. "**Net Livestock**" normally only make up 30 – 50 cents/kg MS or 10% of gross farm revenue, so this is not a major concern to the consultant. If it was higher than this, it might be that the client has sold some capital stock, but this would show up in the change in the value of livestock on-hand. Alternatively the client might have a bull beef unit or sell dairy heifers into the Chinese market. However, the consultant would know this from visiting the farm, so this would not be unexpected. The final figure is "**Net Cash Income**" from the dairy operation.

The next set of data comes under "**Cash Farm Working Expenses**". The consultant stated that this page breaks the data down into sub-categories (Labour expenses, stock expenses, feed expenses, other working expenses and overheads). However, if the consultant wanted to look at the operating expenses in detail, he would go to the page titled "**Financial Details**" report. This has the individual cost items and additional sub-categories and also shows the non-cash adjustments. The consultant mainly looks at the "**Total Cash Farm Working Expenses**" and also the adjusted figure on the "**Financials Details**" page. For example, the "**Total Cash Farm Working Expenses**" might be $3.45/kg and the adjusted figure with the non-cash adjustments included, the "**Total Dairy Operating Expenses**" might be $4.25/kg MS. When considering areas where he might improve profitability, the consultant does not bother investigating cost areas that are relatively small such as weed and pests. Key areas where he knows he can often improve profitability are in relation to feed, labour and fertiliser.

The consultant also looks at the "**Cash Operating Surplus**" and then the "**Discretionary Cash**" figure. The cash operating surplus has interest and taxation removed from it with non-dairy cash income and net off-farm income added in to calculate the amount of **discretionary cash** the client had at their disposal. The consultant stated that the **Discretionary Cash** figure is important because without a good level of discretionary cash, the business will not be able to grow. He stated that "***discretionary cash is the name of the game and it is where people make money or do their investments***". Business growth depends on the clients decisions in relation to discretionary cash. The client must decide whether wants to use it for personal consumption or growing the business through debt repayment or further investment. The consultant does not have indicators for discretionary cash because how a farmer decides to use his discretionary cash is up to them. He does however, take the client through the principles around the alternative uses of discretionary cash and its importance to a business, part of his educational role. He also stresses the consequences to the business if the amount of discretionary cash is low or zero. The consultant points out that if this is the case, then the client should **not expect** to **grow the business** or be able to **make other investments**. A low level of discretionary cash is fine for clients who just make a living, but if they want to grow the business and expand, then they will need to increase the level of discretionary cash the farm generates. As such, the consultant is testing if the client understands the meaning behind the various financial KPI's.

The next indicator the consultant looks at is the "**Cash Surplus or Deficit**". In calculating this, Dairybase shows how the client has spent his discretionary cash, in terms of capital, debt repayments, drawings and other disbursements. As such, the consultant can see the **trade-off** between **consumption** and **investment** and where the discretionary cash has gone. Again, the consultant

might discuss these with the client to find out what they were in more detail. The consultant will also look at the cash surplus or deficit, but also bearing in mind the **scale of the business**. His main question is, does the client have a large cash surplus or deficit given the scale of the business (see previous example of this).

A key KPI that the consultant looks at on this page is "**Equity Growth from Profit**". This is how much the client has grown the business from profit over the financial year. Again, the consultant does not have triggers for this KPI, but he does talk this through with the client. He stressed that there is no absolutely right or wrong figure when it comes to **equity growth from profit**, but it is more about the client being aware of what it means. If the client has a very low number and he wants to expand his business, he checks if the client understands what this means. The consultant stressed that a key part of his role is "***putting expectations in relation to reality***". For example, a sharemilker might want to own a farm in ten years, but the consultant will show him that at his current rate of equity growth this will not happen. Alternatively, if a client wants to have high drawings, a good lifestyle and overseas holidays, and they are not concerned about discretionary cash, then he says "**okay, that is not a wrong call**". This is because the clients "***understand the consequences of their actions***" and have chosen **consumption** over **business growth**. This is why the consultant does not have absolute KPI's for **equity growth**. However, his role is to alert the client to the **feasibility** of them **achieving their long-term goals**. If they have low levels of discretionary cash and/or equity growth and they want to buy another farm, then they will need to change something to achieve this goal. The response to this "***reality check***" can be quite different among clients. Some may change the farm or their behaviour to achieve their goals, others may decide that this was not really their goal and that they are happy with a good lifestyle and a low level of discretionary cash and equity growth. As such, the consultant stated that "***some of my job is reality***", i.e. providing his clients with an **objective view of reality**.

3.3.8.6.3 Financial Details Report

To diagnose problems in relation to the cost of milk production, the consultant will look at the "**Financial Detail**" page, the final report in Dairybase. This page shows the cost of milk production in more detail along with the **non-cash adjustment items** in the Dairybase calculations, an area the consultant believes the industry needs to ensure a standardised approach is used. The consultant stated that some key performance indicators are **farm system type specific** and these can be logically deduced. For example, if a client is system 1 or 2, and has an average or above average cost structure, he is likely to have a low profitability problem, because of the low level of milksolids production achieved under such systems. This logic is represented in Figure 11. First the

consultant assesses the system type the client is running based on the amount of bought-in feed they use and classifies the clients system. If it is classified as a system 1 or 2, he then determines the client's cost of milk production from the Dairybase accounts, benchmarks this against industry data and classifies the farm as average, below average or above average for cost structure. If the client's cost structure is classified as average or above average, given the farm is a system 1 or 2 and milksolids production is expected to be reasonably low, this identifies that the client potentially has a low profitability problem. Alternatively, if the client's system is classified as a system 3, 4 or 5, the consultant again determines the client's cost of milk production, benchmarks it and classifies the farm (Figure 11). The consultant then determines their level of milksolids production per hectare from the Dairybase accounts, benchmarks this and classifies the farm. If the farm's milksolids production is classified as below average, this suggests the client may have a low profitability problem. This process quickly identifies potential cost of milk production problems before the consultant diagnoses these in more detail.

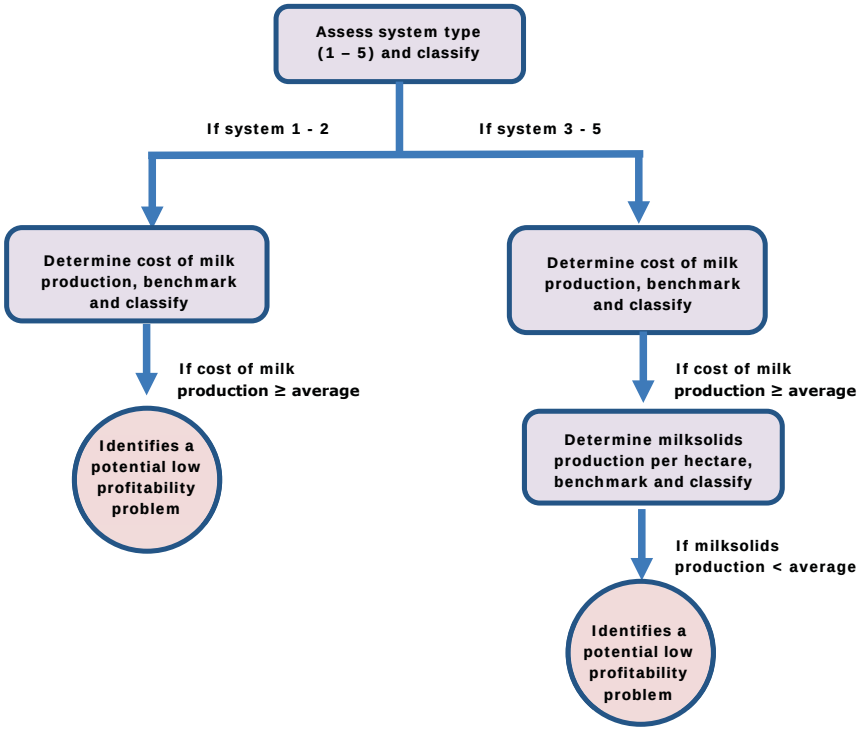

Figure 11. The diagnostic process used by the consultant to identify a potential low profitability problem.

The consultant works through the figures in the Financial Details report quite quickly and he compares the client's costs to the **benchmarks in Dairybase** and **classifies** these as average, below average and above average. He explores each cost category with the client as he works his way down the report.

From this, he identifies areas where they are **doing well** and areas where there might be an **opportunity to improve the situation**. Opportunities for improvement can be classified into two types. The first is where the client's costs are high and the consultant will explore options for reducing these costs. Alternatively, opportunities may exist where the clients costs are below average and the client could benefit from additional spending.

Normally the consultant will start off the process by asking the client if they are happy with this level of spending. He will then ask a series of questions to diagnose why the client has an above average (or below average) level of spending for that particular cost category. For instance, if animal health costs are low, he will ask the client if he is happy with this. The client may not be happy because his stock have been suffering or not performing to expectations. He will then explore animal health options with the client that would potentially improve animal performance and hence profitability. Alternatively, the client may have high feed costs. The consultant will ask the client if he is happy with this level of spending and then identify what they are spending these costs on. He will then try to identify areas where he can reduce their feed costs without reducing milksolids production. During this phase, the consultant stated that he "***nails home what they are doing well and examines what they are not doing well***". Basically the consultant is using benchmarking and classification to identify areas where the client is **strong** and areas where he may be **weak**, diagnoses the cause of the weakness and then identifies options that will either reduce costs or improve profitability.

The consultant has some key cost indicators that he compares to the benchmarks. He will start with "**Labour Expenses**" and if the figure is around $0.90 - $1.00/kg MS, this will suggest the cost structure is fairly typical. The next item he would look at is "**Stock Expenses**" and how that compares to the benchmarks for the group. If this figure is high, he will then look at the sub-categories within this category such as animal health, breeding and herd improvement, farm dairy and electricity to determine if any of these categories are high. The consultant stressed that he cannot do much about some of these costs, but others he can reduce. One of his most important categories is "**Feed Expenses**". The consultant stressed that when looking at reducing the cost structure in terms of improving profitability, he has to be aware of the impact of removing feed costs on the system. For example, the removal of $100,000 of feed costs will have some serious implications for his client's system. As such, a good consultant has to have a **very good idea of how farming systems work** and **the interactions that occur between all of the components** when looking at removing costs and inputs from an existing system. The other point he has to consider is that if he removes costs and as a consequence drives the milk production too low, a farm has a lot of "***fixed overheads***" (rates, admin etc.) that must be covered and if the level of milk production is too low, these

may not be covered. The consultant also noted that some working expenses such as R & M and vehicles do not change that much between low and high levels of milk production, so they are almost a **fixed cost**.

The consultant provided an example of the factors he considers when assessing if he can reduce the feed costs on a farm. First, he has to look at whether the client is using the feed he grows efficiently. This is dependent on the client's grazing practices and in particular, their management of pre- and post-grazing residuals and round length. His next step is to assess if the client is actually making money out of the supplements that he is feeding the herd. He may identify that the client is using too much supplement and that this is not profitable. He then has to assess the impact of reducing feed costs on such factors as milksolids production and stocking rate. For example, a reduction in feed costs may result in a lower stocking rate and/or per cow milksolids production. This demonstrates the complexity of the diagnostic and solution generation process. The consultant stated that he has clients who are spending about the average amount on feed, but producing 13 – 1400 kg MS/ha and others that are spending the same amount, but producing at average (e.g. 900 kg MS/ha) or below average levels of milksolids production (e.g. 700 – 800 kg MS/ha).

The other point the consultant has to consider with a low cost of milk production, is whether or not the client is maintaining his asset base. It may be low because the farmer is not applying maintenance fertiliser or spending enough on R & M to maintain the property. The consultant can look through the various costs in the Dairybase printout and assess if the client is maintaining the asset. However, he pointed out that one has to be careful when interpreting such numbers when they are a ratio because of scale effects. For example, $0.30/kg MS may be adequate for R & M on a farm producing 1800 kg MS/ha (equivalent to $540/ha), but it may not be adequate for a farm producing 1000 kg MS/ha (equivalent to $300/ha).

The consultant stated that some of the key cost indicators change with **system type** such as feed costs, depreciation, R & M on plant, equipment and vehicles and vehicle costs because higher input systems use more feed and infra-structure and tend to milk more cows. As such, different system types will generate different cost structures. Generally, Dairybase does not benchmark by system type. The consultant stated that there are some system type benchmarks, but not many and these would not be by region, rather to get the numbers they might have to cover the North Island. The danger with this is that the benchmark might not be that relevant to the local situation. For his area, the consultant uses Lower North Island figures because this area is different from the South Island and the Waikato, Bay of Plenty and Northland. Because of the range over which the Lower North Island data is collected, the consultant

must make a judgement call when benchmarking a client's farm against this data. The Lower North Island has a large range in farm types from irrigated South Wairarapa farms through to Eketahuna and the Kairanga in the Manawatu. As such, the consultant notes where the farm is and then makes a judgement call about how it is performing relative to the Lower North Island benchmark.

The consultant stated that one of the dangers of using accounts is that accountants sometimes place capital items into farm working expenses. For example, they may place capital for development into repairs and maintenance or capital fertiliser in with normal maintenance fertiliser costs. He has benchmarks for such cost items and if they vary significantly, he will assess if capital items have been included. For example, repairs and maintenance is normally around $1.00/kg MS. If the figure is a lot higher than this, he will investigate what it is made up of. He may find that there is $100,000 of R & M and $20,000 of capital in the accounts. Normally the consultant will say to the client something like: "***Well, your R & M seems high, what does that comprise of for that year***". The client may then say something like, "Oh yeah, it includes the gravel for the drainage I installed last November". As such, the consultant has to work his way through the cost items in the accounts to look for **anomalies**. This is a critical element of analysing a client's profitability and improving it. The physical information he observes on-farm also allows him to **triangulate** with the financial information in the accounts.

As mentioned previously, the consultant views the cost of milk production as a "***double-edged***" indicator because of the denominator/enumerator effect, a point also made by Shadbolt (2012). As such, the consultant has to consider this indicator in light of the context. For example, one of his clients, Farmer A has an average cost of milk production of $4.50/kg MS, similar to the national average (Figure 12). However, this farmer produces 1500 kg MS/ha compared to 900 kg MS/ha for the national average. Another of his clients, Farmer B, has a lower cost of milk production of $4.20/kg MS, but only produces around the average level of milksolids per hectare of 900 kg MS/ha. Both farmers are earning $0.50/kg MS from stock sales and $0.30/kg MS from dairy company shares. At a milk price of $5.50/kg MS, the margin per kilogram milksolids is higher for Farmer B, but because Farmer A produces a much higher level of milksolids per hectare, his farm is much more profitable ($2,700/ha vs $1,890/ha) (Figure 12). As such, it is dangerous to consider one indicator in isolation. The consultant knows the cost of milk production only explains 60 – 70% of the variation in the profitability for dairy farms, hence it cannot be used by itself to assess the profitability of a farm business.

Farmer A

Cost of milk production = $4.50/kg

Milk income = $5.50/kg

Dividend = $0.30/kg MS

Other farm income = $0.50/kg MS

Milksolids production = 1500 kg MS/ha

Profitability = ($6.30/kg MS - $4.50/kg MS) x 1500 kg MS/ha

= $2,700/ha

Farmer B

Cost of milk production = $4.20/kg

Milk income = $5.50/kg

Dividend = $0.30/kg MS

Other farm income = $0.50/kg MS

Milksolids production = 900 kg MS/ha

Profitability = ($6.30/kg MS - $4.20/kg MS) x 900 kg MS/ha

= $1,890/ha

Figure 12. The dangers of using cost of milk production as a partial indicator of profitability.

