Farm Management analysis: a core discipline, simple sums, sophisticated thinking

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Abstract. In this paper it is argued that solving problems in farm management involves applying an appropriate balance of disciplinary knowledge. More specifically, farm management decision-making is about making choices, and the discipline of choice is economics. Thus economics is the core discipline of farm management analysis and decision-making. Modelling farm systems using the whole farm approach, with emphasis on the risky elements, can be very useful. Also enlightening is using real farm case studies to test research output. The conclusion is that bringing to bear on farm management questions a few disciplines, a few perspectives and a few figurings to explore a few futures is a useful way to go.

Keywords: farm management, farm management economics, whole farm, farm systems modelling, farm management decision analysis

Prologue
...If... (a) pending change involves in addition an element of uncertainty, which is usually the case, the firm also assumes the additional function of uncertainty bearing... In the real world the production processes of the firm are being altered continuously. Routine procedure will not suffice. Change born out of dynamic circumstances, is ever present. Adjustments are called for. It is the entrepreneur who decides what must be done. The decisions of the entrepreneur are carried out within the framework of the firm. Two interrelated decisions must be made (a) the amount of adjustment that is necessary, (b) the method for making the adjustment; that is, what to do and how to do it. It is these adjustments of the firm that gives us the key to what we need to look for in our farm management research. To understand the basic nature of these adjustments is to know what is fundamental to the entrepreneurial problem in farming. Since the existence of the firm of necessity arises out of and is dependent upon dynamic conditions, it would appear that both the size of the firm and the success of the firm must be determined within a framework that allows for 'time' and 'change'.


Introduction
The essence of farm management processes is dealing with change and dynamics, strategically and tactically. Jack Makeham always argued that the technology, the people and the potential, are large parts of any farm business analysis, and that deciding on and implementing change is what farm management is mostly about. In 1968 in 'Farm Management Economics' Makeham (1968) wrote that there were two major challenges facing farmers. These were:

- how to incorporate new technology profitably into the existing business organization;
- how to be sufficiently flexible, mentally and financially, to adjust resource management to meet both changed economic circumstances and widely varying climatic conditions.

In any short time, as the future rapidly becomes the present, actual production parameters change from the expected levels on which plans were made; thus
tactical adjustments are continuously being made. Many such decisions do not involve much analysis. In the medium term, and in the wider economic environment, major change occurs. Prices, costs, technical possibilities, fashions and incomes all change. Deregulation of output markets transfers power to consumers. Farmers face greater potential volatility of prices and costs than before, and have to take greater interest in marketing decisions than was previously the case. Greater financial management skills and use of financial market instruments for managing risks are required. Further, changed public awareness of and concerns with resource quality issues within and beyond the farm gate mean that more considered use of inputs and farming methods is being demanded.

The implications of these changes for farm management in the next decade will be highly significant. Pressure on profits from rising real costs and falling real prices mean that farmers hoping to stay in business in the medium term face the imperatives of changing the scale and intensity of their business operations, as well as adjusting the composition and risk profile of their overall investment portfolio. The structure of the farming sector also changes: for instance, less farm businesses account for an ever increasing share of total gross value of agricultural product, and significant farm resources come under the control of a growing non-commercial farm sector.

There has been a wave of thoughtful contemplation about farm management in Australia since the turn of the century (Mullen 2002; Kingwell 2002; Ronan 2002; Brennan and McCown 2002, 2003; McGregor et al 2003; Martin and Woodford 2003; Charry and Parton 2002; Kemp and Girdwood 2002). These contributions incisively canvassed a wide range of perspectives and dimensions of farm management, all with the common thread – the multi-disciplinary, inter-disciplinary, trans-disciplinary nature of farm management as an activity and a process. These recent ‘think pieces’ about farm management also had one other important feature in common: none explicitly stated the central tenet of the whole farm approach to farm management, that economics is the core discipline. Far from this, some argued that the closeness of farm management to agricultural economics presented a significant source of problems for farm management.

