Australasian Agribusiness Perspectives
2019, Volume 22, Paper 13
ISSN: 2209-6612

Farm Economic Research and the Case Study Approach

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Abstract

The 'representative firm' of the theory of the firm has a long and respected history in economic thought. Yet, farm economists are required to put in undue, even unseemly, effort defending using representative case study farms to researchers in non-economic disciplines whose focus is on the empirics of generalising from representative samples to populations. Research that uses the 'whole farm approach' into typical case study farms - 'representative firms' - adds to other methods of inquiry by investigating deeply how and why the farm firm works, considering the people, technology, management, dynamics, risk, uncertainty and influences beyond the farm to determine 'what is', to identify causes and effects, and to imagine 'what could be'. The focus in using a farm as the unit of analysis in farm economic analysis is to identify and solve problems that stand in the way of farmers achieving their goals. The results from analyses of representative whole farms test, and add insight to, economic theory about how farms work and not to how populations of farms work. Applied analysis for management of farms requires adequate modelling of relevant detail and complexity, and our experience suggests that the diversity of detail and complexity across farms in Australia commonly goes unrecognised in aggregative analysis, vitiating the reliability of aggregate representations of states of affairs. Importantly, case analyses can indicate the inappropriateness of specific aggregate analysis *a priori*. As a component of farm case analysis, the whole farm approach exposes fallacious methods of aggregated analysis: the widespread 'get the facts' and partial 'analyses' of much of what passes for 'farm systems analysis'. The aim of this paper is to give those new to farm economic research arguments to justify using the case study approach, to share the authors' insights of using the case study approach in farm economic research and to highlight errors in agricultural science/agricultural systems research that result from ignoring economic principles.

***Key words*:** Farm economics, case study, whole farm approach

Introduction

Research in farm economics is not research in agricultural economics, nor in agricultural science, nor in agricultural systems as it is practiced. Rather, research in farm economics has elements of, and requires input from, each of these types of research, and more. Agricultural economics research has a focus on characteristics of multiples of farms, using key aggregate levels of information about the performance of farms to draw meaning at industry, or economy-wide level, e.g. trends in farm productivity. Agricultural science research involves investigating deeply a part or parts of a system – how the bit works, and how bits work together. The main focus of agricultural systems research is on

the combined scientific and technical aspects of the farm system, but it commonly neglects or caricatures the economic and human elements. Farm economics is about the whole of the farm in its natural, economic and social environment, involving all the parts and players and their interactions that make up the innards of the firm, and all outputs and outcomes: it is about all the important bits that together can solve problems of the whole. The purpose and research method of farm economics are different to those of agricultural economics, agricultural science and agricultural systems.

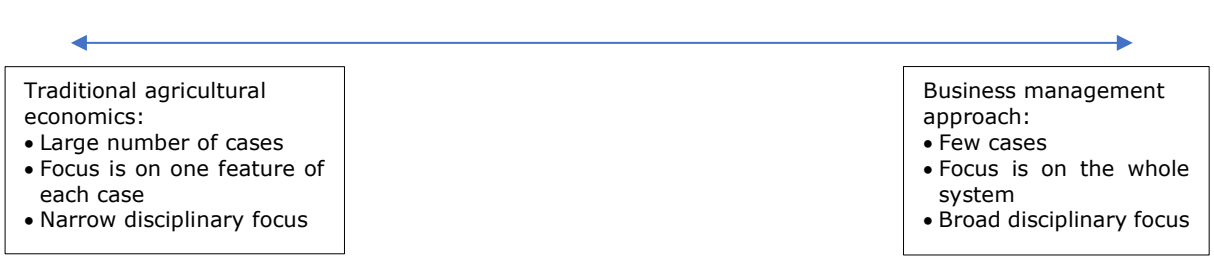
The key task of farm management is choosing between alternative opportunities and actions that identify means to ends – with the ends being goals such as enjoying farming and creating choices, and means involving choices for building wealth, making profit, generating sufficient cash and so on. Farm economics is about framing well and analysing rigorously the choices of actions for farmers. Economic analysis of the operation of farms, whether of research findings or policy changes, is about weighing up alternative ways of running changed farm systems under risky and uncertain circumstances. The case study approach suits research into alternative actions for managers of farm businesses. Each farm business and farmer are unique. The people owning and running farms are unique (with their own set of hopes and goals, skills, views of risk, stage of life, history and family situation), the financial situation is different for each farm, and the history of each farm is unique. The case study method encompasses the many and different variables in a farm system.