In the current low milk price environment, the consultant also splits the expense items into those that influence milk production in the **current season** such as labour, stock expense and feed expenses, and other operating costs that impact more on production over the **medium term** such as phosphate fertiliser, R & M, regrassing, weed and pest and vehicles. As such, if there is a liquidity problem the consultant tells the client: "***it's no use having the best farm for it to be sold from under you***". He will suggest that they reduce or remove costs such as phosphate fertiliser and R & M for 12 months to overcome the liquidity problem. He tells them that "***there is no point painting the buildings and putting phosphate on if you don't own it in twelve months' time. You can always come back and fix things up***". This distinguishes between profitability issues and liquidity issues. Liquidity issues could be due to low profitability and high debt levels. The consultant was highlighting the difference in his approach in relation to improving profitability compared to overcoming a

short-term problem with liquidity. With the latter, he is looking at costs that he can cut over the next 1 – 3 years to get the client through a liquidity crisis. This would be a situation where the milk price is forecasted at $3.90 or $4.50/kg MS and the client has farm working expenses of $4.50/kg MS. The focus is on what costs the consultant can reduce over the short to medium term so that the client can survive the next 2 – 3 years until milk price recovers.

3.3.9 Using the "profitability tree" to diagnose the causes of low profitability problems

When the consultant is considering a client's business, he goes to the top of his diagnostic tree first in terms of profitability. He knows that what the client does is influenced by his or her goals, but he puts this to one side initially. He considers the farm business as if it was a straight business owned by a company and he stated that there are two things that are important to a company: 1) profitability and 2) shareholder wealth. Working back from this he considers the factors that affect profitability and what are the "key" measures of profitability. As such, he starts off looking at the key measures of profitability and then he will work down his "profitability tree" or diagnostic tree reviewing the other drivers and measures that are of lesser importance. The consultant stated "***That helps [his diagnostic tree and knowledge of the key drivers of profitability], I mean like I say, I always keep in the back of my head what is the real important relationships, so that I don't get lost***". He suggested that if one was training a young consultant, it would be important that he was taught these relationships and to think in terms of a "**diagnostic tree**" for assessing the profitability of a client's farm. This is particularly important these days because of the range of farm system types and because "***there is always many different ways to get a good profit***". Using this approach, the consultant draws logical conclusions about what is influencing the profitability of his client's business.

The consultant's process also highlights the importance of the **context** and its influence on profitability. At the top of the diagnostic tree is "**return on assets**" which is a function of "**operating profit per hectare**" and the "**value of the assets per hectare**" (Figure 13). The consultant then looks at the next level down in his "**diagnostic tree**" and the drivers of operating profit per hectare are "**gross farm income per hectare**"[11] and "**operating expenses per hectare**". From this, he then looks at the drivers of these and breaks them down into their components and so-on down the diagnostic tree. For example, gross farm income per hectare is a function of net milk income per hectare, net stock sales per hectare and other dairy income per hectare. Net milk sales per hectare is a function of milksolids production per hectare times the average milk price. Milksolids production per hectare is a function of milksolids per cow times

[11] Gross Farm Income and Gross Farm Revenue are used interchangeably in this document.

stocking rate. As the dotted lines in the diagnostic tree indicate, the consultant can continue down the diagnostic tree to further identify other lower level drivers of profitability on the farm.

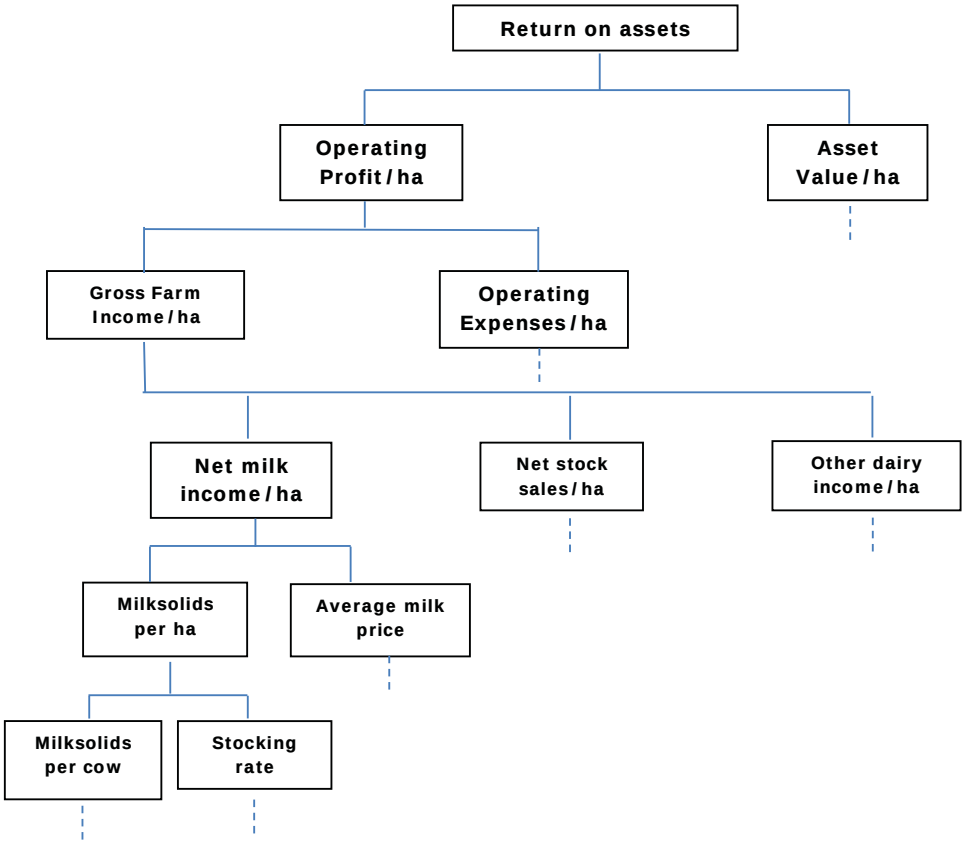

Figure 13. The consultant's diagnostic tree for profitability.

The **diagnostic tree** for profitability can be separated into **different components** in **different ways** to allow the consultant to consider profitability. For example, the consultant may break the income and expenditure down into units of per kilogram of milksolids (Figure 14). He used the example of a farmer who had average operating expenses of $4.50/kg MS, but produced 1500 kg MS/ha, 700 kg MS/ha above the average for the district. For a year where gross farm income is $5.50/kg MS, this farm would generate an operating profit per hectare of $1500/ha. The consultant contrasted this farm with another lower producing farm that also had average operating expenses per kilogram of milksolids of $4.50/kg MS. If operating expense per hectare was used as the sole indicator of profitability, farms 1 and 2 would be expected to have a similar level of profitability. However, the latter farm only produced 800 kg MS/ha, the average for the district, at a gross farm income of $5.50/kg MS. This generates an operating profit per hectare of $800/ha. As such, although the two farms have the same operating expenses per kilogram of milksolids, the first farm is

much more profitable ($700/ha) because it has above average milksolids production. The consultant also contrasted the first farm with another farm that had a below average cost of milk production of $4.00/kg MS, but only produced 800 kg MS/ha, the average for the district. If an advisor had used the cost of milk production as the sole indicator of profitability, he would have identified the third farm as the most profitable. However, the first farm generates an operating profit per hectare that is $300/ha higher than the third farm because of the higher level of milksolids production. As such, the consultant is concerned that farmers and some advisors focus on **partial measures of profitability** such as cost of milk production or milksolids production per cow. Such measures are partway down the consultant's diagnostic tree and are often not good indicators of overall profitability.

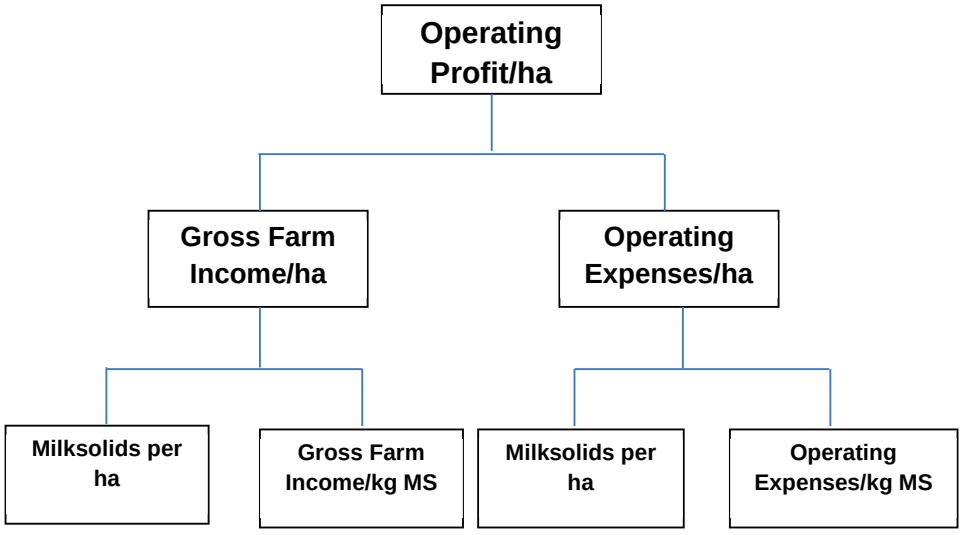

Figure 14. Diagnostic tree for profitability – using per kilogram milksolids indicators.

The consultant identified that the following financial factors were often the causes of low profitability: 1) low gross farm revenue per hectare, and/or 2) high farm working expenditure per hectare, or a high cost of milk production. These in turn lead to a low **operating profit margin**. He stated that a key factor that influences profitability is ***gross farm revenue per hectare***. This can vary between years because of milk price and as such the key driver of gross farm revenue is milksolids production. The consultant points out that there are **two sides** to profitability, "***firstly how much am I earning and secondly, how much am I spending***"? As such, if gross farm revenue per hectare is low on a client's farm there may be an opportunity to increase milksolids production. However, the consultant stressed that he has to be careful because it is a relative benchmark (Gross farm revenue does not take

into account the cost of producing the milk) and it is generated from farm data that covers a wide range of "***landscapes***" and different "***farm types***". As such, a client might only be achieving a gross farm revenue per hectare that is about average, but this might be quite good because he has a difficult farm (e.g. poor soil types and/or climate).

On the other side of the equation, another cause of low profitability is the ***farm working expenditure per hectare***. The consultant looks at this benchmark and he also looks at the ***cost of milk production ($/kg MS)***. However, he notes that the latter indicator is a double edged sword because it may be driven by the **level of milksolids production** and/or the client's **cost structure** because of the enumerator/denominator effect. So a farmer could have average costs (per hectare), but a low level of milk production so that he has a high cost of milk production per kilogramme milksolids or he could have high farm working expenditure per hectare and an average level of milk production to end up with the same level of profitability. As such, he needs to determine if the problem is due to an average cost structure and a low level of milk production or a high cost structure and an average level of milk production or good levels of milk production and very high costs. This information starts to tell the consultant about the **relativities** in terms of **costs** and **milk production**.

Gross farm revenue in effect primarily reflects milksolids production on a farm because 90% of the income normally comes from milk sales unless the client has an abnormally high level of livestock sales. As such, the consultant's concern with this indicator is around the client's level of milk production relative to his bundle of physical resources. The consultant would not expect the same level of milk production from a farm in Eketahuna as compared to a farm in the Kairanga. He also pointed out that the cost of land per hectare would be lower in Eketahuna as compared to the Kairanga, reflecting the productivity of the relative resource bundles. When considering profitability, and in particular, **return on assets**, the consultant is often thinking, "***is this a good investment***" over the medium to long-term? The consultant may also look at **operating profit margin**. It will indicate the proportion of profit that the client is extracting from gross farm revenue, and as such it will indicate a low profitability problem. However, although this indicator tells the consultant that there is a profitability problem, it does not tell him what the cause of the problem is. It is then a matter of establishing whether it is because of low milk production per hectare, a high operating cost structure per hectare or a combination of the two. The consultant then just works down his diagnostic tree to determine the causes of the client's low level of profitability.

This provides the consultant with a range of causes of low profitability:

1. Low levels of milk production for the farm's bundle of physical resources
2. A high cost structure for the level of milk production

3. A combination of milk production and cost structure
    a. An average cost structure and low levels of milk production
    b. An above average cost structure for average levels of milk production
    c. A high cost structure for good levels of milk production
    d. A very high cost structure for very high levels of milk production.

3.4 Diagnosis of high level causes

The consultant also has to assess **why** the client is performing poorly in a particular domain at a **high level** (Table 9). He has to assess if this is a problem due to: 1) a **knowledge problem**, i.e. the client lacks the knowledge and skills to perform well in the domain, 2) an **attitude** or a **motivation problem**, i.e., the client has the knowledge and skills to perform well, but he is not interested in performing well in that domain, or 3) a **social norm** e.g. the client is driven by the belief that good farmers achieve "high per cow production". The client uses a combination of methods to diagnose between these causes. Drawing on a range of information, the consultant uses a sense-making process to diagnose why, at a high level the client's farm is performing poorly in relation to profitability.

Table 9. High level causes of poor performance.

1	A knowledge problem due to:	a. Lack of knowledge (theory) about the domain (**explicit** or **why and what** knowledge) b. Inability to turn explicit knowledge into tacit knowledge that will provide the plan to implement a practice change (**translation** of **explicit** knowledge into **tacit** knowledge c. Inability to implement a plan effectively in a domain (**tacit** or **how to** knowledge) d. Inability to monitor and control a plan in a particular domain (**tacit** or **how to** knowledge)
2	An attitude or motivational problem	
3	A social norm problem	

The identification of a knowledge problem or "**knowledge gap**" is the most straight forward diagnosis. In this instance, the consultant assesses the client's capability (knowledge and skills) in a particular domain through observing what he says and triangulating this with what he does, and with the consultant's knowledge of best practice, identifying what he is monitoring, comparing the client's assessment of the state of the farm's resources with his own assessment, challenging the client, listening to the discourse used by the client, using this information to assess the client's understanding of the domain, and benchmarking and classifying the client's performance in that particular domain (Table 10). The client may lack explicit or scientific knowledge (know what and know why) about the principles within a particular domain (Table 9). He may lack the knowledge to translate the theory (explicit knowledge) into practice (know how) or he may also lack the tacit knowledge (know how) to implement a management practice effectively or to monitor and control the implementation of a practice effectively.

Table 10. Methods used to diagnose a knowledge gap.

Diagnostic methods
1. Triangulation of what the client says he does and observation of what he actually does
2. Comparison of the client's practice with "best practice"
3. Determining what the client is monitoring in relation to the domain
4. Comparing the client's assessment of the state of resources with the consultant's assessment
5. Challenging the client about his practice
6. Assessing the client's understanding of the domain
7. Listening to the discourse used by the client about the domain
8. Benchmarking the client's performance in that domain

The diagnosis of a **knowledge problem** is also used to help identify an **attitudinal** or **motivational problem**. The consultant may identify that the client does not have a knowledge problem in a particular domain, that is, he understands the theory and how to implement the theory on-farm, but he has failed to do this because he is not interested or motivated to do so. In this instance, the consultant will then investigate the reasons for the lack of interest or motivation in the domain. In contrast to the previous two problem types, a social norm problem is identified when the consultant determines that a client's behaviour is driven by a prevailing social norm (e.g. good farmers achieve high levels of per cow production or good farmers achieve a low cost of milk production) to the detriment of the profitability of the farm business. The nature of the high level diagnosis then has implications for the nature of the solutions the consultant develops to overcome the low profitability problem. The following sections discuss how the consultant brings about change in relation to these high level problems.

3.4.1 Bringing about change in relation to low profitability problems caused by high level factors

The consultant was asked how he brought about change when the cause of the problem might be: 1) social norms, or 2) an attitude problem or 3) a knowledge gap. The consultant uses a range of techniques to help bring about change including encouragement, highlighting the advantages of the change, bringing subtle pressure to bear on the client and so-on. He makes a particular effort to act as a change agent (Cerf *et al.*, 2011), if the client is facing serious problems. He might even have to alter the fundamental attitudes and social norms of his clients. His approach is described below.