Economics as the core discipline of Farm Management

Economics is the discipline of choice. Farm management is about farmers making choices among alternative uses of resources to achieve a mix of goals to varying degrees, in the face of many unknowns. Many types of information from many disciplines are required to make informed choices and information from non-economic disciplines alone are not sufficient for farm management decisions to be made.

Economics is the discipline concerned with measuring and valuing benefits and costs of particular uses of resources and the resultant outcomes and farm management decisions are determined by the expected benefits and costs of what to produce and market, by what method and at what time. These questions are answered by applying empirical information to basic principles of production and economics, viz. diminishing marginal returns, comparative advantage, size, fixed and variable costs, opportunity costs, inventory income, equi-marginal returns, cash and profit, gearing and growth, risk, valuation of benefits and costs, and time. In a logical framework such analyses inform consideration of decisions and conclusions about the potential contribution that alternative actions can make to achieving goals.

People working in farm management do so in different ways: as farmers on
farms, input suppliers and output transformers in markets, researchers in academia, consultants in farm business, government and commercial businesses, and in a range of advisory capacities. When practitioners in any of these fields are not applying the whole-farm approach to analysing choices about resource use on farms, which is synonymous with the economic approach to farm management, they are providing information that is not good enough to assist in making good decisions about resource uses. The economic way of thinking is central in this process in that it first sets the agenda, helps define the goals, resources and constraints, and then enables benefits and costs to be compared.

Farm management economic analysis does not have to be complicated. The logic is: ‘what has been and is the situation’, ‘what is likely to be the new situation if I do this, or that, or nothing different’ and ‘am I likely to be sufficiently better off, all things considered, for it to be worthwhile doing this instead of that or doing nothing different?’ Most good answers to a decision question of a farm business can be captured with a few key numbers in a few key budgets that are sound and rigorous - economic arithmetic if you like (for example, see Davidson 1965). More complex analysis than simple budgets is likely to be inefficient because the extra information adds little value in terms of behaviour-changing impacts of the analysis. (It can of course even be negative in its effects, or lack of them, on users of the outputs of the analysis).

**Modelling farm systems for decision making**

Farm models can only ever be partial representations of reality. Farm businesses are complex operations with many dimensions. Techniques that enable information about more of the important measurable and unmeasurable elements of the decision problem to be incorporated into the analysis are useful in practice. They will prevail over techniques that deal with parts of the decision problem in great depth but insufficiently encompass all the important parts of it.

Since the 1980s the power of computers has made possible more efficient modelling of detailed aspects of the operation of whole farms, particularly biological interactions and financial eventualities, for purposes of both systems simulation and dynamic optimization analyses. The crop farm simulation work in Western Australia in the 1980s that resulted in the MIDAS model and its subsequent relatives and applications is but one outstanding early example (Kingwell and Pannell 1987).

As a first step it is incumbent on those who carry out farm management analyses from any perspective to get it right in terms of scientific and economic theory. Thus, in terms of economics theory, farm modelling exercises - sophisticated or simple- need to account correctly for such factors as marginal changes to farm systems, expected inflation effects on cash flows, and required rates of returns and interest rates. They need to include a reasonable estimate of tax implications of changes, accounting for productivity change over time in a technical sense and for potential changes in real prices and real required rates of return, and the dynamics of stocks and flows of livestock. The critical distinction between economic and financial analysis needs to be made, as well as the distinction between capital and current expenditures. Meaningful ways of accounting for the magnitude of important parameters about which little may be known are also an important part of any analyses.

A simple form of analysing a farm business is to establish ‘what has been and what is’ the situation, then explore ‘what might be’ the situation with and without change. The comparison is between alternative futures, not the
future and the status quo. As well as return to capital and debt servicing ability, linking the expected operating profit and cash budgets indicates expected growth in equity. The ‘with change’ situation can be examined using either a steady state partial budget or expected whole-farm budgets for the situations with particular changes. The net benefits and financial viability from making a change are examined using discounted and financial cash flow budgets. For major decisions, risk and its possible consequences can be investigated by using scenario analyses, breakeven budgeting and sensitivity testing, for a small number of possibilities for the few key numbers in the budgets. Both partial and whole farm perspectives are used and in these budgets dollars and interest rates are consistently nominal or real and tax estimates are included.