In the remainder of this paper, the role of the approach of using representative whole farm case studies to carry out farm economic research is canvassed along with some lessons for those new to farm economic research. The contention in this paper is that case study methods are appropriate methods for research in farm economics. This is not a new proposition as others from Elliott (1928) to Feuz and Skold (1992) and Crosthwaite et al. (1997) support using the case study method in applied farm research. However, researchers outside of applied farm economic research still question the use of this method. Thus, the aim of this paper is to shed light on why this method is appropriate for farm economic research and why it is appropriate for research on the impact of a policy on a change on farm.

The Case Study as a Research Method

One of the first steps in research is deciding on appropriate research method(s) to use. A continuum of research approaches exists in agricultural and farm economics, ranging from a narrow discipline focus involving sizeable samples of relevant populations to a multi-disciplinary focus on a small number of 'whole cases' from a population of whole cases (Figure 1).

Figure 1. Continuum of research methods



Source: adapted from Crosthwaite et al. (1997)

Choice of research method is determined by two criteria: 'What question are we trying to answer?' and 'What is the most appropriate technique to use to try to answer that question?'. In Table 1, the foci of different research methods are presented. Each method has its own approach to collecting and

analysing empirical evidence. Each method has advantages and disadvantages and each method has its own logic and procedures.

Table 1. Relevant situations for different research methods

Method	Form of research question (seeking to explain or predict)	Requires control over events?	Focuses on contemporary events?	Can allow many variables in relation to data points
Experiment	How, why?	Yes	Yes	No
Survey	Who, what, where, how many, how much?	No	Yes	No
Archival analysis/ economic modelling	Who, what, where, how many, how much?	No	Yes/no	No
History	How, why?	No	No	Yes
Case Study	How, why?	No	Yes	Yes

Source: adapted from Yin et al. (1983) and Yin (2018)

The case study method is the appropriate research method (Yin, 2018) when:

- The research question is about 'how' or 'why',
- The research does not, or cannot, manipulate (or control) events, and
- The focus of the research is on contemporary (that is not historic) events or issues.

Case study methods have an established literature and rationale (Yin, 2018). Yin (2018) argues that case study approaches are needed to understand complex social phenomena, because case studies allow researchers '… to focus in-depth on a "case" and to retain a holistic and real-world perspective – such as in studying … organisation and managerial processes' (p.5). In this regard, Schramm (1971) stated: 'the essence of a case study … is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result' (p.6). Schramm (1971) went on to say: 'and it will be useful to the extent that a reader can relate his (*sic*) own decision problems to those described in the case' (p.6).

Yin (2018) defines case study research as having two parts. The first describes the scope of a case study when doing case study research (which encapsulates the thinking above). The second part of the definition explains the features of case study research:

> (i) A case study is an empirical inquiry that:
> - Investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between the phenomenon and context may not be clearly evident.
>
> (ii) A case study:
> - Copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result,
> - Benefits from the prior development of theoretical propositions to guide design, data collection, and analysis, and as another result,
> - Relies on multiple sources of evidence, with data needing to converge in a triangulating fashion.
>
> (Yin, 2018, p.18)

The second part of this definition highlights important aspects of the design and practice of case study research. One of the strengths of the case study method is that it allows a researcher to draw on a broad range of disciplinary knowledge.