3.4.1.1 Social norms

One issue the consultant has is that social norms around **per cow milksolids production**, and more recently, the **cost of milk production**, are important drivers for many of his clients. These social norms may be limiting the profitability of the client's business. To bring about change, the consultant has to assess how important the social norm is to the client and how open to change they are. He does this by asking them a series of questions about the norm. During these discussions, the consultant will assess how open the client is to change. If they are very open to change, he can completely shift their views on the norm and change their system to reduce per cow milksolids production and supplement use, improve pasture dry matter harvested per hectare and profitability. In contrast, if a client is "**driven**" by high per cow production, then the consultant knows that the degree of change they are happy to make will be limited and there is little point trying to move them to lower per cow milk production to increase profitability. In these situations, he will focus on maintaining high per cow production, but achieving this with less costly feed inputs. He summed this up in the following statement: "***Or sometimes if you want to turn black into white, they [client] are going to walk away, so let's head towards grey***". For these farmers, the consultant made the analogy to religion. He stated that "***as an example, it who might be like religion, you are not going to turn a Muslim into a Christian are you***"?

If the social norm is important to the client ("***if you get a buzz out of it***"), the consultant is happy for them to pursue this goal provided they understand the impact of this on the profitability of the business. He continues to question them about such areas and some clients will change, but others will not because it is what drives them. As a consultant he noted that one has to be happy with a relative increase in profitability rather than achieving the optimum level of profitability for a client. The solution is bounded by the client's goals which are often dictated by social norms (e.g. good farmers achieve high levels of per cow production).

For clients that are not open to change, the consultant stated that he plays "***the long game***". He compared it to "***Yeah, it's a bit like turning the Queen Mary***". He will "***plant seeds***" that he reinforces at each visit. He made the comment: "***Sometimes it is small steps and you keep taking small steps***", so he is trying to bring about change incrementally over a longer time frame. During this period his role is like that of a personal trainer. His visits help maintain the client's commitment during the change process (Block, 1999) through encouragement and support. This should lead to higher client performance according to Bauer and Green (1996) and Strike (2012). Another technique the consultant uses to bring about change is to talk about farmers in the district that the consultant and the local farming community respect because they run highly profitable farm businesses. The consultant stated that these are the type of farmer that local farmers are saying "***this farmers is great, he makes lots of money***". In this instance, the consultant is putting up examples of "***good farmers***" where "***good***" is defined by the ***profitability of their operation***, not their level of ***per cow milk production***. In effect, the consultant is fostering a change in social norms within the dairy farming community. As such, the consultant is using farmers he respects for the purpose of changing social norms. The consultant's clients listen to him when he talks about these farmers because "***they know I respect them***". He believes that other farmers take note of farmers for who professionals voice their respect for. It is another mechanism to bring about change.

Minato *et al*. (2010) termed the social norms highlighted in this study as descriptive or practice norms. Compared to other more deeply held norms (e.g. personal and abstract norms), practice norms are more open to change and can be changed through the presentation of strong contrary evidence which farmers cannot "interpret away" (Minalto *et al*., 2010, p. 395). This is the process the consultant uses to try to change his clients' social norms around per cow production.

The consultant stressed that one has to be careful when talking about "***good farmers***" because other players in the **advisory system** are putting up their own examples of "**good farmers**", particularly well-known farmers, who the consultant knows do not achieve high levels of profitability or return on assets. As such, farmers are receiving **mixed** or **competing messages** about what is a "**good farmer**". The consultant has also highlighted that these social norms change over time and he has to be aware of these and their impact on farmer behaviour, a point made by Minato *et al*. (2010). The consultant has problems with both of these "indicators" of a good farmer because they are only ***partial indicators*** of profitability, with the former having little correlation to operating profit per hectare and the latter ignoring the income side of the equation.

3.4.1.2 Attitude problems

After social norms, the next high level problem type is one associated with an "***attitude problem***". The consultant separated attitude problems into two types. The first is where the client has the knowledge and capability to perform well, but chooses not to. In this instance, there are **other drivers** that are more important that constrain the client from putting the effort into the problem area. Alternatively, the client is capable, but he does not put the effort into an area because he does not believe that the rewards from the change justify the time cost. In this case, the attitude is due to a **lack of knowledge** about the costs and benefits of the change. In this instance, the consultant stated that he has failed to convince the client of the benefits of changing his behaviour. The example given was a client who had attitude problems around pasture dry matter harvested per hectare. He did not want to use a rising plate meter or pay attention to post-grazing residuals. The consultant stated that such a client might not truly believe that profitability is highly correlated to pasture dry matter harvested per hectare. As such, this is an attitude problem driven by a knowledge gap.

For an attitude problem caused by **other drivers**, the consultant needs to explore the issue in more depth and determine what exactly is driving the client. Importantly, the consultant believes that one should not tackle the client head-on and say something like: "I think you should be plate metering", because this approach is wrong. He stated: "***You're trying to bang down the front door, but you've got to think how to get in the side door or the back door because the front door is a big solid door and you are not going to get in that way***". A consultant has to think about the strategies he can use to convince the client to change. He stated that "***Too many people try and bang on the front door, but you've got to find a driver somewhere else because if you can't find the driver, you're not going to get there***".

The consultant provided the example of a bull beef farmer in Northland who was quite profitable, but the consultant thought he could do better. The client stated that he could not see the point of running more bulls because it would require more work and create more problems. The consultant had discussed this issue with the client over two visits, but on the third visit, he changed tack and asked the client what they wanted to do and where they wanted to be in the future. The client admitted that he enjoyed big game fishing and that he wanted to build a boat so that he could set up a charter business in the Bay of Islands. However, the client said that to do this, he needed a lot more money. The consultant then suggested that if he changed his bull beef system, he could use the extra profit to fund his proposed venture. The client then employed a manager, improved his bull beef operation and built his boat. This proved to be the consultant's "***side door***". Profitability was not a driver for the client, rather the driver was his long-term goal of setting up a charter business. Profitability

provided the means to achieve this end and this fostered the change in practice. **If a consultant cannot identify such drivers, he is unlikely to bring about change.**

Normally if the consultant can find the drivers, change will then follow. Essentially, the consultant is acting as both a reflective specialist and a reflective listener (Andersen, 2004). He tries to ensure that his clients are actually committed to making the changes he recommends. He is also able to identify what is actually driving his clients in order to try and meet their needs. According to Andersen (2004) such a consultant is a rarity in the world of agricultural advising.

For some clients, it can take the consultant a while before he identifies their drivers. He also admitted that he still gets surprised by what is driving a client. He states that it is about "***What's really driving them, what's really ticking them, what's going to get them excited in life, what's going to make him happy***". The consultant stated that a first step might be to show the client where they are now and where they might get to in the future, a form of gap analysis. However, to progress this, he has to find the drivers that will motivate the client to change. **Tailoring solutions** to the client's situation is secondary to identifying the drivers, the former is simple once the drivers are identified. Much of the consultant's work is about **change** and **change management** and what changes people and the **psychology of change**.

In the situation where the attitude constraining profitability is because of a lack of knowledge about the benefits of a particular practice, the consultant would ask the client if they can do better and if they are happy with their current level of performance. He would then attempt to convince the client that there were considerable benefits from changing his management practices. The consultant would then describe the performance of another farmer who is performing better than the client. Normally a client with an attitude problem is performing at an average or a bit above average level. As such, the consultant shows them what some of the top farmers are doing, in effect creating cognitive dissonance. He then asks the client if they want to achieve at this level of performance or if they are happy with their current level of performance. For some clients, they will be happy with their current level of performance and unwilling to change. Other clients will be motivated to make the change.

3.4.1.3 Knowledge gap problems

The consultant was asked that if he has diagnosed that a low profitability problem was because the client was lacking knowledge in a particular domain (**knowledge gap**), how did he work with the client to bring about change for this problem. During this phase he aims to obtain buy-in for the proposed change. On a visit, the consultant employs one or more of his three key strategies - building client knowledge, reinforcing his advice and critiquing the

client's views (providing a second opinion). As such, when necessary, the consultant in this study appeared to act explicitly as an educator (Eraut & Du Boulay, 2000; Coutts *et al*., 2007) disseminating relevant knowledge (Ingram, 2008; Faure *et al*., 2012; Messervy, 2013). His first step however, is to convince the client that their current knowledge is lacking or faulty. Once this is achieved, he can then build or refine the client's knowledge. Cerf *et al*. (1999) mentioned that advisors were able to change the structure of farmers' knowledge and help them use new techniques.

The consultant uses a range of methods to challenge the validity of a client's current knowledge, but he stressed that they may not always agree with his view. In Coutts *et al*.'s (2007) study of Australian consultants, they found that clients welcomed opportunities to extend their knowledge, but they did not mention the problems faced by consultants in refining a client's knowledge. In effect, the consultant is playing the role of a knowledge broker (Klerkx *et al*., 2009; Klerkx and Proctor 2013) and he has to show that his knowledge is more **creditable** than that held by the client and/or that sourced by the client from other knowledge providers. The consultant uses a number of techniques to demonstrate the credibility of his advice and to demonstrate that the client's knowledge is faulty (Figure 15). For example he may use a range of written material from reputable sources to show that the client's knowledge is faulty. This material normally covers the current research on the topic of interest. The consultant may use Dairybase analyses, DairyNZ fact sheets, booklets and reports, farm surveys, other scientific reports and papers along with analyses the consultant has undertaken on his clients' farms to support his argument. Often when he is using this written material he is pointing out **important relationships** between factors to the client.

Written material from reputable sources • DairyNZ fact sheets, booklets and reports • Dairybase analysis • Farm surveys • Other scientific reports and papers • Analysis of client farms
Quotes from reputable and independent sources • From independent industry experts • From well known, well respected high performing farmers
The demonstration of principles using computer technology and/or worked examples • DairyNZ Supplementary feed price calculator • Other DairyNZ Apps and tools • Take the client through a worked example
Arrange for the client to talk to a farmer who has successfully implemented the change

Figure 15. Methods used by the consultant to convince the client his knowledge is faulty.

The consultant may also quote reputable and independent sources to support his argument that the client's knowledge is faulty (Figure 15). This may include independent industry experts such as DairyNZ scientists and university academics. He may also quote well known and well respected high performing local farmers to support his argument. When he uses these individuals, he will stress that this person is objective and independent, "***he has no axe to grind***". The consultant also makes the distinction between **telling** a client and **showing** a client, noting that often the latter has more credibility. As such, he may undertake a demonstration of the principles he is trying to get across to the client using computer technology (Figure 15). For example, he might use DairyNZ's Supplementary feed price calculator to help the client understand the economics of using different supplements. He stated that "**It's a bit like a little black box [computer programme], it always carries a bit more weighting than coming out of somebody's mouth**." Alternatively, the consultant may use worked examples to support his argument. Another means of ensuring farmers revise their existing knowledge and implement a practice change is to get them to talk to other farmers who are using the practice; this is a powerful technique according to the consultant for bringing about practice change, a point also made by Sewell *et al*. (2014, 2016).

The consultant is not just focused on improving clients' knowledge about underlying principles or different practices. He also believes that his clients should use tools that will provide them, and himself, with more accurate information for decision making. Sometimes the client does not wish to use a

particular tool, for example, a plate meter: "***If you expect me to plate meter this will be your last visit***". In such situations, the consultant emphasises the benefits of using the tool to obtain more accurate information for decision making. He will **reinforce** this view over time in an attempt to bring about change. The consultant may advocate other tools such as feed budgets, cash flow budgets or the use of Dairybase. However, clients have to have ownership if they are going to use these budgeting tools. The consultant cannot see the point otherwise. He stated that often the banks do budgets with clients, but there is no ownership and the clients do not continue on with the process, Ideally the consultant likes a client to do their own budgets (feed and financial) and then show it to him for comment. He can then work with them identifying ways of improving the farm's financial performance. Alternatively he can sit down with a client and help them put one together.

The consultant stated that each client is different. For some he only has to explain the concept to them verbally, but for others this is not enough and he has to provide them with a lot more evidence and take them through a worked example before they will agree that their knowledge is faulty. While he is doing this, he is also monitoring body language to see what impact it is having on the client, "***are they thinking about it, are they sulking or are they convinced that his advice is correct***"? The consultant will often challenge the views of clients, advising them to read material from independent sources. Here he is giving the clients information to help them think for themselves and enhance their personal development (Cerf and Magne, 2007). The consultant is also monitoring the client's "***receptivity to the new knowledge***". However, he also emphasises that this process requires a lot of discussion with the client and it also requires him to challenge them. The importance of dialogue in farmer learning was stressed by Sewell *et al*. (2014). As such, convincing a client that their existing knowledge is faulty and replacing it with valid knowledge can be a lengthy process.

If the consultant's advice is a challenge to what the client normally does, this can create resistance to the proposed change. Often the client's response is that they do not believe him and that they are going to carry on with what they are currently doing. However, the challenge often makes these individuals think about the change and they frequently contact other farmers and discuss it with them. With these clients, the change will take time. The consultant stressed that **reinforcement** is also important for bringing about change. He stated that "***I tell them once, I tell them twice, tell them three times***". He will also use a range of techniques to reinforce his message e.g. verbal explanations, written articles, reports and papers, material from experts, material from well-respected farmers, the use of calculated examples or through the use of DairyNZ apps and tools. Repeat visits are useful (Bauer & Green, 1996; Strike, 2012), according to the consultant for reinforcement. If a client has not followed the

advice given, then the consultant will suggest once more an appropriate course of action and again provide the rationale for this. Sewell *et al*. (2014, 2016) identified the importance of reinforcement for farmer learning and showed how this could be done in a number of ways in much the same way as the consultant uses the process.

The other important information the consultant obtains during this process is to find out who they obtain their information from in relation to the domain he is focussing on. He will then explain who the most suitable experts are for the domain of interest. His aim is to convince them to only use reputable individuals as sources of information, an important knowledge brokering role (Klerkx *et al*., 2009; Klerkx and Proctor 2013). As such, he is building the client's "**know-who**" knowledge (Klerkx and Proctor 2013) about who are the important knowledge sources in particular domains. The consultant also tries to discredit individuals that may contradict the advice he is providing. The consultant believes that he has the responsibility to help his clients identify people from whom they can take advice. He explains to them about sources that they should trust for objective and un-biased information and sources they should not trust. Often he will point out that the people the client should not trust have "***an angle to take***" or a product to sell. He might suggest that the client go to a seminar by one of his "**trusted**" sources. If they go along, they normally agree that such people "***know their stuff***" and this makes the consultants job much easier the next time around when he uses a quote or some material from this "***source***" to convince the client that he has a knowledge gap.

During the visit, the consultant is refining the client's knowledge in a number of areas. These include explicit knowledge (know what and know why knowledge) (Klerkx and Proctor 2013) about underlying principles to enhance the client's understanding of a domain. The consultant is also helping enhance their tacit knowledge (know how knowledge) (Klerkx and Proctor 2013) about how to put theory into practice on-farm. Finally, the consultant is also enhancing their knowledge about who are creditable sources of knowledge in particular domains within the industry (know who knowledge) (Klerkx and Proctor 2013) . Overall, the consultant's visits are all about building client knowledge, reinforcing his own opinions or critiquing the client's views (providing a second opinion). A visit may involve a mix of these three strategies. He is attempting to "provide a platform for the facilitation of farmer learning" (Ingram, 2008, p. 1).

3.5 Tailoring a solution to a specific client

Once a problem is diagnosed, a key aspect of the consultant's problem solving process is that he tailors his solutions to the client's requirements or context. This is central to his way of operating. He believes that if he fails to do this, then he is unlikely to secure repeat business from the client. This point was reiterated by consultants in other studies (Rogers *et al*., 1996b; Gray *et al*.,

1999a). To tailor a solution to a specific client, the consultant has to be able to generate a wide range of alternative solutions. This then provides him with a greater likelihood that one of these solutions will best match the client's situation or context. The consultant has techniques that allow him to increase the size of the solution space and also quickly identify a range of possible solutions to a problem. He has a classification schema for problem types and each problem type has a set of alternative solutions that he can draw on to then identify the solution that best meets the client's requirements. Similar findings were reported in other studies of New Zealand consultants (Rogers *et al*., 1996b; Gray *et al*., 1999a).