There is an ever-present danger of repeating the mistakes of the past, where rapidly growing computer capabilities led to the thinking ‘it now can be done so we’d better do it’, i.e. mistaking the feasible with the sensible. Another approach, instead of a relatively narrow focus on a particular systems model, is to have an increased and keen focus on the problems we are trying to solve in farm management economic work that is a keener focus on identifying and understanding the nature of the problem and on what is needed to analyse and reach a conclusion or decision about it. The various farm management-modelling techniques on offer then are of interest merely as to whether or not they are appropriate to analysing the problem at hand.

There is a big difference between modelling for science versus modelling for management decision analysis. The tradition in Australia has been for interested scientists to model part of the agricultural system that interests them, identifying gaps in knowledge, and running simulation inquiries. Then, recognizing that farm systems are not conducted only for the fun of it has seemed like a good idea to put some dollar measures into the model somewhere and call the result a decision support system. The result is that a tool designed to do something well, such as model the operation of the biology of a system in considerable detail, is thought to also be what is needed to help farmers make decisions about changing their farm system. Unfortunately, despite the immense detail of the part of the system that is usually modelled, large parts of the whole farm system are either missing, or included, commonly, in an erroneous way (usually some simplistic cash flows or single activity gross margins analysis). The critical capital aspects of change are rarely included properly, if at all, let alone return on extra capital, effects on gearing and liquidity, as well as effects on the technical and economic operation of the rest of the activities of the farm business.

What farm management economists require from the agricultural systems modellers are the technical coefficients for potential changes to the operation of the production system. The tools for analysing changes to farming systems in the whole farm context are already available, and are very powerful, but they must be in competent hands to be useful.

The development of so-called decision support systems for farm management proceeded steadily since the late 1970s. Following much development of decision support systems, researchers eventually focussed on what might be needed to achieve the objective of having these tools actually used by decision makers (McCown 2001, 2002a, 2002b; McCown et al. 2002). When the focus changed to making decision support tools operational, much was learned. The main learning was: start with and continually involve decision makers in
the DSS development and implementation.

A problem-oriented farm management approach makes clear the nature of farm management analysis, where the key is correct identification and understanding of the problem, based on sound definition of the current situation, its constraints and potentials. Once this knowledge is established, (the usually few) possible solutions can be defined efficiently. The status quo is never an option. The nature of the problem determines the appropriate mix of disciplines, the appropriate perspective, the appropriate technique and the relevant futures to ponder.

In advocating a more problem-oriented approach and a less technique-oriented approach in farm management economics, there is one over-riding proviso. If conclusions about how something works or suggested solutions to problems are to be influential in contributing to change, the process by which the conclusions were reached, especially the key economic and technical detail and the logic, have to be transparent. In almost all decision analyses the key conclusions depend critically on the magnitude of a small number of key parameters. This should be clear to decision-makers weighing up the information resulting from the analysis.

Even with regard to the critically important technical and dynamic components of problems, care is needed to condense to the essence. What information on dynamic relationships is critical, and for which decisions do they, become central questions? In accounting for the dynamics of systems multitudes of possible permutations and combinations can quickly make the analysis intractable. Still, for any decision, the most critical dynamics can be tackled with a small number of key ‘comprehensive’ scenarios.

So far it has been suggested that a problem-orientation may well prove a useful approach to thinking about whole farm management methods. The major reason for advocating a problem-oriented approach to farm management analysis derives essentially from the view that the truth of any matter can never be convincingly discerned from one perspective, rather by considering the matter from a number of perspectives, using a number of methods, and pondering several alternative futures. This means however that questions of balance arise. The right balance of disciplinary emphases is needed in order to correctly identify and understand the problem; then the right balance of disciplinary knowledge is required to help solve the problem, and the right balance of perspectives is required to ensure there are no big angles being missed. Finally, balance is needed in assessing what has been, is, and could be, and the determining relationship between these.