The limit - and strength - of the case study approach is that only a small number of cases can be analysed. There are trade-offs between the number of cases that can be examined, and the extent of disciplinary depth and breadth that can be brought to bear on each case (Crosthwaite et al*.,* 1997). Schramm (1971) articulates the benefits of this trade-off:

> The wide angle lens of the case study extends not only over time, but over space. It can deal with the project as a whole, rather than a part of the activity abstracted from the whole. What it loses in detail, it gains in breadth. Thus, it can deal with more than one or two interactive elements in a decision. It can reproduce the conditions with a fullness that will help a reader to decide whether he (*sic*) can relate that decision and its result to his own problems.
>
> (Schramm, 1971, p.10)

Like all good research, good case study research is time-consuming, labour intensive and difficult to do well.

Farm Economic Research and Case Study Analysis

In farm economic research, the researcher is seeking to answer how and why and what if type questions. Farm economic research is essentially farm benefit cost analysis of changes to the way the farm operates and of the implications for the farm of changes in the environment – economic and natural – in which it operates. Typical questions that farm economists seek to answer include:

- how would this change in policy affect a farm business?
- why would/would not this farm business adopt this change?
- how could this change be successfully integrated into a farm business?
- how much is profit and risk expected to change as a result of this change?
- how could this business increase wealth?
- how does this change in the external environment affect this farm business and how can it adapt?
- why is this business set up in this way and how has it changed over time?
- what if various different sets of circumstances occur and what might they mean for the changed farm business?

Farm economic case study research involves learning a lot about small numbers of the population. Farm management economists are working at the level of the individual farm, not populations that lend themselves to statistical analyses (Nuthall, 2011). The reason for this is that each farm (and farmer) is unique with a unique past, present, and set of plausible futures. Malcolm et al*.* (2012) pointed out differences and common elements of farms:

> This process of whole farm analysis recognizes that each farm family is unique in terms of the resources they control, their history, stage of life, psychological make-up, attitude to risk, and goals. However, elements of the biophysical systems at work on farms, and important influences external to farms, are common. The problems, relationships and adjustment possibilities faced by managers of similar farms are not unique. However, the goals of farm managers, their preparedness and capabilities to learn about and implement new knowledge or technologies, and their willingness to bear risk, all differ.
>
> (Malcolm et al., 2012, p.41).

In farm economic research the farm is the unit of analysis. The working of a farm system is the result of the combination of all the bits in it, while farm performance is the result of the combination of all things. A unique feature of case study methods is that they can help 'uncover' information about the motivations and strategies behind decision making within a business (Deakins, 1996; Sterns et al.,

1998; and Penrose, 1995). There is a saying: 'you cannot manage what you do not measure'. This is true, in part. More accurately, 'you cannot manage what you do not understand'. Johnson (1999, p.3) believed that you could look for the 'underlying assumptions that lay beneath the layers of abstraction that conventional measurements had generated'. Johnson went on to paraphrase W. Edwards Deming: 'Perhaps W. Edwards Deming was resonating with this point when he said that 97 per cent of what matters in an organisation can't be measured' (Johnson, 1999, p.4).

Criticisms of the Case Study Approach

Farm economists seem to be always defending the use of case studies to those researchers whose focus is on the empirics of generalising to populations. Common criticisms of the case study approach are that the results can be biased; the research is not rigorous; and that the results cannot be generalised to populations. Each of these criticisms is dealt with below.