During a visit, the consultant collects information about **constraints** (e.g. high debt levels, desire for high per cow production) that the client's situation will impose on the solutions he generates, a process highlighted in other studies (Gray *et al*., 1999b; Bruce, 2013). The consultant in this study also identified resource opportunities that may be useful for different possible solutions (e.g. low debt levels, sand dunes). The consultant's classification schema also includes a set of attributes for each alternative solution in terms of resource requirements and so-on. He then matches the attributes of the alternative solutions with the constraints (and resource opportunities) to reduce the consultant's large set of alternative solutions down to a solution or solutions that best meets the needs of the client. Similar findings have been reported by other studies (Rogers *et al*., 1996b; Gray *et al*., 1999a). Rogers *et al*. (1996b) and Gray *et al*. (1999a) considered that this process was similar to Tversky's (1972) elimination by aspect process. Because of the complexity of the diagnostic process, limited information was collected on the solution tailoring process. However, the following sections provide some insights into the process.

3.5.1 Generating a wide range of solutions

To tailor solutions to a broad range of clients, a consultant has to be able to generate a **wide range** of **alternative solutions** for the problem (Rogers *et al*., 1996b; Gray *et al*., 1999a). To improve the "**solution space**", i.e. identify more alternative solutions for solving the problem, the consultant considers the problem from a **broader perspective**. For this example, **a drainage problem** is just a sub-set of a broader problem about **pasture dry matter harvested per hectare problem**. From a **narrow** problem definition, the only solution to a drainage problem is to introduce drainage. However, if the problem is viewed from a **broader** perspective of being a pasture dry matter harvested per hectare problem, then the solution space increases dramatically. He can then consider other options such as improving the grazing management, applying nitrogen or increasing the soil fertility of the farm to improve the problem situation. Alternatively, the client might graze the herd off over winter or improve his wet weather management of the soils. This process has not been reported in the literature.

The consultant also stressed that he uses his diagnostic tree or mental schema to identify a broader range of alternative solutions. For example, drawing on his diagnostic tree in relation to improving pasture dry matter harvested per hectare, he can utilise the two "sides" to the tree. As such, he can either increase pasture dry matter grown, or he can increase pasture utilisation. Solution tailoring requires the consultant to "***follow all the branches***" of his diagnostic tree which then helps him think about the range of solutions he has available for a client. He stated that "***So you'll work down all sides of the tree, just don't go down one side of the tree like just don't go down the eating more of it side [utilisation] because there might be 2.0 t DM/ha I can grow more on the other side***. ***So you'll just work down, when you start from the top, you come down to it and you'll work down the tree and you don't just follow down one side, you'll keep following all the branches***". As such, the consultant utilises his mental schema of the problem domain to identify a range of alternative solutions.

The consultant also uses his classification schema to store a wide range of alternative solutions in memory. He classifies low profitability problems in terms of the cause. For example, he identifies 1) **infra-structure problems**, 2) **tactical and operational management problems,** 3) **technology problems** and 4) **systems problems** (Figure 16). Each of these causes will have a different set of solutions associated with it. For example, under infra-structure problems, the consultant has sub-categories that include: drainage, irrigation, soil fertility and pasture species. For each category, he has a set of solutions that are often divided into further useful sub-categories. For example, under drainage, the consultant has classified his alternative solutions as either high capital cost solutions or low cost solutions (Figure 16). Under high capital cost options, the consultant provided the example of Novaflo and mole drains and a feed pad. Examples of low cost solutions included the use of a sacrifice paddock and the use of sand dunes.

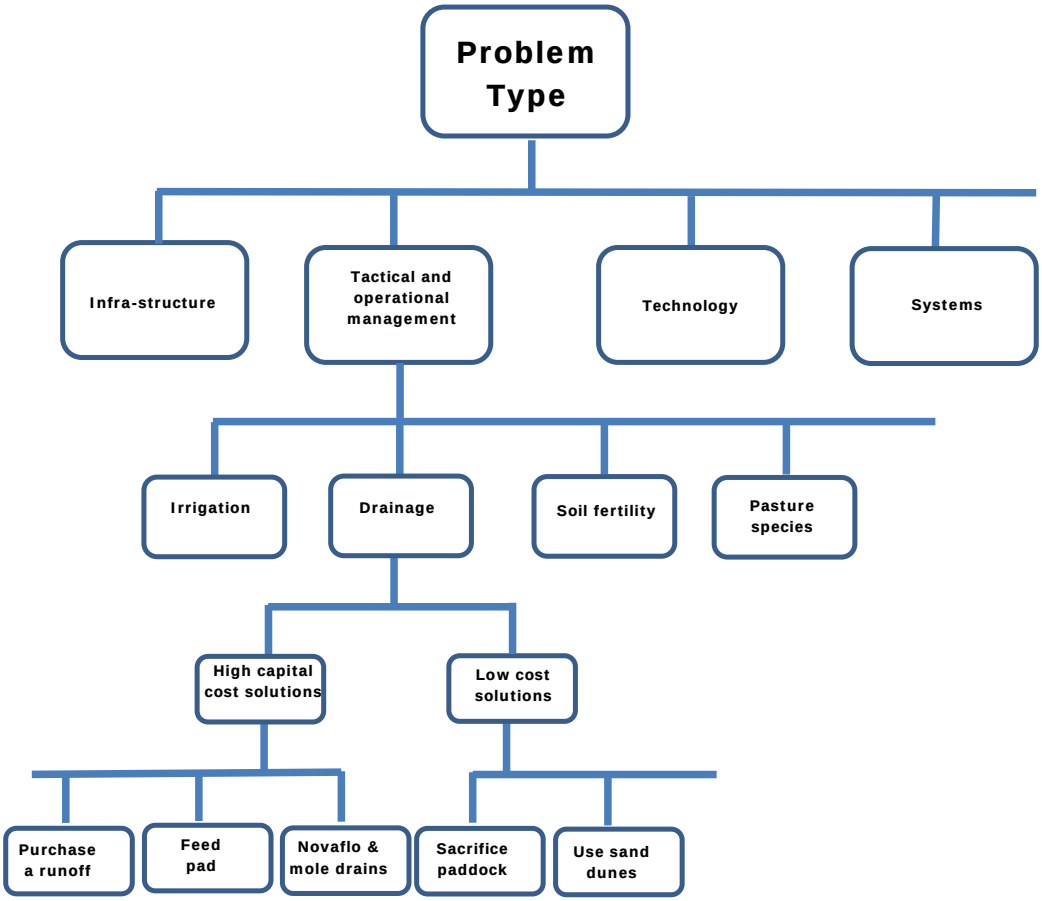

Figure 16. The use of problem type classification schema to generate alternative solutions

3.5.2 Selecting a suitable solution

This section describes examples of how the consultant tailored solutions to infra-structure, tactical and operational, technology and systems problems. The consultant stated that at the heart of identifying a suitable solution is knowing where the client wants to be.

3.5.2.1 Infrastructure problem

In the example, the consultant provided, he wanted his client to improve the amount of pasture dry matter harvested per hectare to improve profitability. He had identified that poor drainage had reduced pasture utilisation and pugging and soil compaction had reduced the amount of pasture grown. The choice of the solution will depend upon the constraints or opportunities the consultant has identified during the visit that are relevant to the problem. The consultant then matches the attributes of the alternative solutions to the constraints (and resource opportunities) he has identified to determine the most suitable solution for the client. The consultant has identified a set of attributes for each solution.

These include the resource requirements of each solution such as the capital, cash flow, labour, management capability requirements, level of risk and so-on (Figure 17). For example, an important attribute of the solution of installing an intensive Novaflo and mole drainage system is that it has a high capital cost (Figure 17). As such, if the consultant has identified that high debt levels are an important constraint for the client, he will not consider this solution. Instead, he would consider alternative solutions that have a low capital outlay such as the use of a sacrifice paddock or the use of sand dunes if the client has these on the farm (a resource opportunity). If a client is in a financial position to afford intensive drainage, the consultant may weigh up whether he is best investing in drainage or a feed pad and which investment option provides the client with the greatest advantage. The other alternative is to purchase a runoff (Figure 22) to reduce pugging and soil compaction over winter. However, the consultant would also use the runoff to increase the stocking rate on the farm so that the client can afford the capital outlay on the investment. The complexity of this solution is much greater than the use of a sacrifice paddock or sand dunes to overcome a drainage problem.

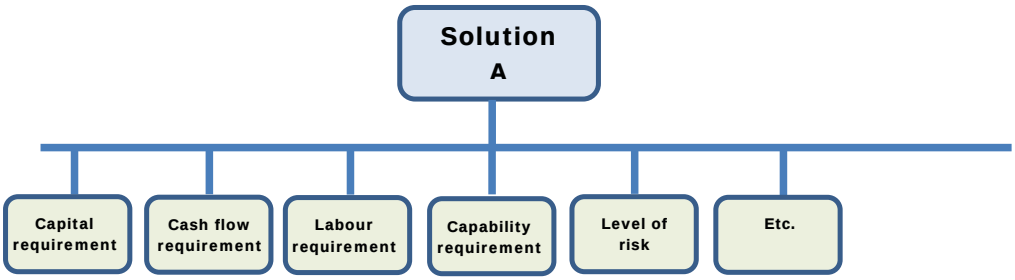

Figure 17. Solution attributes.

3.5.2.2 Tactical and operational management problem

The consultant provided another example of a **tactical and operational management problem** where a client has low levels of pasture dry matter harvested per hectare because of poor grazing management. To improve the situation, the client may need to start using a feed budget, pasture wedges, a plate meter and adjusting their pre- and post-grazing residuals to more suitable levels. Often the client is not interested in grazing management. The consultant says that he often goes out to farms where the client says to him "***Don't ask me to score pastures otherwise you can hop in your car and leave now***". Such changes require additional labour input by the client and some clients may not want to put in all this extra work, another constraint. As such, the consultant must tailor the solution to their workload requirements. He stated that by providing such a client with rules for their rotation length at different times of the year and rules about pre- and post-grazing residuals and how to

increase or reduce supplement feeding levels to ensure these levels are met, they may be able to achieve 80% of the gains possible compared to the more time-consuming and formal approach that uses feed budgeting and a plate meter. As such, the consultant has solutions that provide quite good results for his clients without them having to put in as much effort as solutions that will provide the optimum impact.

The consultant stated that as an advisor, he has to have **a suite of solutions** that require different levels of **labour input** and **management capability**. For example, he can get a client to do a full pasture walk with a plate meter to obtain the average pasture cover level on the grazing area or he could recommend a technique developed by the Taranaki research station where a farmer can visually assess the longest five paddocks and the shortest five paddocks and average these to estimate the average pasture cover on the grazing area. The advice the consultant offers a client in relation to grazing management is heavily dependent on their management capability in this area. Information about the client's ability is then used to tailor the solution to that specific client.

The consultant provided examples of two farmers with different capabilities in relation to pasture management. He described one farmer who was motivated and focused. This farmer was monitoring and recording pasture cover levels, and calculating cow intakes from pre- and post-grazing residuals to estimate what the herd was eating and he was focused on improving profit. Because this client was focused, the consultant provided him with more detailed advice on grazing management and how to improve profitability. In contrast, he had another farmer who did not monitor or record pasture cover levels or calculate cow intakes. The consultant provided him with a lower level of advice that suited his skills, knowledge and motivation. For the motivated knowledgeable farmer he would suggest that he grazes the sward at the two and a half to three-leaf stage to increase the amount of pasture harvested. For the other farmer who is less knowledgeable and less motivated, he would provide him with rules of thumb for round length at different times of the year for their district. This advice is not perfect, but it would allow the farmer to capture a good proportion of the potential benefits from improved grazing management without them having to understand grazing management and leaf emergence. In one situation, the consultant is providing the client with the principles and asking them to use these to improve their management. In the other situation, the consultant is providing a recipe that is based roughly on the principles, but the recipe will not have the full impact of the former approach.

Where a client has limited skills and knowledge, and or motivation, the consultant must simplify the solution and re-evaluate the likely impact of the change. He knows that a solution may have different impacts depending on the

knowledge and skills of the client. The consultant's clients range from top 10% farmers through to below average farmers. As such, a good farmer might obtain 90% of the potential impact of a change, but a poor farmer might only capture 70%.

3.5.2.3 Technology problem

In terms of technology problems (Figure 16), the process of solution generation can be straight forward. For example, if the consultant determines that a client is not using nitrogen, a "**technology problem**" and he thinks it would be profitable for the client to use it, then the choice of the solution is quite straight forward. However, the application of this technology may not be quite as straight forward because the consultant has to determine how much nitrogen to use, when to use it and then how best to use the extra feed that has been generated. There is also some overlap between technology and infra-structure problems because a feed pad is a technology, but it is also a solution to a drainage problem, an issue of infra-structure.

3.5.2.4 Systems problem

In another example, the consultant was asked how he would respond if he identified a "**systems problem**" where the client's stocking rate was 100 kg LW/tonne DM available, i.e. above the optimum level that he likes his clients to operate at (80 - 85 kg LW/tonne DM available). In such a situation, the client can go one of two ways to achieve this optimum. They can reduce stocking rate or they can increase the amount of bought-in feed. To decide what the client might do, first the consultant would have a discussion with them about risk and milk price risk in particular in relation to whether they want to reduce cow numbers or increase feed inputs. The consultant also discusses the type of system they want to operate, because he knows that most clients have a preference. As such, the consultant is considering both the client's **risk attitude** and **system type preference**. These are matched against the risk and system type attributes of the two solutions.

In the first example, the client wanted to achieve high levels of milksolids production per cow. This **goal** acts as another constraint the consultant must take into account when determining the best solution for the client. This client then stated that he did not want to buy in additional feed. After analysing the situation, the consultant replied that he thought that the client was expecting too much from his herd for the level of feed he was providing. He did not believe his client could achieve his production per cow goal without feeding additional supplements. In effect, the consultant had identified a **husbandry constraint**. He then cited research that showed that a stocking rate of 80 - 85 kg LW/tonne DM offered is the optimum stocking rate for good levels of milksolids production. He informed the client that because his herd had a stocking rate of 100 kg LW/tonne DM offered, he was struggling to produce at a

good level of milksolids production per cow and per hectare. He pointed out that the client was carrying a lot of live weight per hectare and not providing them with the feed they needed to produce at high levels of milksolids production. If the client did not want to buy in feed, then the consultant offered to estimate the reduced stocking rate he should be running to achieve his per cow production goal. For example, based on his calculation, he estimated that to operate at a comparative stocking rate of 80 - 85 kg LW/tonne of feed available, the client must reduce his herd size (and hence stocking rate) by 30 cows.

In the second example, the client's stocking rate was too low (e.g. 65 – 70 kg LW/tonne DM offered). The consultant pointed out that their stocking rate was too low and that there was insufficient grazing pressure being placed on his pastures. At such a low stocking rate, it was difficult for the client to maintain a high level of pasture dry matter harvested per hectare without very good management. The choices open to the client are to increase cow numbers or reduce supplement. The decision will again depend upon the client's preference for a farm system type. Do they want a system that uses a lot of supplement or do they want a low input system. The consultant's general rule is that the more supplement a client puts into his system, the higher the per cow production he should expect. He also has some rough rules of thumb about how much per cow production he can expect out of the different farm system types. For a system 1, he would expect the farm to produce milksolids at a level equivalent to 80% of the mature body weight of the herd and for a system 5 this figure should be 100%.

These results show that the consultant might have the same problem on different clients' farms (e.g. stocking rate too high or stocking rate too low), but the solution to the problem could be quite different. For a situation where the stocking rate is too high, one client might reduce stocking rate because he does not like buying in feed and is risk averse. Another client might increase the amount of bought in feed because he likes well fed cows that achieve high levels of milksolids production. Alternatively, with a scenario where the stocking rate is too low, one client might reduce supplement use whilst the other might reduce cow numbers for similar reasons as stated above. As such, the consultant has to tailor his solutions around the client's preference for farming system type, their production goals, and also their attitude to risk.