**Risk and Farm Management decisions**

When considering risk and farm management decisions, the main point is that above average returns to capital are only possible if the capital is exposed to above average risk. Emphasis in farm management on risk and volatility as something to be minimized is misplaced. This emphasis has been at the expense of an emphasis on risk and volatility not only as something farmers manage to live with, but as a major source of opportunities to be exploited in order to prosper and grow. How best to manage businesses in order to exploit the consequences of risk/volatility on those who manage it less adeptly than their competitors remains one of the great neglected questions of the past 50 years of farm management in Australia. Also missing for many years in Australian farm management economics was a focus on financial management under climatic and market risk, gearing and growth in Australian farming, the type of
work typified by the content of the US text ‘Financial Management in Agriculture’ by Barry, Hopkin and Baker (1998).

In all business, major decisions are made in the face of many great unknowns and unknowables – as well as many important unmeasurables. Bernstein (1996) defines risk management as follows:

The essence of risk management lies in maximizing the areas where we have some control over the outcome while minimizing the areas where we have absolutely no control over the outcome and the linkage between effect and cause is hidden from us (p.197).

Bernstein (1996) argues that formal probability theory cannot be applied well in business decisions because of the paucity of necessary information, the relative ‘fewness’ of events and outcomes, and the reality that Arrow’s (1992) ‘Clouds of Vagueness’ will continue to characterize business decision environments. This all means that businesses have a chance to create their own futures (Arrow 1992 cited in Bernstein 1996).

Most significant decisions can be judged on the basis of a few simple sums in which the measurable bits of the situation are counted, and the results are then tempered by consideration of the unmeasurable aspects of the case. There are always some aspects which are not measurable, because response functions of particular circumstances are not known, the future is unknowable, or a sensible price cannot be put on everything. However, it is sensible to think about the range of possible outcomes of doing some things in the unknowable future, and about how likely these outcomes may be. When it is not known what will happen, it is useful to think about what would need to happen for the action in question to turn out to be a good investment, and how likely it is that the required levels of important parameters in the decision will actually happen. This approach is called the ‘breakeven method’, and it is useful when a situation being analysed has some key unknowns.

In practice farmers do many things to try establish a situation for themselves and their business which is risk-durable in the light of their many aims including short-term liquidity and medium-term profit and increase in wealth. The risky nature of farming in Australia should dictate that an offensive view of risk, volatility, consequences and management in the face of future change would be an apt construct in Australian farm management economics.

David Pannell and colleagues used these methods to help test the relative importance of incorporating the farmer decision-maker’s attitude to risk when analysing a decision, as compared with the relative importance of getting right other aspects of the decision, such as its technology and dynamics (summarized in Pannell et al. 2000). The conclusions reached were that including farmers’ risk preferences in a formal way was much less important to good decision analysis than making sure that technical and dynamic aspects of such decisions are well represented in the models used. Relatedly, Kingwell et al. (1993) found that making good tactical decisions in the occasional highly favourable seasons can do more for achieving farm family aims than worrying too much about including risk aversion of decision-makers in the decision analyses.

Real case studies

Evaluating scientific research output or policy options in farming contexts is an important area where the standard farm management budgeting methods can have an important role. Ultimately, such changes have to be analysed for the farm system of the potential adopter or affected farm business. However, research and policy is also subject to analysis beyond the farm gates usually

http://www.afbmnetwork.orange.usyd.edu.au/afbmjournal/
for typical representations of farming systems and businesses in question. Such analyses are most commonly carried out at a higher level of abstraction than is done for particular farm businesses and real farm families are not part of them. Representative farm models are usually the first run of such analyses. (Note: representative does not mean arithmetic average).

The use of artificial farm businesses constructed for analytical purposes can be a powerful, highly useful approach, as long as these artificial businesses are typical (in ways that are most important to the analysis) of the types of operations that exist in the distribution of businesses in the population of interest. However, the general attractiveness of looking at questions from a number of perspectives dictates that the analyses would be enhanced by the addition of some parallel, real, whole farm case studies.

While any model is only a partial representation of reality, insights and conclusions from the analyses of ‘unreal’ farms that do not actually exist become more convincing after being challenged and complemented by results from real farm case studies in which more of the real situation can be included. Thus the gap between abstraction of representative situations and the less abstract real farm case study situation could be reduced. Consequently a better judgement about the true consequences of research findings becomes able to be formed.