The first concern (criticism) is that case study approaches are open to researcher bias. As in any research, such failings are not a failing of the method; they are a failing of the researcher for not following systematic procedures or for allowing equivocal evidence to influence the direction of the findings and conclusions. There is no avoiding the need of researchers to be transparent and explicit about limiting (or even eliminating) biases. As Yin (2018, p.19) explains, bias can be a problem in other research methods '… such as in avoiding the experimenter effect …, in designing unbiased survey questions, or in searching for evidence when doing historical research.' The challenge of avoiding bias is not different; being aware of bias risks and ensuring a systematic and rigorous approaches will help to eliminate or, at least, minimise the bias. Some strategies proposed by Yin (1994) to ensure rigorous research are to:

- Create a case study database. This is where the data collected, and the reports from them are two separate pieces of writing. This means that the database can then be the subject of separate, secondary analysis, independent of any reports by the researcher. This increases the reliability of the case study, which is one of the tests Yin (1994) believes is needed for case study research.
- Maintain a chain of evidence. Yin (1994, p.98) states: 'The principle is to allow an external observer – the reader of the case study, for example – to follow the derivation of any evidence from initial research questions to ultimate case study conclusions.'

Another contributor to rigorous and reliable results from case study research is having a rigorous research protocol and multiple sources of evidence, i.e. come at the question from a range of viewpoints/angles, called triangulation.

Another concern regarding case study research is that it is often viewed as not being sufficiently rigorous. A common point of contention is the fallacious thinking Dillon and Officer (1971) described as 'the cult of the asterix'[1]. This refers to the quite reasonable requirement for establishing scientific truth being that there is only a 5 per cent or so chance that the result of an experiment could have been achieved by chance. Managers, though, employ different odds: they are willing to bet on actions in their farm system that are less than 95 per cent certain to achieve the result they desire. Depending on their attitude to risk, a farm manager may be prepared to back a change to the farm system that has 60 per cent probability of success, i.e. odds of 6/4 on, more chance of succeeding than failing but considerably less than 19 out of 20 chances of succeeding.

The third criticism is that, unlike the standard agricultural economics empiricism, no general principles can be derived from individual case studies. It is common to be asked, when doing case study

[1] The indicator used to point to 'significant' (eg, in the following example, 95 per cent likely) results.

research, how the results can be generalised. That is, how can a limited number of observations be used as a basis for generalisation? Generalising to populations (statistical generalisations) is only one type of generalisation (Yin, 1994; Gummesson, 2000). Gummesson (2000) pointed out that generalisation has two dimensions. One dimension refers to the use of quantitative studies based on many observations to determine how much, how often and how many (statistical generalisation). The other dimension of generalization involves deep investigations to identify underlying phenomena. Yin (2018, p.21) refers to this as analytical generalisation: 'Rather than thinking about your case(s) as a sample, you should think of your case study as the opportunity to shed empirical light on some theoretical concepts or principles'. A case study does not attempt to represent a sample, rather the findings are used to challenge, expand and generalise to theory. When doing case study research the goal is to expand and generalise theories; it is not to extrapolate probabilities about the occurrence of phenomena. This difference is illustrated by Gummesson (2002) who quotes Normann (1970):

> If you have a good descriptive or analytic language by means of which you can really grasp the interaction between various parts of the system and the important characteristics of the system, the possibilities to generalise also from very few cases, or even one single case, may be reasonably good. Such a generalisation may be of a particular character; it might be possible to generalise a statement of the type "a system of type A and a system of type B together comprise a mechanism which tends to function in a particular way." On the other hand, one cannot make any generalisations about how common these types of systems and interaction patterns are. But the possibilities to generalise from one single case are founded in the comprehensiveness of the measurements which makes it possible to reach a fundamental understanding of the structure, process and driving forces rather than a superficial establishment of correlation or cause-effect relationships.
>
> (Normann, 1970, p.60)

Platt (in Blaikie, 2000, p. 224) stated that 'case studies can be used to generalise' providing that case studies are specifically and critically designed, rather than being chosen by accident or for convenience. Further, in his examination of case study methodology, blai (1998) stated that case study analyses help 'build' theory by investigating the 'how do?' rather than 'testing' theory by investigating the 'how should?' as many scientific and statistical research methods do. Finally, Malcolm et al. (2012, p.45) stated 'The results of a real case study analysis are either consistent with theory, and add support to the explanations of current theory, or they are not consistent with theory and challenge accepted wisdoms'.