A key guideline that the consultant considers when helping a client change their farm system is to identify the client's "***comfort zone***". This is the zone that they want to be operating in, that that they are comfortable with. Some clients are most comfortable running low input systems, others prefer higher input systems where their herd is fed high levels of supplement, are maintained in good condition, and produce high levels of milksolids per cow. The consultant has to **identify this zone** for each client and work within the **constraints of**

that preference, e.g. " ***… the word is where they want to be, their comfort zone, the zone they want to operate in, everyone has a zone where they want to operate. … I want to be able to step right or step left [tailor solutions], that's the zone, so you have to work within that to do the best with that***". The consultant has clients that range from systems 1 and 2 through to systems 4 and 5.

3.5.3 The role of constraints in solution tailoring

The consultant also views problems from the perspective of his diagnostic tree and how far down the tree he goes will depend upon the client. For some, he can go all the way and optimise profitability with no constraints, but for others, how far towards optimum profit he goes is dictated by the constraints the client imposes on the solution. As such, one of the key processes the consultant undertakes is to **identify the constraints** that the client and his farming system will place on the solutions the consultant can generate to overcome the client's low profitability problem.

The above examples show that the solution chosen by the consultant will depend upon the client's **specific context** and the **constraints** (and **resource opportunities**) these impose on the solution. During the information gathering and picture building process, the consultant identifies constraints that might limit the solutions that he can provide for the client. These constraints can be separated into personal, resource, system type, and husbandry constraints (Figure 18). Personal constraints include: the goals, and drivers of the client, the client's preferences, attitudes and interests, their management capability in different domains and their attitude to risk. Resource constraints can be separated into land, labour and capital constraints. The system type the client is operating also places constraints on the types of solutions the consultant can recommend. Husbandry constraints dictate what is technically feasible within the client's farming system (e.g. level of milksolids production per cow for the level of supplementary feed provided per cow).

The constraints in Figure 18 are similar to those reported in other studies. Bruce (2013) found that when designing a new enterprise mix for a client, the consultant took into account the client's goals, preferences, attitude to risk, the strengths and weaknesses of the client and other constraints. Bruce (2013) also classified the constraints identified by the consultant in her study as those imposed by: 1) the client (goals, management ability, risk attitude, enterprise preference), 2) the farm resources (land, labour, capital) and husbandry constraints (sheep to cattle ratio, average pasture cover levels). In the study by Gray *et al*. (1999b), they also identified similar constraints: the client's knowledge, skills, attitudes and beliefs, goals and objectives and the resources. However, they did not mention systems or husbandry constraints. The

consultant in their study however also considered the family as a source of constraints.

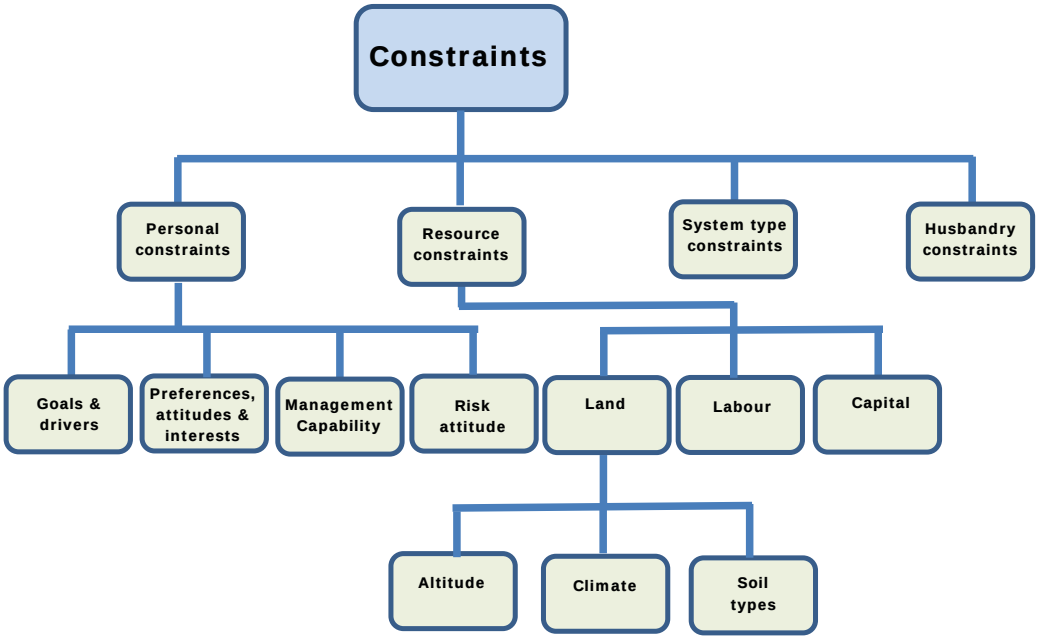

Figure 18. Types of constraints.

3.5.4 Tailoring solutions and risk

Although the consultant has always considered risk when tailoring solutions for a client, this has become much more important because of the much greater volatility in milk price. Any solutions he suggests have to take into account risk and also provide flexibility. In the current volatile environment, farm systems need to be able to take advantage of upside risk and minimise the impact of downside risk. The consultant stated that some farmers just want to farm in a consistent way, but if they farm in the same way at a $4.00/kg MS pay out as at an $8.00/kg MS pay out, then they have something wrong. He argues that a client has to think about the impact of farming for a low price year on their ability to then take advantage of a high price year when it comes along. Where possible, the consultant tries to maintain flexibility within his client's system to ensure that they can do this.

The consultant does not analyse the risk associated with different solutions quantitatively. He admits that he probably should, but argues that until relatively recently, milk price had been quite stable. Palm kernel has allowed farmers to cope with production risk, but price volatility is much more difficult to manage. Because farmers have only had two cycles of milk price volatility, they have not had enough time to learn about how to manage this volatility and build in appropriate risk management strategies. The consultant believes that farmers

are quite good at managing production risk, but struggle with market risk and business risk. A problem with the current low milk price is that because of this, farmers have removed some of their risk management strategies to bring about cost savings. As such, if there is a drought during the low milk price phase, farmers may struggle to manage production risk. Similarly, debt levels impact on how well farmers can survive in a low milk price period.

The consultant believes that farmers will need a new set of risk management skills to perform well in this "turbulent" environment. In the previous high milk price period, farmers purchased additional land and leveraged their debt. Inflation took care of the increased debt levels because inflated land values improved farmers' equity. However, this strategy places farmers in a vulnerable position when milk prices are low. In this new environment, the consultant believes that farmers need cash reserves to provide working capital as a buffer for the first year of any down turn in milk price. Similarly, when tailoring a solution for a client, the consultant does not want to place them in a position where they are unable to take advantage of an improvement in milk prices.

In the current environment, to provide flexibility around solutions, the consultant is staggering some of these decisions over a period of time. This in effect delays the decision so that the client has more information on milk price trends before he has to act. For example the consultant might suggest a client farms his full herd numbers through to balance date and then at that point thinks about whether he will reduce cow numbers to avoid having to feed supplements if the milk price is forecast to remain low. He may suggest they delay the decision until Xmas when pasture growth rates begin to decline and by this stage the client will have a better idea of the likely milk price. At that stage, the farmer has to decide if he will cull additional cows to avoid feeding supplements over summer, autumn. This decision to cull capital stock will impinge on the client's "**herd bank**" for next year and reduce his ability to take advantage of an improved milk price. The next decision might be in the autumn and if the milk price outlook is poor, then the client can afford to run a lower stocking rate through the next season and cull accordingly. This is a type of incremental risk management strategy, but it retains flexibility within the system. This process is similar to the process used by sheep and beef farmers in a drought where they identify key decision points and make decisions at these points based on the latest information about feed levels whilst trying to retain some flexibility (Gray *et al*., 2008).

The consultant believes that in the current low milk price environment, every farmer except those farming system 1 type properties should be looking at making changes. This is because system 1 farmers often have limited scope to reduce costs. For the high input systems (System 4 & 5), the consultant asks these clients to look at what they are spending on feed and the types of feed

they are using. Some feeds make more money (or lose less) than others and the consultant also believes these farmers should be scaling back their inputs to some degree. Normally the consultant does not implement major changes to these systems, rather he will scale them back and reduce feed inputs to a degree. The consultant does not see much flexibility with labour because farmers do not want to work harder and there is also a relationship issue with staff. Despite this, some farmers will be forced to reduce staff because of their financial position. He tends not give advice on whether to shed staff or not because of moral issues, and leaves that decision to the client. Instead, he will make suggestions about how things can be done differently to reduce costs and improve productivity. The consultant tends not to look at diversification options because of market risk issues. For example, beef is profitable at the moment, but the market may have changed by the time a farmer has cattle to sell.

In the current environment, the consultant is asking his clients to think about what a good debt to asset ratio is for the level of volatility they are now facing. If they generate surplus cash, he recommends they use it to build cash reserves (build $100,000 war chest) rather than for consumption purposes. The consultant is now thinking about the size of the cash reserves a farmer needs based on their debt levels and he would express these in terms of $/kg MS reserves required. He believes a lot more thought needs to go into this area. He does not believe dairy farmers handle risk well and some of the business structures that are in place are not well set up to manage risk.

In the current environment, one of the consultant's key performance indicators when he looks at a client's accounts is his liquidity. It is an important measure of business health. The key issue in relation to cash reserves is the client's level of debt. If debt levels are low, then the client can pay off debt with their discretionary cash and if required they can borrow to cover a down turn in milk price. In contrast, if a client has high debt levels, the consultant believes they are better to build up a "war chest" of cash reserves during periods of good milk prices and use this to buffer the impact of a down turn. He believes that the higher the debt, the greater the amount of cash reserves a client needs to retain.

In relation to climate change, the consultant has not built this into his view of what their businesses need to look like going forward. However, he believes that they could refine their infra-structure and business structures to be better able to cope with climatic variation. The nature of the infra-structure changes will depend upon the nature of the impacts of climate change on a client's farm. For example, if climate change information suggests a client will face wetter winters and they have heavy soils then the consultant might suggest he invest in a feed pad. Alternatively with the expected variation in pasture growth rates, the consultant might suggest the client runs a lower stocking rate over the

longer term. The other important point with climate change is to ensure the client has a strong business in terms of profitability and liquidity. He stated that he has not thought about what the climatic conditions might be like 10 years from now, but wonders if he should be considering this.

The consultant also has to consider the risks associated with environmental regulations and what this might mean for his clients such as having to reduce stocking rate or upgrade infra-structure. It may mean the client has to reduce nitrogen use. He is also thinking about what practices his clients can undertake and what practices they will not be allowed to use under the new environmental regulations. However, he tends to provide advice within the current guidelines and he does not change this until the regulations are in place. He compared this to the speed limit: "***But you know it's a bit like our open speed zone's 100 km/hr so I keep driving at 100 km/hr and if they say it's going to come down to 90 km/hr well I worry about it when it comes down but I've been thinking about it***". However, he does think about what environmental regulations are likely to be introduced in the future and how his clients might have to adapt to cope with these. As such, he is preparing for future changes and developing strategies to cope with these if they are introduced. He also keeps his clients abreast of developments in this space so that they are aware of possible changes.

One of the consultant's key strategies for managing risk is to ensure the client has a strong business structure and by this he means a highly profitable business. As such he want his clients to be in a position where they generate a cash surplus of at least $0.50 - $1.00/kg MS per annum most years. He stated that "***If we did that [ensured the client had a strong business], if I had all my guys with 50 cents to $1 [per kg MS] sitting there in the bank I'd be a very happy consultant, we'd all be drinking latte's***". By business structure, the consultant means that the client will be performing well in terms of liquidity, profitability and solvency or wealth creation. He points out that many of his clients have good cash reserves at the moment. Because of the down turn he stated that "***I mean they've got plenty of cash reserves and they're just slowly mining away at them. Are they happy? No. Are they panicking? No. Are they careful? Yes. But they're in a position that they can see their way through this. They can say 'well you know we're fine we're not going to get any nasty notes from the bank'.***" The consultant believes that risk is going to be an increasingly important issue for his clients going forward. He believes that until recently it has not been as big an issue for dairy farmers and like most skills, farmers develop these "***on the run when you need it***". He compares this to the nutrient management area. Fifteen years ago, he would not have known anything about it, but since the issue emerged he has had to learn a considerable amount about this emerging

area. The management of risk in an increasingly volatile environment is the same.

In relation to risk, the consultant is always thinking about business resilience. He does think about risk and system type and he has identified the risks that are of most importance to each system type. For a system 5 client, milk price volatility and feed input prices are their main sources of risk. The issue for him is how do his clients best manage these risks. In contrast, systems 1 and 2 are more exposed to production risk in terms of climatic variation. As such, the consultant works with his clients to identify risk management strategies that will best suit their system and situation. Some strategies are common across all systems such as having reduced debt levels.

The consultant has a philosophy that although he keeps a watching brief on developments within the environment and considers strategies to manage emerging threats and opportunities if they arise, he tends to operate for the "here and now" which reduces his own stress levels. He also believes that often technologies or management practices emerge that can be used to manage these risks. As such, he does not believe in worrying too much about possible threats that are too far into the future. He said that one of the skills of a good consultant is to decide when they need to take a possible threat seriously. A good example of this was the environmental regulation risk where when the consultant considered that it was a potential threat to his client's businesses he developed networks with actors in the domain and undertook courses on nutrient management. As such, like farmers, the consultant must have **adaptive capacity** which is the ability to identify when there is a significant change in the environment and then have the ability to develop strategies to cope with this new environment. However, the strategies relate to the consultant learning about the impact of the new environment on his client's businesses and the strategies that can be used by his clients to minimise threats and take advantages of opportunities. An important aspect of the consultant's **adaptive capacity** is to **judge** when to **inform his clients** of these **emerging threats and opportunities** and when to suggest they implement strategies to manage them.

Overall, the consultant does little financial (Martin, 2005) or quantitative risk analysis (Martin and Shadbolt, 2005), but he does focus on the resilience of the farm business. When selecting solutions for his clients, he tries to select options that maintain the client's flexibility and allow them to take advantage of both downside and upside risk. He will always point out the risks associated with the kind of system that the client is running. Of all of the risk sources mentioned by Shadbolt *et al.* (2011), the consultant is most concerned about the variability of the milk price, climatic uncertainty and the impact of environmental regulations for his clients.

3.5.5 The magnitude of the change

An important skill for the consultant when tailoring solutions for a client is to determine how far he will go in terms of implementing a solution to the problem. If the consultant proposes a solution that is too radical for the client, "***most people won't do it***". As such, an important skill during this phase of the visit is to determine the nature of the change that the client will be **comfortable with.** The consultant has demonstrated that there are **different solutions** to a problem depending upon 1) the cause of the problem, 2) the client's situation or context that includes constraints (high debt, low labour availability) and 3) the effort the client wants to put into solving the problem. The consultant has a mental schema that can handle this level of complexity in terms of tailoring a solution to a specific client.

The consultant differentiates between clients who would implement a change fully and those that prefer to implement the change incrementally. However, the majority of his clients fall into the latter category. The consultant stated that the incremental approach is important because often "***if you try to take client from 1 to 10, you will probably fail more times than not***". A number of factors dictate how quickly a client will change such as personality, attitude, the nature of the change and so-on. The clients that make radical changes without incremental steps tend to have extrovert personalities and a positive attitude.

The consultant provided the example of a farmer who had focused on production per cow and the consultant wanted him to focus on profitability. This was a major change in farming philosophy and as such it required incremental change so that the client gained confidence that the change was delivering the impacts the consultant said it would. Through this process, the consultant then gradually changed the client's farming system and management. The solutions the consultant helped the client implement over several years included: reducing the amount of supplement fed to reduce wastage, improving grazing management through better pre-and post-grazing residuals, rotation lengths and the use of leaf stage so that more pasture dry matter was harvested per hectare, and reducing the amount of topping that was undertaken by showing the client how to drop paddocks out of the rotation to make supplement.