A further reason for advocating the use of real farm case studies to accompany representative farm analyses is that while it is possible to generalize to some degree about ‘what seems to be’ at the present on the basis of empirical evidence, it is impossible to generalize about any future situations because each farm business has a different past and will have a different future. The extra detail about the options and possibilities of real farm situations, and goals of the farmers, will play a role in determining their future situations.

The oft-thought ‘problem’ of being unable to generalize to populations from unique case studies is neither here nor there – if that is the question of interest then different methods apply. Case studies generalize to theory, not to populations in a statistical sense (Yin 1993, 1994). Of interest is the ‘fit’ of how a case firm actually works compared to how theory explains how firms seem to work. Again, approaching questions from several angles, one of which is case studies, would seem a safe bet.

Escewing the confusion between ultimately and only is also valuable: what may ultimately determine outcomes, say economic factors, is not what only determines outcomes. Much else is involved, in all businesses, and maybe especially in farming. Case studies enable the ‘much else’ to be dealt with more widely and deeply than in other analyses adopting a narrower focus on individual farm businesses and a broader focus on a number of farm businesses.

Finally a further reason for arguing for this synthesis of real and unreal farm business analyses is that case study theory has progressed in recent times (Yin 1993,1994; Stake 1998; Howard and MacMillan 1991; Eisenhardt 1989; Sterns et al. 1998; Crosthwaite et al. 1997). While a significant practical constraint on greater use of case studies is that, done properly, they are costly in terms of resources and require specialist skills, the returns in information are correspondingly of high value.

Thus the approach being advocated recognizes first that the abstraction of representative farm studies delivers many insights, some of which are unobtainable from real farm case studies. Secondly, actual farm case studies can deliver different insights, some of which are unobtainable from representative farm case studies. Thus
there is a case for a synthesis of the ‘practical’, real farm case study methods, and the ‘research’ approaches used to analyse representative or ‘unreal’ farms. Whatever farm management methods are being used, the aim is to add the extra insights of real farm case studies to the findings of more abstract representative farm models. Done well, this would help close the gap between research findings about abstract farm situations and possible responses to change and the individual real farm complexities that help influence actual adoption and rates of change.

Further, and importantly, the analytical format used to test out a research idea on a real farm provides a framework (e.g. a skeleton budget) that can be efficiently adopted and adapted to any real farm situation where the research results warrant analysing on that farm. In this way research analyses can be linked via real case studies to other farm situations where potential changes are evaluated and decisions made about those changes.

The hoped-for outcome of such an approach to closing gaps between research and reality would be that we will be less likely in the future, as compared to the record of the past, to be answering questions that no one is asking, or are ever likely to ask.

**Environmental concerns**

Whilst from a production perspective, the activities of most farmers do not make a large difference to total annual gross value of agricultural production, from the perspective of natural resource quality and environmental concerns, all farmers are managers of the natural resources of the country and so what all farmers do is of interest.

The economic imperative is that to be profitable over time farmers have to use the resources they control in a way that is sustainable, and to be sustainable they have to be profitable. Public concerns arise where what is deemed to be profitable and sustainable for private users of natural resources is not deemed to be the ‘profitable and sustainable’ that other members of society perceive and require. However, to answer questions about environmental effects the facts of each case have to be ascertained, generally on the basis of what is happening paddock-by-paddock, farm-by-farm. For example, is this farmer farming his/her farm in a way that increases nutrient composition of water flows in the catchment? Is this farmer farming his/her farm in a way that will result in the destruction of some flora and fauna of which there is not much left?. If the answer to the above questions is ‘yes’, some further questions follow: Is it phenomena beyond the farm that are of interest? Is permanent change occurring? Is the phenomenon avoidable with a change in farming practice i.e. is reducing or preventing the phenomenon compatible with continuing to use the resources for agricultural purposes? Then: How does the phenomenon happen and why? How does the farming system need to be changed to prevent or reduce it? What are the costs and benefits of change?