Lessons for Farm Economic Research Tyros

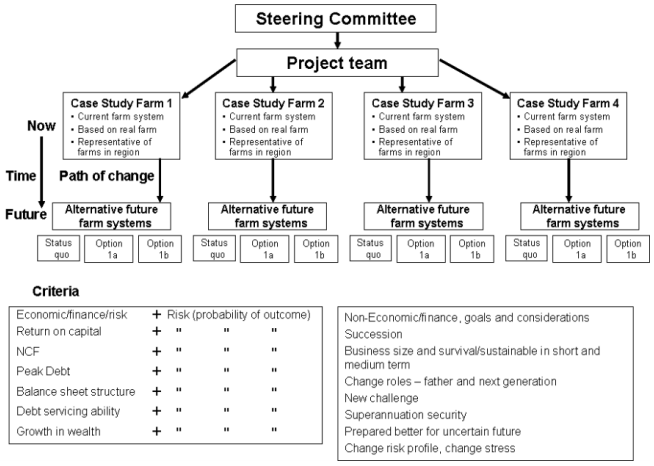
In the following, a brief discussion of the application of the case study approach is presented, along with a discussion of the challenges of doing farm economic research.

An example of the application of the use of the case study approach in farm economic research, that all authors have been involved in, was the Dairy Directions project (Malcolm et al., 2012). The key to farm economic analysis is identifying the question. The same applies to farm economic research. The question at the core of the Dairy Directions research project was 'if I make this change, how is risk and return expected to change and why? (i.e. am I better off/does the change help achieve my goals – considering the changes in risk profile of the business?)'. Malcolm et al. (2012) provide a graphical representation (Figure 2) of how the case study approach was applied to this project.

This approach involved:

- Obtaining input from a group of industry experts to define the research questions, selecting farms that are representative of the population under study, testing assumptions used in the

Figure 2. Whole farm analysis approach used in the Dairy Directions project



Source: Malcolm et al. (2012)

analysis and reviewing the results from the analysis. The use of such a group ensures that particular views do not unduly influence the analysis of the case study farms and therefore the conclusions drawn; a limitation of case studies as identified by Yin (1994).

- Choosing case study farms that are well-managed businesses with good information about the inputs and outputs of the farm system.
- Interviewing the farmer, asking open-ended questions, to develop an in-depth understanding of the production system.
- Modelling and analysing the alternative futures available for the selected farms and judging these against economic and financial aims as well as non-pecuniary goals.