The consultant stressed that this incremental approach "***is all about confidence***". In this statement, the consultant appears to be referring to the self-efficacy (Bandura, 1997) of his clients. Self-efficacy is defined as an individual's belief that they are capable of performing at a certain level in order to achieve specific goals (Schunk and Usher, 2012). Individuals use several sources to judge their self-efficacy for a specific future-focused task such as improving their grazing management (Sewell *et al*., 2016). Sewell *et al*. (2016) argued that actual experience plays a major role when an individual assesses their self-efficacy for a task. Success in completing the task will improve the

individual's self-efficacy whereas failure will reduce it. As such, the consultant's incremental approach to change management is designed to enhance a client's self-efficacy, the enhancement of which is likely to then lead to further changes in practice. This is similar to the findings by Sewell *et al*. (2016) in a study of farmers learning and practice change in relation to herb pastures. They reported that the farmers in their study described their practice change as evolutionary in nature and that it involved a series of incremental changes over time that eventually resulted in quite complex changes to their farming systems. Sewell *et al*. (2016) argued that this approach reduced the risk associated with a complex technology and allowed farmers to plan with greater certainty.

3.6 Co-production of knowledge

In the literature coming out of Europe there is a focus on the co-production of knowledge, where advisors work with farmers or scientists to develop knowledge together (Cerf & Magne, 2006: Laurent *et al*., 2006; Le Gal *et al*., 2011). The consultant was asked whether he was the sole provider of knowledge to his clients and how he interacted with others with regard to the co-production of knowledge. He sees himself as, to some extent, a knowledge broker who is constantly searching for good ideas to apply on-farm. At one end of the spectrum he provides most of the knowledge to his clients. At the other end, he learns a great deal from what he refers to as "***smart, thinking farmers***" who are innovative or doing something different. In the middle of this spectrum, there are farmers he works with to co-construct knowledge where each draws on the other's knowledge and experience to develop useful solutions. As such, the consultant can take the role of: 1) a sole provider of knowledge, 2) a co-constructor of knowledge, and 3) a recipient of knowledge. There are four main sources of new ideas for the consultant – scientists and academics, other rural professionals in the industry, farmers who are not clients and farmers who are clients.

The consultant sources new knowledge through attending conferences and reading scientific publications. However, most importantly, he talks regularly to researchers (scientists and academics) and other rural professionals in his network, for example, bankers and staff from DairyNZ, about new ideas and how to deal with situations. In these informal groups, an exchange of ideas takes place, involving some co-production of knowledge. The consultant also acts as a knowledge broker (Klerkx *et al*., 2009; Klerkx and Proctor 2013) between "experts" (scientists and academics) and his clients. The experts will suggest new ideas and the task facing the consultant is to assess if these ideas have merit on-farm and then for particular clients. He may assess that a new idea has no value to farmers in general. Alternatively, he may decide that the idea has merit, but it will only suit some of his clients because of their skill sets, system type or infra-structure. The acid test is when the clients adopt the

technology and the consultant monitors its impact on their system and whether it performs as he expected.

In his interactions with scientists and academics the consultant is testing the new theory against his experience in the field. In other words, does his experience support what the theory is suggesting? During this interaction, he is also discussing how the theory might be put into practice on-farm, a translation of explicit knowledge (know what and know why) into tacit knowledge (know how). He may also work with scientist and farmer clients to test emerging ideas on-farm (e.g. Donaghy and Clarke, 2016) and this type of interaction can provide a powerful learning platform for the co-construction of knowledge. Because of his experience, he is often asked to be involved in workshops and research projects with DairyNZ and the local university, other sources of new ideas. To keep up with developments in relation to new scientific innovations, the consultant also finds out which farmers are implementing these new ideas and visits them to find out what they are doing, what they know about the new technology and what they have learnt from implementing it on their farm. This is another example of the consultant **extending his networks** to ensure he is up to date with **emerging issues** and **technologies**.

In their research, Cerf and Magne (2007) identified a group of farmers who had built up a large knowledge base because they wanted to attain technical mastery of the system. The consultant also identified similar farmers, whether clients or not. He calls these his "***smart, thinking farmers***" and they have strengths in key areas that are of interest to him. He has then integrated them into his network and uses them as an invaluable resource often meeting them every 1 -2 weeks. For example, he has one non-client farmer who spends a great deal of time on the web, and he provides the consultant with a regular summary of the latest developments in dairying and how these new ideas might be put into practice. The consultant discusses these developments with the farmer to establish whether they are useful or not. He might also make suggestions himself about possible ways of implementing these innovations on-farm. As such, the consultant and the farmer co-construct knowledge through an on-going dialogue. This ongoing dialogue is very valuable to the consultant and his business. Sewell *et al*. (2014, 2016) has highlighted the importance of dialogue in farmer learning and this is obviously also important for consultant learning.

Cerf *et al*. (2011) pointed out that appropriate farm practices have to be developed when introducing the latest scientific findings and that this involves the translation of explicit scientific knowledge into practice or tacit knowledge. Problems can arise if there are no clearly proven techniques or some missing knowledge. Faure *et al.* (2012) emphasise the need for advisors to use a participatory approach in these circumstances rather than the knowledge transfer paradigm. An example of this was provided by the consultant in

relation to a new technology, gibberellic acid, a plant hormone that promotes pasture growth. The idea was developed by a company who did some trial work on it and then promoted it to farmers. Other than these few trials, little was known about it in a pastoral farming context.

The consultant listened to the firm's reps and the claims they were making. He also identified a number of questions that he needed answers to before he would recommend it to clients such as would the use of the technology run out a farmers' pastures within five years? He then researched it further and considered how a client might integrate the technology into their farming system. The consultant then talked and observed how his smart, thinking farmers were using it and discussed its use with them. He stated that it is useful to have such smart farmers among his clients: "***So you've got your guys who are leaders, smart, think about things, and I think to be a good advisor you've got to have some of those. You won't survive making a fortune out of them because you might not earn a lot of money out of them. They're just part of your network***". In this case, the innovative farmers are an important source of knowledge about new technologies, but the consultant can play a role in the co-construction of knowledge by acting as a sounding board for these innovators. The consultant may also learn information about what **not to do** with a new technology because one of his "smart, thinking" farmers has tried some new practice and it has **not worked**.

When the value of a new technology has been demonstrated, the consultant then takes the idea out to his clients. Based on his assessment of what he has observed on the early adopters' farms, he would suggest when and how his clients might use the technology. However, he would also stress that this might change as he learns more about the technology. He explains the benefits of the technology, but he also explains the risks and where scientific knowledge is lacking. He stated that it is "***important that he makes it clear to the client the areas where his thinking is not clear about the technology"*** i.e. where "***his knowledge gaps are"***. As such, he recommends that his clients **experiment** with the technology first. He stressed that it is important that they know this is a "***trial***" where "***knowledge is lacking"***. As such, the clients implement the technology knowing that the outcome is not certain. The consultant must be quite upfront about this. The other critical aspect of this process is that the consultant **monitors his clients' experiences** with the technology and **learns from this**. Through this process, he is co-constructing knowledge with his clients. At the same time he is monitoring developments in relation to the science through his networks and other information sources, and combining this knowledge with what he is observing in practice on his clients' farms. This is an example of one of the benefits of **repeat visits** in relation to **knowledge flows** and the **co-construction of knowledge**.

At the other end of the spectrum, the consultant has clients where the knowledge flow is primarily one-way with the consultant providing the client with all the knowledge and there is little co-construction. Normally the consultant obtains little or no new knowledge from these exchanges. However, he admits that occasionally there is a surprise and he does learn something new from these types of clients, but it is the frequency of these events that is the main difference between these clients and his "***smart, thinking***" farmers. The latter stimulate his learning much more frequently than the former and the quality of the learning tends to be much higher. Hansen (2015) in his study or farmer-consultant interactions reported that for farmers to benefit from such interactions, they need enough relevant knowledge. If they have limited knowledge, they will obtain much less benefit out of an interaction than a farmer with a much higher level of knowledge. On this basis, Hansen (2015) concluded that farmers need a good level of human capital to benefit from interactions with consultants. As such, farmers "with a high level of knowledge are more able to utilise external knowledge through their networks" (Hansen, 2015, p. 91).

A different form of knowledge co-construction occurs with "average" farmers or clients. The consultant provided a typical example of the nature of the co-construction of knowledge that occurs with these types of clients. The consultant will have identified an opportunity to improve the client's performance, and part of this process is to ensure the client recognises that this opportunity exists. The consultant will explain the science behind the opportunity which will require a change in the client's practice (e.g. the client will need to graze to lower residuals). The consultant will then explain how the client might implement a practice change to take advantage of the opportunity. The farmer may listen to the consultant's suggestion, but then suggest a different approach to achieving the same end point. The changes the client makes to the consultant's solution may be due to practical considerations such as ease of management. The consultant will weigh up the client's alternative solution and if it achieves the same end point, he will suggest the client goes ahead and implements it. The consultant's process for bringing about practice change supports the finding by Hansen (2015, p. 91) the learning takes place when a person who receives the knowledge understands "intricacies and implications" associated with the knowledge so that they can apply it.

In this process, the consultant has provided information to challenge the client's current management practice and convinced him that it is a problem. He has also provided the client with the scientific principles (know what and know why knowledge) behind the change so that the he now understands the science behind the practice. The consultant then provides the client with knowledge about how to implement a practice change to take advantage of the science (know how knowledge). As such, the consultant has tried to overcome Hansen's (2015) human capital constraint by providing additional knowledge which

enhances the client's learning and ability to learn more. Drawing on this knowledge of principles (know what and know why knowledge), the client has challenged the consultant's suggestion and come up with another solution to the problem that takes into account some of the practical constraints the consultant had not considered (know how knowledge). As such, the consultant has helped the client develop some new tacit knowledge in terms of putting a new idea into practice along with providing them with new explicit knowledge.

The consultant's average clients can also initiate the co-construction of knowledge by reporting back to him situations where his ideas did not work. This provides the consultant with knowledge about the conditions under which a practice does not work. Gray (2001) reported that farmers in his study assessed the robustness of their knowledge and identified the situations or contexts in which it was and was not valid. Again this highlights the importance of **repeat visits** in relation to knowledge flows and the co-construction of knowledge. The consultant stated that clients are often quick to tell him that his advice was incorrect. However he is careful when this happens and he will ask them what exactly the advice was that he had given them. If the client set out what the advice was, but it does not sound correct, he will ask to see the report he sent the client after the visit to verify that this was his recommendation. He tends to know the nature of the advice he provides to his clients, so if it does not sound like the sort of advice he would give, he investigates it further. Alternatively he may find that they have not implemented his advice correctly. So the consultant's evaluation of examples of where his advice fails is quite thorough and an important source of learning. He may either identify that the client has mis-understood his advice or implemented it incorrectly or he may find that his advice has not worked under some specific conditions that occurred with that client. As such, he also learns how "**robust**" his knowledge is and under which conditions it applies and under which conditions it is not valid (Gray, 2001).

Cerf and Magne (2006) also pointed out that clients, who are part of a large **community of practice**, can also act as a developmental resource for a consultant, possessing both local and experiential knowledge (Riley, 2008). The consultant's clients challenge his views and show him improved ways of dealing with situations. All kinds of farmers can come up with different ways of doing things. Once, after he had made a suggestion, the client replied, "***Well what if I didn't put those cows there, but I put them on that block because it's a hell of a lot easier and it saves me time.***" He learns from these experiences, but sometimes the knowledge is very situation specific and the results cannot always be generalised. As such, the consultant is identifying new knowledge that he can generalise and he is also determining the conditions under which the generalisation may hold e.g. does it apply to all dairy farms or just system 5 dairy farms. As such he is determining the robustness (Gray, 2001) of his knowledge around various practices.

The consultant may identify new ideas and practices from a range of his clients, particularly when a domain is in a state of change. For example, he may identify new practices in terms of how his different clients are coping with the current low milk price environment. It may be the changes a client farming a system 5 farm has introduced to cope with the low milk price. Alternatively, new ideas may emerge from **discussions** with his clients about topics such as how to manage in the low milk price environment. He said that this can be particularly fruitful on his larger farms where 4 – 5 people might be involved in the discussion. In this situation, a range of people are putting up their ideas and each individual often approaches the problem from a different perspective. The consultant might not agree with all the suggestions that are made, but the process allows new ideas to be generated and worked through: "***Yeah and again it's like a board. You might not agree with 100% of the outcome but okay that's the outcome, but you have your 5 cents and somebody else had something. Okay yes I didn't think of that and so on. Whatever, three brains are better than one***".

The consultant is very aware that his clients are obtaining advice from several sources (Cerf and Magne, 2006, 2007; Klerx and Jansen, 2010) including their peers and other rural professionals. In the European research this is often perceived as an advantage. The consultant though is very wary of this situation. If clients do listen to the views of too many other people, they might misunderstand what they have heard or "***cherry pick***" the advice that they receive, acting only on the bits that they like. The consultant has to point out to his clients the importance of listening to people with "***no axe to grind***". The consultant noted that the situation in New Zealand with its emphasis on a whole farm system approach is somewhat different to that in Europe where the focus is often on specialised advice (from agronomists, veterinarians etc.). These specialists do not have a business background. Their advice can be quite costly and clients who follow it might not make any profit. It can also mean that farmers receive a range of mixed messages and do not know who to believe. The move to specialists, the consultant believes, could happen in future in New Zealand with, for instance, veterinarians providing advice about feeding cows. This would be a pity since the whole farm system approach employed in New Zealand is one of this country's strengths.

The consultant also talked about advisors bringing in international research on intensive feeding systems and not realising that many of the findings from these studies are not applicable to New Zealand's pasture-based systems. As such, there is a dangers of inexperienced advisors providing advice from overseas sources that is not valid under New Zealand conditions due to such things as the protein content of our pastures, a point not raised in the European work. This issue about how research findings from one context can translate into a different context have been highlighted as a problem by health researchers (e.g.

Estabrooks *et al*. 2006), but not in agriculture. However, it is an important area to be aware of given the ability of the internet to provide advisors with research results from across the globe.

In summary, the co-construction of knowledge is complex in the consultancy field. With farmers, the consultant can operate along a continuum from: 1) providing all the knowledge to a farmer, a point made by other authors (Ingram, 2008; Faure *et al*., 2012; Messervy, 2013) to 2) the co-construction of knowledge that draws on the expertise of both parties (Laurent *et al.*, 2006; Ingram 2008; Faure *et al*., 2012) and 3) acting as the recipient of knowledge provided by farmers as proposed by Cerf and Magne (2006). The consultant is also involved in the co-construction of knowledge with other actors such as scientists, academics and rural professionals and again these flows can sit along a continuum and relate to either explicit or tacit knowledge. Cerf and Magne (2007) and Klerkx and Jansen (2010) talked about advisors obtaining expertise from their peers and other rural professionals. An important aspect of the co-construction of knowledge for the consultant is assessing the robustness of knowledge or under which situations or contexts is it valid. This is because the consultant is always assessing if knowledge is relevant to his clients and the degree to which it can be generalised if relevant, i.e. Does it apply to all his clients, or just farmers with certain characteristics. The study has found that the consultant works with some farmers in a participatory way to co-construct knowledge, but that the degree to which he does this depends on the nature of the client and their level of human capital (Hansen, 2015).

3.7 Developing an action plan

Once the consultant has convinced the client to change and worked with them to determine the most suitable solution, he will then develop an action plan with the client to bring about the change. The consultant might set out an action plan for a client to reduce supplement feeding. This might involve using supplement up until balance date, but then culling cows after this date rather than feeding supplement and making balage over the spring. The action plan sets out the activities the client will implement over time and the factors he will monitor to ensure effective implementation. Kubr (2002) noted that one of the aspects missing from proposals presented to clients in corporate consultancy was a realistic and feasible plan for the implementation of the proposal. He argues that such a plan should not only include what to implement, but how to do it. Little is written in the agricultural consultancy literature about developing an action plan. Most studies (e.g. Rogers *et al*., 1996b; Gray *et al*., 1999a,b) just mention that the consultants develop an action plan to solve the problem, but provide little further detail.