The next question that follows is: How might a farm management economist usefully analyse a question about public effects of the operation of a private farming system. One way is to first establish how the farm system operates and at what level of intensity and profitability, using whole farm balance sheet, profit budget and cash budget, for the near past and near future if these are unchanged. This is called ‘What is’ analysis. Having done this the focus turns to ‘what might be!’ This encompasses imagining the state of this farm business in the short to medium future, with and without a couple of changes that may be possible and analysing the net economic and other gains from making these possible changes. This is done using the partial budget. The potential changed whole farm situation is explored- the expected
balance sheet, profit and cash budgets will tell the story here.

The comparison of the futures - what might be without change to the farming system and what might be with changes are both different to the current situation, which is not a valid comparator. Comparing alternative futures gives a basis for judgement as to whether concerns about the state of natural resources on and beyond the farm are valid; whether the situation of a natural resource is likely to be improved or worsened according to important criteria; whether the on-farm changes will produce added public benefits or costs; and whether measures are required to encourage or discourage the types of changes the farmers are likely to have to make in order to remain profitable and sustainable. If such measures are found to be required it will also facilitate a decision as to the nature and extent of them.

The combination of case study theory integrated with farm management economic theory makes a powerful foundation for a useful analytical approach to questions of natural resource use and preservation on and off farms. The nature of environmental concerns means that in the case-by-case analyses required, the appropriate units of inquiry are likely to be both the whole farm business and paddock-by-paddock.

**Farm Management education**

The outstanding characteristic of the most successful managers of businesses is their mastery of information; thus the educational requirements of farm managers can be considered in the broad framework of helping to equip them to ‘master information’. More specifically, the main requirement of contemporary farm management education is for students and practitioners to learn to bring rigorous ways of processing information from a range of disciplines to bear in solving business problems of a multi-disciplinary and multi-dimensional nature, in order to manage businesses in a risky environment where much is unknown or unknowable.

Farm management education is the most demanding area within the general field of agricultural science, because of the breadth and depth of knowledge required. A sound training in production economics is an imperative as it is the theoretical framework within which problems can be solved. Close exposure to practical farming is also essential in order to appreciate the detail and the nature of farming as a technical/business/human activity and to see farm problems as they are seen by the farm family.

**Conclusions**

A glance through history suggests that some elements of managing a farm have altered little over time - farming remains a biological, human, economic and financial process subject, over time, to much volatility of outcomes and much influence from beyond the farm gate.

The gist of this paper is that people who are armed with a mix of farm-related disciplinary knowledge including the economic way of thinking, the intellectual wherewithal to look at questions about the management of farm businesses from a number of perspectives, the ability to do some farm management figuring, and the capacity to imagine a few different futures, can do much that is useful in informed farm decision analysis and decision-making; in evaluating agricultural research; and in judging agricultural and environmental policy measures.

Whereas academic imperatives of specialization in order to learn more and more about less and less seem to have dominated academic efforts in farm management, what is required for farm management economics is to try to know more and more about more and more. The notion of bringing the appropriate balances of disciplinary emphases,
perspectives methods and futures to bear on the problem at hand comes from Kenneth Boulding (1956, 1974) who talked of there being an 'optimum degree of generality' of disciplinary knowledge to bring to bear to solve a problem. This ‘optimum degree of generality’ lies somewhere between the totally abstract and the totally specific, neither of which are meaningful in a real problem-solving sense. Used with care, the whole farm, interdisciplinary approach, where human, technical, economic, financial, institutional and risk aspects are all considered in analyses in a balance appropriate to the problem, has proved to be extremely valuable in an applied research and a practical problem solving sense.

The methods for evaluating important farm decision questions are well established. At present, the standard whole farm budgeting techniques for analysing major decisions are not widely used in farm management. Most farmers make their decisions about major changes to their farming system on the basis of judgement and experience, at best doing some rudimentary cash flow calculations. Most do it well enough for their business to survive, albeit at various levels of economic efficiency, for usually a couple of decades.

There will be no shortage of challenges for farmers managing and making decisions in the future. A few disciplines, perspectives, figurings and a few futures are sufficient for good farm management analysis: sophisticated thinking and simple figuring is the rule.

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