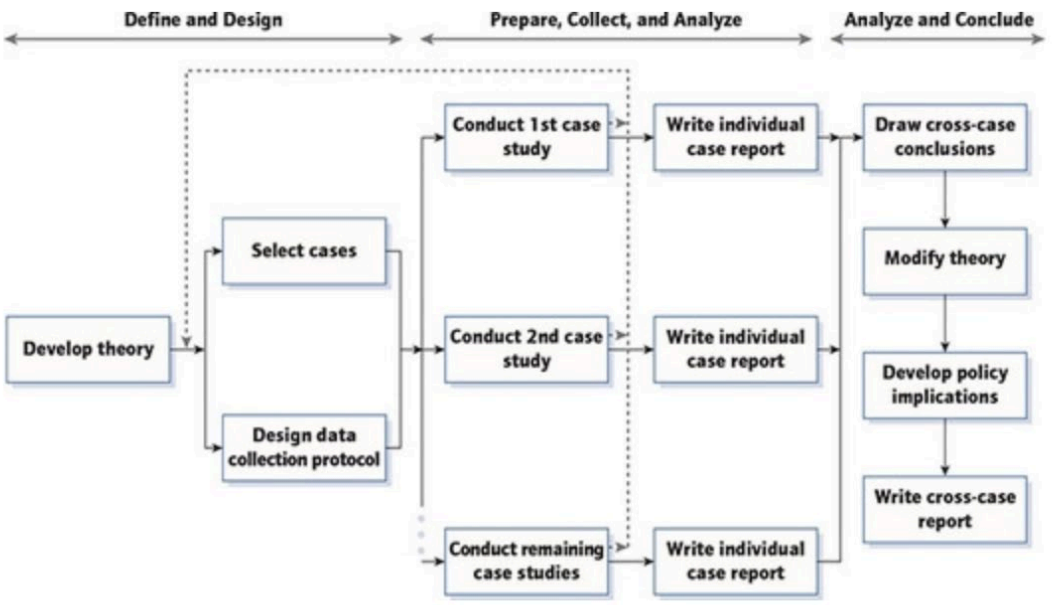
Carefully selecting the types of farms to be included that will be most helpful in answering the questions of the research is the foundation of successful case study research aimed at assessing the worth – return and risk – of innovations in farming coming out of scientific research or the effects on farms of changes in policy settings. In the Dairy Directions project, the steering committee spent six months and numerous meetings 'getting it right'. A robust and rigorously debated approach which bordered on torturous was used from the outset to ensure that the results from this research were defendable. First, it was decided that a multiple case study approach (instead of a single case study) was appropriate as it is regarded as more robust (Herriott and Firestone, 1983). Second, as mentioned above, deciding on the appropriate farm businesses to be a case study was important. A key part of selecting the cases for this research was to use a replication logic rather than a sampling logic. A sampling logic is commonly used in surveys when a researcher wishes to determine the prevalence or frequency of a particular phenomenon. The replication logic is analogous to the design of experiments (Yin, 2018, p.55) 'Each case must be carefully selected so that the individual case studies either (a) predict similar results (a literal replication) or (b) predict contrasting results but for anticipatable reasons (a theoretical replication)'.

For the Dairy Directions project, the aim was to identify cases that were representative of the several types of dairy farming operations that were currently, and would be in the future, 'typical' of the dairy farm population of the region in which the project was based. Through doing this it was expected that each case would uncover important information about each representative system, problems and possibilities, and each case would produce contrasting results for anticipatable reasons. The selection of each case was a lengthy process. The agreement on the types of cases to select was reached after a complex array of possible criterion were bandied about robustly and rigorously through lengthy

meetings between researchers, consultants and farmers. The selection criteria of each case included herd size, gross income, number of staff employed, calving system, predominant type of pasture, mix of feed sources, level of equity and debt, property rights and quantities of irrigation water, stage of development, potential for improvement, and future prospects. A major advantage of using the steering committee with the case study approach was that identifying the actual farmer businesses that would be best as case studies was quick and easy once the criteria for selecting farms was settled. The members on the committee knew well the farmers and the farms in the region best fitting each category of farm that was to be studied.

The number of cases to select is another important consideration and it is decided through judgement, not a formula. For the Dairy Directions project, four case studies were chosen to explore the research questions because the contrasting farm systems fell into four distinct categories of interest. In Figure 3, the approach for conducting multiple case studies is presented. As explained by Yin (2018) each case study is the subject of a whole case study and an individual case report is produced, then from these individual case reports, cross-case conclusions relating the findings back to the theory is undertaken.

Figure 3. Multiple-case study procedure



Source: Yin (2018)

The key to this research was grounding the analysis in real farms and defining rigorously the 'types' of farms that are to be analysed as the representative farms. The unique human component of the system (e.g. individual goals, skills, risk aversion, stage of life) was 'abstracted' out to allow greater capacity to generalise aspects of the case study and examine changes that the farmer may not actually implement. This removed the variability inherent in different farm operators' ability to implement and manage a change to the farming system. The result of this research was that some important lessons were added to theory.