3.8 Solution implementation and evaluation

The repeat visit process is quite important in relation to the implementation of solutions. It allows the consultant to achieve several important outcomes: 1) it can motivate the client to change, 2) it allows the consultant to monitor the implementation of the solution and provide suitable advice, 3) it allows the consultant to reinforce his message. The repeat visit also places pressure on the client to be accountable for the implementation of the solution. If the client said he was going to implement a change and the consultant is coming back after a month, there is pressure on the client to make sure he has implemented that change. As such, the repeat visit process has a motivational element, a point highlighted by a farmer in a study by Gray *et al*. (2013). The repeat visit process also allows the consultant to **monitor the implementation of the change** and provide advice to the client as and when required. This increases the likelihood that the solution will be implemented **effectively**. Follow up is important in bringing about change where the consultant is not confident a client can implement the solution effectively. Often he will make a phone call post-visit to see how the implementation of the solution is going. Alternatively, he will provide follow-up at the next visit. The follow-up phone call is important for rapport building and credibility. Clients really appreciate it when the consultant rings them after a visit to see how their solution implementation is going. Sometimes the consultant will make a phone call to find that the client has decided not to implement the solution. In this situation, the consultant has to be philosophical; otherwise he would quickly become frustrated. He stressed that the repeat visit process is important where clients are making incremental changes to their farming system.

The consultant noted that some farmers will introduce a practice change quite quickly and other farmers may take several months to make the decision. This is where the repeat visit is important because it allows him to **reinforce his message**. He provides positive reinforcement to a client if they have made the change. Alternatively, if they have not, he goes through the change again and tries to get them to implement it. The mentoring and coaching process that comes with repeat visits helps ensure practice change on a client's farm. The consultant made the analogy to going to a powerful course and coming away "fizzing" only to find a few weeks later that nothing from the course has been implemented. The consultant has the opportunity in follow up visits to handle any resistance from clients who reject his advice or do not even want to be provided with relevant information (Block, 1999). In a follow up visit, the consultant can check what has been happening on the farm. If too many cows are being milked, he can point out that the client is losing more money than they should be. He does not say, "I told you so" but suggests again appropriate solutions. He tries to re-inforce his message, for example, giving demonstrations on his calculator. The consultant also adds to the information he has previously

provided. He has a few tools that he can use to improve the client's knowledge: "*They might (not) believe me, but I don't give them a chance. I add to the story. I tell them once, tell them twice, tell them three times*". He always asks his clients to have the courtesy to listen to his views even if they do not follow his advice.

The speed with which a solution is implemented can vary with the nature of the change (complex versus simple) and the nature of the client (motivated versus non-motivated, confident, versus not confident). For example, the consultant stated that ProGib and palm kernel are quite simple technologies to introduce into a client's farming system. However, he pointed out that one client took 12 months to decide to implement these simple technologies. Other clients might have made a similar change before the consultant had left the property. The consultant identified motivation as a key influence on how quickly a client will change his practice. Different farmers have different levels of motivation. Confidence also varies across clients and the consultant has found that an incremental approach to bringing about change can increase a client's level of confidence as he successfully implements the first activity within a programme of incremental changes (see section 3.5.5 on self-efficacy).

The consultant also uses the repeat visits for evaluation purposes. He evaluates a number of factors including: 1) his assessment of the client and his situation and 2) the relevance of the service he is providing to the client. The consultant does a "***stock take***" or **evaluation** after 12 months to assess if his initial assessment of the client and his situation is correct. He will do this on the drive out to the farm and will reflect on what is really driving the client, what he wants, and if there is anything he is missing in relation to the client. He may then ask the client these questions when he gets to the farm.

The consultant also evaluates the relevance of the service he is providing to the client. In particular, he might ask a client "***What else can I do better for you?***" Whether or not he asks the client will depend upon how comfortable the consultant thinks the relationship is. For some relationships he stated that "***you get a feeling that you know a relationship is going well, it's clicking, it's working, you think you are giving them something***". He will not ask this question of all clients, but he does ask it if he is wondering how his consultancy input is considered by the client and if he is providing the right advice in the right areas. The consultant asks these questions when he believes that the relationship is at a point where the client will provide **truthful** answers to his questions. Normally he will ask such questions near the end of a visit when the relationship is more relaxed (as opposed to the start of a visit). He stressed that he does not phrase the question in a way that asks what he is doing badly. It is phrased so as to ask what additional services he could provide to the client. Responses from a client can range from:

1. No, it's good and I am happy with your input,
2. I would like a little bit more in this area or I would like to know about this
3. This area does not spin my wheels

The consultant also highlights that there is a danger of a consultant "***getting into a rut***" and these questions are good for avoiding this situation. However, he wonders if he does enough of this with his clients. The risk is that the client gets tired of the same old process, and as a result they may think that they are getting less value from the consultant. **The consultant is monitoring his clients to identify if the services he is providing them with are of interest to them.** Normally he observes his clients and identifies how they respond to the input he provides. He is mainly observing the ***level of interest*** they have for his advice. A key indicator is whether or not the client is ***actively listening*** to the consultant when he provides them with advice. It is the ***level of engagement*** that is important.

3.9 Fostering change

An area that has emerged from this study that was not a focus of the research is the techniques the consultant uses to foster change with his clients. This is not surprising given the focus of the consultant's work is to bring about practice change so that the client can better meet their goals. In the context of this study, this relates to improving the profitability of their farm business. This section draws together material from previous sections under one heading. Key processes that the consultant used to foster change included: 1) ensuring problem and solution ownership, 2) managing resistance to change, 3) building client self-efficacy, 4) tailoring solutions to the client (Table 11). These processes are discussed in the following sections.

Table 11. Processes the consultant uses to bring about change.

Ensuring problem and solution ownership
• Identify what is driving the client
• Use a participatory approach
  o Works with the client through the diagnostic process
  o Works with the client on developing solutions
• Ensure self-realisation
  o Works with the client through the diagnostic process
  o Uses a range of persuasion techniques to convince the client that a problem exists and/or that a change will be beneficial
  o Ensuring the client has realistic expectations of what they can achieve in the future

Managing resistance to change • Avoid raising sensitive issues before rapport is built • Avoid the "blame game" and telling the client they have a "problem" • Monitor the client's level of buy-in and enacts contingencies • Seed planting and message reinforcement
Building client self-efficacy • Advises an incremental approach to solving the problem • Tells the client about peers who have successfully made the practice change • Organises for the client to visit a farmer who has successfully implemented the practice change • Repeat visits   o Positive reinforcement
Tailoring solutions to the client • Determines the client's goals and drivers and constraints • Works with the client on developing solutions • Managing the magnitude of the change

3.9.1 Ensuring problem and solution ownership

The consultant stated that the most important outcome from the problem identification process is to convince the client that they have a problem ("***If you don't have buy-in, you haven't gone anywhere***"). Normally, during this phase, the consultant has to persuade the client that they have a problem and that they need to change. This is a particular problem with consultancy because the consultant is not the problem owner, the client is (Rogers *et al*., 1996b). Buy-in or problem ownership is critical for motivation and commitment. For

most clients, money or profit is not the driver, it is purely a means to an end. The consultant believes that the industry over-rates profitability as a driver of behaviour.

The consultant stressed that with a new client, his primary focus is to determine what is driving them. He believes that a consultant is more likely to get this wrong than with the technical issues. Over time he, determines the boundaries around what they are comfortable with (or uncomfortable with) because he will propose something and observe the client's response. This allows the consultant "***builds a picture incrementally of what is driving the client",*** "***what spins their wheels***". The consultant stated that he might propose a change and "***whoops, then there is a bit of resistance there or no that's fine***". Often what the client says is important is not really the case. Determining this is important in relation to problem ownership and tailoring solutions.

The consultant identified three reasons as to why clients may not provide accurate information about what drives them. The first is that they are not sure themselves about their goals or what drives them. The consultant stated that it is surprising how many clients are in this category. The problem with clients who do not have clear goals is that it is difficult for the consultant to provide them with advice. The second reason that that consultant may struggle to identify his client's drivers is that the he does not have access to all the family members that influence the decision making process. As such, there may be hidden drivers that are influencing the decisions his client makes. The final reason why the consultant may not obtain an accurate picture of what drives the client is a lack of rapport between himself and the client during a first visit. On a first visit, the level of rapport is not high and the consultant stated that "***you're feeling each other out, you're getting more comfortable with each other***". As such, the client is less likely to divulge sensitive information such as what is driving their behaviour. Other studies (Williams *et al*., 1997a,b; Kemp *et al*., 2000) reported that without good rapport, consultants will struggle to obtain sensitive information from a client. Over time, a consultant's assessment of a client's drivers will either be confirmed or refuted and if refuted, then modified.

To affect problem ownership, the consultant involves the client in the diagnostic process. He stated that when he is undertaking a diagnosis with the client, it is always good if he can get the client to **come up with the answer themselves**. As such, the consultant tries to "***lead his clients through the diagnostic process"***. In corporate consultancy the importance of participative change where consultants work closely with an organisation to bring about change has been stressed for many years (Kubr, 2002). The consultant is also **monitoring** the client's input into this process and **controlling** deviations from the planned diagnostic path through the use of **guiding questions** that are designed to keep the client "**on-track**". Sometimes the client will diagnose the problem with little

help from the consultant and at other times the consultant will have to lead them through the whole process. However he stressed that most of the time he gets the client to think through the diagnosis. He stated: "***Yeah, if you can [get them to think through the diagnostic process], it is a powerful process***". He stated that it is powerful because it brings about "***self-realisation***".

The consultant also uses **persuasion** techniques to convince the client they have a problem and need to change (Table 4). He will normally ask his client how they feel about the level of profitability that their farm business is achieving, is it good, bad or indifferent? He pointed out that this is where benchmarking is useful. He normally benchmarks the farm, presents the results and points out where the client sits relative to the benchmarks. If the client is below average, the consultant will ask him if it worries him and if he would like to improve his profitability. This process creates cognitive dissonance (Leeuwis, 2002). Leeuwis (2002) argued that where a farmer encounters a cognition that is different from their existing cognition they may view it as threatening or rewarding. If it is viewed as threatening, they will adopt strategies that reduce cognitive dissonance such as rejecting or denying the new practice, or down playing its importance. Alternatively, if they see it as rewarding, Leeuwis (2002) argued that they would accelerate their learning considerably.

Table 4. Persuasion techniques

Techniques	Effect
1. Ask the client how they feel about their level of performance	1. Creates cognitive dissonance
2. Compare the client's performance to benchmarking data	2. Provides evidence of the problem
3. Specify the cost of sub-optimal performance to the business	3. Provides evidence of the magnitude of the problem
4. Compare the clients performance to that of high performing farmers	4. Highlights untapped potential
5. Provide economic research	5. Provides evidence to reinforce the nature of the problem
6. Repeat the message a number of times	6. Reinforcement that the problem exists
7. Seed the idea and raise it at subsequent visits	7. Reinforcement that a problem exists

Kubr (2002) drawing on the work of Kurt Lewin in his book on corporate consultancy viewed this as the first stage of practice change which is called "unfreezing". The individual is faced with an unsettling situation and it is assumed they experience a degree of anxiety and dissatisfaction. This "unfreezing", triggers a search for new information about the area of dissatisfaction that then leads to learning and the next phase which is "changing". Change occurs at several levels including the knowledge, attitudinal and behavioural levels. The final stage is "refreezing" where the individual verifies change through experience. Kubr (2002) argued that at this stage, the client required a conducive and supportive environment which the consultant could foster.

Benchmarking is also important because it provides evidence of the problem. For example, the consultant has clients that are focused on achieving high levels of milksolids production per cow to the detriment of the profitability of their farm system. Dairybase data is important for demonstrating to these clients the poor relationship between milksolids production per cow and profitability. This often creates an "***ah ha moment***" for the clients. The consultant stated that "***Yes, sometimes it's like in your face***" [the client's].

The consultant will quantify the impact of the client's sub-optimal performance on the farm business to provide evidence of the magnitude of the problem. For example, he might state that the poor grazing management is costing the client around $30,000 per annum. Is he happy for this to continue? The consultant also compares the client's financial performance data to high performing farmers in the area so that the client can see the potential that is available to him if he changes his management. The consultant's data on high performing farmers is useful when he has a client that is performing above average. For example, the client may be generating an operating profit of $3,500/ha when the average in Dairybase is $2,500/ha. So he might say to the client, "***Okay, so you are doing well, and it's good, great, but you know the top 5% are doing $8,500/ha and this is why they are doing it***". As such, he shows the client the scope for further increasing the profitability of his business ($5,000/ha) and also specifies how the client might change his practice to improve his profitability. Such information acts like **a carrot for the client and can motivate them to change**.

The consultant also used economic research from DairyNZ to persuade the client to change. In this situation, the For example, he pointed out the research reported a correlation between pasture dry matter harvested per hectare and profitability of 50 – 60%, compared to the correlation between per cow production and profitability of only 10%. Some clients take longer to persuade than others. In this situation, the consultant may repeat the message a number of times over several visits to reinforce the idea. He stated that "***I tell***

them once, I tell them twice, tell them three times". He will also use a range of techniques to reinforce his message (e.g. verbal explanations, written articles, DairyNZ apps and tools). Repeat visits (Bauer & Green, 1996; Strike, 2012) are used for reinforcement. Similar findings in relation to farmer learning were reported by Sewell *et al*. (2014, 2016).

Alternatively the consultant may seed an idea with such clients, and then reinforcing this periodically. The consultant may never obtain buy-in and he is fine about that because his clients employ him for a range of reasons. However, if he believes the issue is important to the client's business, he will never give up. As such, he views ***persistence*** as a key requirement for a successful consultant. However, he did point out that one has to be careful how they repeatedly raise issues with a client. One does not want to sound like "***a broken down gramophone record***".

During this phase, the consultant is both trying to persuade the client to change and if they do not want to, ensuring that they understand the consequences of not changing. Although other studies into farm consultancy have described the problem identification process (Rogers *et al*., 1996a,b; Gray *et al*., 1999a,b; 2000; Bruce, 2013), few have mentioned the need to obtain buy-in (or problem ownership) to ensure engagement with the client in relation to solving the problem. However, this is stressed in the corporate consultancy literature (Kubr, 2002). Similarly, little is written about how a consultant goes about ensuring problem ownership by the client. This is a critical aspect if practice change is to occur.

Another example of self-realisation is ensuring clients have realistic expectations about what they can achieve in the future. For example, a sharemilker might want to own a farm in ten years, but the consultant will show him that at his current rate of equity growth this will not happen. Alternatively, if a client wants to have high drawings, a good lifestyle and overseas holidays, and they are not concerned about discretionary cash, then he says "**okay, that is not a wrong call**". This is because the clients "***understand the consequences of their actions***" and have chosen **consumption** over **business growth**. This is why the consultant does not have absolute KPI's for **equity growth**. However, his role is to alert the client to the **feasibility** of them **achieving their long-term goals**. If they have low levels of discretionary cash and/or equity growth and they want to buy another farm, then they will need to change something to achieve this goal. The response to this "***reality check***" can be quite different among clients. Some may change the farm or their behaviour to achieve their goals, others may decide that this was not really their goal and that they are happy with a good lifestyle and a low level of discretionary cash and equity growth. As such, the consultant stated that "***some of my job is reality***", i.e. providing his clients with an **objective view of reality**.