In the Dairy Directions project, the findings from the case study farm analysis were generalised to theory through adding further evidence to support theory and some analyses and results added to the theory. The onset of major drought during the course of the Dairy Directions project saw the focus of

the research directed to investigating the implications for the farms and the region of drought and water policies.

For those seeking a 'how to' on whole farm case study analysis, Malcolm et al. (2012) describe and explain this research approach in more detail, including applied examples. Nuthall (2011) also provides guidance and examples on the choosing and using case study farms for investigating questions about farming. Yin (2018) is an excellent resource for those seeking guidance on how to design case study research, how to select cases (single unit or multiple unit), and how to analyse case study analyses.

Challenges to be Aware of for Those New to Farm Economic Research

One challenge with analysing possible futures for a case study farm business is that the future often involves scaling-up the farm business. Scaling-up a budget/model of a current farm business to a larger farm business holds particular traps for tyros. The world does not come to us in straight lines – 'the sky is the limit' linear relationships do not apply. The Law of Variable Proportions (diminishing returns) tells that as new inputs are introduced to a farm system this puts it on a higher whole farm production function. The relative proportions of inputs in the farm system change as a result of adding more of some inputs. The responses to additional output are not linear but subject to diminishing marginal returns. Extra costs of extra complexity and extra exposure to risk that comes with intensification of farm systems are incurred and require careful consideration. A more complex farm system requires better and more highly paid management. Timeliness of operations remains imperative, and increasingly so as a farm business expands. Ensuring timelines of operations in larger, more complex systems has extra costs – either costs to achieve extra timeliness or costs of not achieving the required timeliness. Growth and intensification increase costs, average returns and variability of average returns, called risk. These changes with growth and their implications need to be incorporated in scaled-up farm businesses.

Another challenge is incorporating increased volatility in analyses. For example, intensification increases exposure to risk, such as increased reliance on purchased inputs including feedstuffs, fertilizer, fuel or chemicals, or increased gearing. The firm is also exposed to increased volatility of costs of inputs, including capital. The effect of these forms of additional volatility of costs, which ends up as increased volatility of profit and net cash flows, need to be incorporated in analyses. One way of including some of the additional cost associated with intensification and increased volatility of costs and income is to include the cost that would be required to offset this volatility. Take an intensified grazing animal business. Feed shortages will be more frequent and severe than for the status quo, less intensified, system. Regardless of what tactics and strategies the farmer will take to manage the increased volatility of feed supply, a proxy for the additional costs can be to include a cost of purchased feed to fill feed deficits and maintain a more stable level of output, profit and cash flow. Though this strategy may not be followed by the farmer – other actions such as destocking and restocking may be more attractive – 'pretending' to buy the extra feed required is a simple proxy for the risk-related costs of any strategy that may be followed. The point is that it is better to allow, in some way, for extra cost of extra risk associated with farm businesses growing and intensifying than to leave out of the analysis the, often hidden but nevertheless significant, extra costs associated with added risk or complexity.

One final trap for young players in farm budgeting is double counting of risk. This happens when risk effects on risky variables are built into the numbers in a budget/model and then risk is allowed for again in a risk-adjusted discount rate. Including risk in the discount rate implies risk is an exponentially increasing function of time. The more distant future is more uncertain, but is this exponentially increasing? A general rule is to include risk in the 'numbers' and in the scenarios, but not in the discount rate. Another form of double counting risk is to include risk in the discount rate and also use

probability distributions of the risky variables as is done using a risk program, such as @Risk to generate distributions of outcomes.

To finish this discussion and to help those new to the game of farm economic research, we reiterate that the core discipline of farm economic research is economics. Too often people giving advice to farmers analyse farm information in ways that means the advice is simply wrong. That is, they do not use economics in the analysis and violate basic principles of economics. Yet, the same information about the farm business can be used to do analyses that is firmly embedded in the farm economic theoretical tradition and will produce sound advice for farmers. It is as easy to get it right as wrong: the same data interpreted in the farm economics tradition or without the farm economics, is the difference between getting it right or wrong. For example, disciplinary specialists, especially some scientists in agricultural science disciplines who are not 'old-style agriculturalists', often favour partial technical-focussed approaches to analysing why a farm system is being run, and is performing, the way it is. This amounts to heading down the widdershins of individual 'drivers of profit' on farms, searched for in vain by those bereft of farm management economics expertise, convinced they can identify the contribution of a single input to output, not doubting they can provide farmers with a 'simple' recipe to apply to increase farm profit. Such efforts - often wrong but never in doubt - unfailingly perpetrate an impressive number of fallacies.

For those new to farm economic research, note the following list and understand that if an analysis is done without economics the results and advice are wrong. It is wrong to:

- Imply farms are operating on the same production functions; if farm/farmer A can perform at this level then so too can farm/farmer B simply by replicating on farm B what is done on farm A. (This is the implied production function fallacy. This is a fallacy as each farm has its own unique set of production functions for individual inputs and unique combinations of inputs and own unique whole farm production function representing the combination of all things).
- Use average input: output responses instead of marginal responses, when it is marginal responses that matter for change and it is not possible to infer marginal productivities from average productivities (unless the response is linear, in which case more is better).
- Take a narrow view of changes to a farm system. Marginal cost and benefits encompass the changes in costs and benefits resulting from all changes to a system to achieve an outcome; all changes are counted and only changes are counted.
- Maximises technical ratios – output/input – as an objective and performance criteria.
- Relate a physical or financial output measure to a single physical input, such as regressing total milk/meat/grain or farm profit against stocking rate or irrigation water, and then compare these ratios for different farms.
- Relate a whole farm measure such as profit to a single input such as hectare: profit is the result of all inputs being combined. Comparing profit per hectare is not useful as it has the highly unlikely assumption that seldom stands scrutiny in agricultural production systems: each causal factor is assumed to operate independently of other factors. It is even less useful if used to compare between different farm businesses: whether different-sized farms, different total profit, different total capital, comparison gives no indication of efficiency which is measured as return on total capital.
- Use net profit as an indicator of farm performance; operating profit as a percentage return on all capital managed is the indicator of farm performance.
- Combine, add, subtract, divide, multiply dollar figures for different years as if a dollar in one year has the same value (purchasing power) as a dollar in a different year. They do not, because of (i) inflation affecting nominal values of currency at different times and (ii) benefits and costs have different real values (real purchasing power) in the future because of the time value of money, i.e. a dollar benefit in one year has an equivalent value of $0.90c today if the dollar today could be invested at 10 per cent for the year and thus grow to $1.

- Treat risk as all bad, to be avoided or reduced. Reducing risk reduces profit; risk is something to be managed, to a level the farm manager is comfortable with.
- Analyse changes to a farm system without considering implications for risk.
- Analyse changes to a farm system without looking at economic, finance and wealth angles, the three criteria to judge business performance.
- Extrapolate last year's prices and yields as though last year will happen again next year.
- Fail to compare a farm system change to the appropriate *alternative future.* Understanding and analysing the 'without' change situation is just as important as the 'with' change. This is needed to ensure all benefits, costs and risks associated with the change are accounted for correctly.
- Not recognize Einstein's dictum that not everything that counts can be counted and not everything that can be counted counts.

Conclusion

The case study approach with the whole farm as the unit of analysis is the appropriate method to use for farm economic research. With economics as the core discipline of farm management analysis, this type of research brings rigorous thinking about analysing the whole problem, instead of part of the problem. The key understanding, recognition, commitment, acceptance needed is that solutions to parts are not solutions to wholes. When done in accordance with the tenets of appropriate theory, the information generated by farm economic research informs the decisions of managers of farm resources, and scientists and policy makers, in ways that are likely to contribute more effectively to them achieving some of their goals, than the far too common alternative approach of farm analysis and advice that does not have economics at its core - or anywhere else for that matter.

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