3.9.2 Managing resistance to change and avoiding the "blame game"

A consultant always needs to bear in mind that clients might be resistant in various ways to being helped (Block, 1999). They might not accept suggestions or even want to listen to relevant advice. Block (1999) recommends that resistance should be explored with the client and they should be encouraged to express their concerns. The consultant has many different strategies for handling this issue. He might not even mention an issue initially if he disagrees with what is happening on the farm, but it has little impact on the client's business. Where something will have serious consequences for the business, he will point this out to the client, even if the client is unlikely to want to hear this advice (Ingram, 2008). He is acting in the best interests of the client not only for ethical reasons, but also to protect his own reputation. Even when the client acknowledges that changes have to be made, the consultant has to get buy-in for his proposals through encouragement, highlighting the advantages of a course of action, bringing subtle pressure to bear on the client and so-on.

The consultant does not classify clients with regard to the amount of resistance they display. He handles any situation as it arises by trying to reinforce his message. During repeat visits he can monitor if his advice is being followed. He chooses carefully, though, those battles that he wishes to fight. If too many cows are being milked, he can point out that the client is losing more money than they should be. He does not say, "***I told you so***", but suggests again appropriate solutions, he avoids the "***blame game***". He tries to strengthen his case by giving demonstrations on his calculator. The consultant also adds to the information he has previously provided. When benchmarking, he goes through the more detailed material and points out to the client areas where he is good, poor or average. Where the client is average or poor, the consultant portrays these areas as **opportunities** for improving the profitability of the farm. This is in order to avoid blaming the client for the farm's poor performance.

The consultant is **monitoring** the client to see if he has **buy-in** and implementing contingencies if they appear resistant to change. By asking the client to organise for the accounts analysis, the consultant assesses the degree of buy-in he has with the client. If the client fails to contact the accountant, then he knows he does not have buy-in. The consultant will contact them to remind them and "give them a push" but he will not "hound them to death". If they do not want to do it, he will step back. Alternatively, the client might say something like: "I am not sure I agree with you about that". The consultant might tell them that they need to think about it. He may also say: "***Well this is what the analysis says, where do you think it is wrong***"? Often they say they don't know. The consultant might then give them a few days to think about it. Normally clients have a gut feeling that the farm business is not performing well. The consultant then tries to ensure there is the **realisation** that the business is not performing well and an **acceptance** that this is the situation.

They may need time to go and talk to someone else about it before they fully accept the situation. Normally, this differs for different clients. However, the consultant points out that to have got this far, the clients must have been interested in improving their financial performance. Clients that are not interested would not put their accounts through Dairybase. If the consultant has given the client time to think about the Dairybase analysis, he will then ring them back in 4 – 5 days.

An alternative approach used by the consultant is to plant a seed of an idea about change and then reinforce the idea over time. He uses this in two types of situations. The first is where resistance to the change is high. Here he uses it as a "**softly, softly**" approach. Alternatively, he may use the approach for changes that are "**on the horizon**", e.g. possible changes to environmental legislation. In this instance, the approach is used to prepare the client for a change that may occur 3 – 5 years in the future. For example, in a casual conversation he will mention that nitrogen use may have to be reduced in the future. Clients have effectively been warned that change is coming, but in a low-key fashion. Unlike some of the advisors mentioned in Ingram's (2008) study, the consultant will not avoid mentioning an important issue whether formally or casually. Overall, the ways he handles resistance varies considerably – avoidance or delay for minor issues; identifying major problems when required whilst reinforcing his message in repeat visits; and forewarning clients informally about future changes in regulations.

An alternative approach to the consultant's process is to tell the client directly what the problem is e.g. he could tell them that their pasture utilisation is poor and their post-grazing residuals are wrong. He stated that a client's first response to this is to take up a ***defensive position***. The client will then defend their position. The client and consultant end up in a **confrontational situation** from which makes it very difficult for him to change the client's behaviour. However if the consultant can lead them through the diagnostic process, they then realise that their grazing management is not that good and that they could improve it. Overcoming resistance to change has been highlighted by Kubr (2002) as an important area in the corporate consultancy literature. The consultant believes that this is a critical skill for a young consultant. He ***does not believe that young consultants are trained in this skill***. He stated that "***Too many people try and bang on the front door, but you've got to find a driver somewhere else because if you can't find the driver, you're not going to get there***". Some people have a natural ability in this area, but little training is provided for this. Other consultants are very direct and tell farmers how "bad" their management is. The consultant noted that some clients like consultants that are direct and "***don't pull the punches***". This highlights differences in the attitudes of individuals towards change and their ability to

change (Kubr, 2002), something good consultants such as the expert in this study assess.

3.9.3 Building client self-efficacy

The consultant uses a range of techniques to build self-efficacy (Bandura, 1997), an important factor that influences learning and practice change (Leeuwis, 2002; Sewell *et al*., 2016). He uses an incremental approach to practice change because it "***is all about confidence***". This allows the client to successfully achieve a step in a detailed change process (e.g. begin measuring pasture cover), gain confidence from this and then move to the next step which might be using the information to allocate paddock areas to ensure the correct post-grazing residuals. Sewell *et al*. (2016) argued that success in completing a task played a major role when an individual made an assessment of their self-efficacy for the task. They also reported that practice change is evolutionary in nature with a series of incremental changes eventually leading to quite complex changes over time. Sewell *et al*. (2016) also argued that this approach reduced the risk associated with complex practice changes, something that often limits adoption (Pannell *et al*., 2006).

The consultant also used other techniques to improve a client's self-efficacy in relation to a proposed practice change. He gave them examples of peers who had successfully adopted the practice and also organised for them to visit and observe and discuss the practice change with farmers who had successfully adopted it. Bandura (1997) argued that vicarious experiences, where an individual observed their peers successfully completing an activity, can convey to the observer that they also have the capability to successfully complete the task. In a recent study of farmer learning, Sewell *et a*l. (2016) reported that such vicarious experiences were a source of information that helped develop farmers' sense of self-efficacy in the learning group. The other important practice that the consultant used that assisted the development of self-efficacy in his clients was his use of repeat visits where he provided encouragement and positive reinforcement in relation to a practice change. Bandura (1997) argued that having a trusted person, in this case the consultant, telling you that you have the capability to successfully complete a task is another method of enhancing an individual's self-efficacy. Sewell *et al*. (2016) reported that scientists played this role in a farmer-scientist learning group that they were studying.

3.9.4 Tailoring solutions to the client

To help bring about change, the consultant must tailor solutions to the client's context. To do this he has to determine the client's goals, drivers and constraints. He also involves the client in the solution generation process and also manages the magnitude of the change.

3.9.4.1 Determination of a client's goals, drivers and constraints

The consultant stressed that with a new client, his primary focus is to determine their goals and what is driving them. He believes that a consultant is more likely to get this wrong than the technical issues. Over time he, determines the

boundaries around what they are comfortable with (or uncomfortable with) because he will propose something and observe the client's response. This allows the consultant "***builds a picture incrementally of what is driving the client",*** "***what spins their wheels***". The consultant stated that he might propose a change and "***whoops, then there is a bit of resistance there or no that's fine***". Often what the client says is important to them is not really the case. As such, an important risk for a consultant is to turn up at a farm assuming that the client has invited them out to the farm to help them improve profitability. For many of the consultant's clients, making more money is generally unimportant. One of the key processes that the consultant undertakes is to identify the constraints that the client and his farming system will place on the solutions the consultant can generate to overcome the client's low profitability problem. To provide effective solutions that the client is likely to adopt, he must take these constraints into consideration.

3.9.4.2 Working with the client to develop solutions

The consultant also involves the client in the process of developing a solution to the problem. Kubr (2002) argued that it was important for consultants to take a participatory approach to consultancy if they wanted to bring about change. Often The consultant will ask a client, "***how would you overcome this problem***?" This provides another opportunity for the client to take ownership of the problem and the solution. However, the consultant admits that the client's input into this process ranges from the consultant solely providing the solution, the consultant and client jointly developing a solution, through to the client developing the solution himself. This will depend upon the capability and confidence of the client in the problem domain. The consultant also provided the example where he has explained the reason for the problem and put forward a suitable solution only to find the client puts forward an alternative, but effective solution. In this situation, the consultant reported that the client has identified other constraints or reasons (issues to do with the context) for the alternative solution that the consultant did not know about.

3.9.4.3 Managing the magnitude of the change

Some clients are happy with implementing the full change recommended by the consultant and others prefer to implement the change gradually. An important skill for the consultant when tailoring solutions for a client is to determine how far he will go in terms of implementing a solution to the problem. If it is too radical, the client may not implement it. As such, the consultant must determine the nature of the change that the client will be **comfortable with.** There are **different solutions** to a problem depending upon 1) its cause, 2) the context including the constraints and 3) the effort the client wants to put into solving the problem. The consultant also stated that a number of factors dictate how quickly a client will change such as personality, attitude, the nature of the change and so-on. The consultant takes all these factors into account when

tailoring a solution to a specific client. The clients that make radical changes without incremental steps tend to have extrovert personalities and a positive attitude. However, the majority of his clients prefer to make incremental changes. The consultant stressed that this incremental approach "***is all about confidence***" or the self-efficacy (Bandura, 1997) of his clients. This is critical for bringing about practice change.

4.0 Conclusions

The aim of this study was to describe the processes an expert farm management consultant uses to diagnose and tailor solutions for a new client who is achieving low levels of profitability. The primary aim of the consultant was to help his clients better meet their goals. As such, he operates as a **change agent** where he tries to facilitate change in his clients' attitudes, social norms, knowledge, skills and behaviour. Where possible, the consultant adopts a **participatory approach** to problem solving with the client to ensure problem ownership. He likes clients to actively participate in the process as long as they do him the courtesy of listening to his advice. He is prepared to take the character and goals of clients into account to some extent when responding to clients, but does not change his basic modus operandi.

The results from this study highlight that a good consultant needs to be independent and objective with good people skills. They also need to think systemically, be open to new ideas, adaptable, experienced, knowledgeable, analytical, logical and goal-focused.

Triangulation was found to be critical to problem identification and diagnosis because the consultant is not the problem owner. The consultant might have to deal with missing or erroneous data. Triangulation allows the consultant to assess the reliability of the client's information and check inferences that he has made. This must be done carefully to avoid creating distrust. Several forms of triangulation were identified and the consultant uses the results from this to classify the client in terms of his provision of accurate information.

Unlike the results from other studies, this consultant did not use the client's accounts to identify if a low profitability problem existed. Rather, he used a range of indirect physical and management information to identify a potential low profitability problem. He can do this because he has a good systemic understanding of the drivers of profitability. If such a problem is identified, he then asks the client to put their accounts through Dairybase. The consultant has developed this approach because the financial position of the business is a **sensitive** topic for most farmers. Because of this, new clients are unlikely to talk to the consultant about this easily on a first visit. Instead, the consultant uses a range of indicators to **make sense** of the client's situation.

The consultant drew on his broad knowledge of the region to benchmark client's farms. He knew the amount of pasture dry matter harvested per hectare for different soil types within particular districts, where the location reflected the local climate. He also had similar benchmarks for stocking rate, milksolids production per cow and per hectare for soil type, location and system type. The development of such benchmarks for different regions would be useful for novice consultants. The consultant benchmarks a farm and classifies it as below average, average or above average for the indicator. If performance is above average (e.g. top 10%), this suggests that there is limited scope for improvement in this area. In contrast, if it is below average, this suggests there is considerable opportunity to improve performance. Similarly, if the client's farm performance is average, there is scope to move it into the top 10 - 20% of farms.

High level causes of low profitability include the level of pasture dry matter harvested per hectare, low levels of milksolids production per hectare, the use of high cost supplements and a high cost of milksolids production. Once a high level problem is identified, the consultant uses a diagnostic tree to identify its cause. This mental schema sets out problems and sub-problems by type and as one moves down the tree, there is a set of symptoms associated with each problem type at each level. The schema is used to hypothesise the symptoms associated with possible causes of the problem and rank the most likely causes. Different causes have different indicators or cues (e.g. symptoms of diseases that affect reproductive performance), so the consultant determines the specific set of indicators or cues he need to use to test that the hypothesised cause is in fact the source of the problem. Information is then collected during the farm visit and from the accounts analysis to confirm or refute these hypotheses in order of their ranking in terms of likelihood.

The consultant also has to assess **why** the client is performing poorly in a particular domain at a **high level**. He has to assess if this is a problem due to: 1) a **knowledge problem**, i.e. the client lacks the knowledge and skills to perform well in the domain, 2) an **attitude** or a **motivation problem**, i.e., the client has the knowledge and skills to perform well, but he is not interested in performing well in that domain, or 3) a **social norm** e.g. the client is driven by the belief that good farmers achieve "high per cow production". The client uses a combination of methods to diagnose between these causes. He also uses different approaches to bring about change when the cause of the problem is: 1) a knowledge gap, or 2) an attitude problem or 3) a social norm.

Once a problem is diagnosed, a key aspect of the consultant's problem solving process is that he tailors his solutions to the client's requirements or context. This is central to his way of operating. He believes that if he fails to do this, then he is unlikely to secure repeat business from the client. To tailor a solution

to a specific client, the consultant has to be able to generate a wide range of alternative solutions. This then provides him with a greater likelihood that one of these solutions will best match the client's situation or context. The consultant has techniques that allow him to increase the size of the solution space and also quickly identify a range of possible solutions to a problem. He has a classification schema for problem types and each problem type has a set of alternative solutions that he can draw on to then identify the solution that best meets the client's requirements.

During a visit, the consultant collects information about **constraints** (e.g. high debt levels, desire for high per cow production) that the client's situation will impose on the solutions he generates. He also identified resource opportunities that may be useful for different possible solutions (e.g. low debt levels, sand dunes). The consultant's classification schema also includes a set of attributes for each alternative solution in terms of resource requirements and so-on. He then matches the attributes of the alternative solutions with the constraints (and resource opportunities) to reduce his large set of alternative solutions down to a solution or solutions that best meets the needs of the client. The consultant rarely makes the final decision for his clients, just offering them advice which can be accepted or rejected.

The consultant sees himself as, to some extent, a knowledge broker who is constantly searching for good ideas to apply on-farm. At one end of the spectrum he provides most of the knowledge to his clients. At the other end, he learns a great deal from what he refers to as "***smart, thinking farmers***" who are innovative or doing something different. In the middle of this spectrum, there are farmers he works with to co-construct knowledge where each draws on the other's knowledge and experience to develop useful solutions. As such, the consultant can take the role of: 1) a sole provider of knowledge, 2) a co-constructor of knowledge, and 3) a recipient of knowledge. There are four main sources of new ideas for the consultant – scientists and academics, other rural professionals in the industry, and farmers (clients and non-clients).

The focus of the consultant's work is to bring about practice change so that the client can better meet their goals. In the context of this study, this relates to improving the profitability of their farm business. Key processes that the consultant used to foster change included: 1) ensuring problem and solution ownership, 2) managing resistance to change, 3) building client self-efficacy, and 4) tailoring solutions to the client.

The other important question for this study is how can this knowledge be best used to train novice consultants? The study has made much of the expert consultant's tacit knowledge explicit and this can form the basis for training. Seminars and workshops can be run. Processes and templates that can assist novices with their work can be developed. A workshop could take the novices

through the processes used by the expert consultant. The novices could test these approaches in the field and then reflect on them in a group situation designed to foster learning. These workshops could cover the following topics: information gathering and triangulation, problem identification and sense-making, problem diagnosis, solution tailoring, change management, the role of networks, the co-construction of knowledge; and identifying, evaluating and introducing new knowledge to clients. Templates could be developed such as the diagnostic tree described in this study to help novice consultants with the development of their own diagnostic processes. Similarly, the senior consultants in local consultancy firms could provide benchmarking standards for farms by soil type, location (climate) and system type for their region that would help a novice consultant more quickly identify potential problems on-farm. They could also document the diagnostics they use locally and use these to train new consultant. In the same vein, they could develop a typology of solutions for different problems along with their attributes and show how these can be tailored to specific problem contexts. These local resources could be built up over time and form part of a firm's important IP. Once a novice has built experience, one of his roles could be to critiques and refine these templates in conjunction with senior staff. Finally, novice consultants need to be made aware of the need for lifelong learning and the role of reflective practice.

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