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Changing business environment: implications for farming

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Abstract. The natural, technological, economic, political and social environment in which farmers farm constantly changes. History has lessons about change in agriculture and about farmers coping with change, though the future is unknowable and thus always surprising. The implication for farm operation is to prepare, do not predict.

Keywords: Preparation, prediction, farm management, uncertainty.

Introduction

The changed future will come to farmers in Australia a day at a time and, as always, it will be shrouded in 'clouds of vagueness' (Arrow 1992) until it unfolds about them. Farmers will be making decisions about choices in their changed future to try to achieve their goals under conditions of limited information, risk and uncertainty. These decisions will be of an operational (day to day), tactical (within seasons and years) and strategic (2-5 years, 5-10 years) nature.

In deciding their choices, farmers will have access to more information than ever about nearly every aspect of their farming systems and commodity and financial markets. But, lack of knowledge and uncertainty will remain the main challenges. Despite the mountains of new and more timely information, much about the present will remain poorly understood and misinterpreted, e.g., knowledge about key, response functions. The main challenge for farmers will be to manage inevitable uncertain events in partially understood farm systems, while doing some things much as they have always done and doing other things in situations and ways that are not even imagined at present.

As suggested in papers in this volume, trends in major changes beyond the farm will continue apace: concerns of an increasingly wealthy population about the natural environment will increase; some water in the MDB will be diverted from irrigation agriculture to the natural environment; private investment in agricultural R D&E may increase, while the need for the highly rewarding but slowing down public investment in agricultural R D&E will be greater than ever. As well, in the medium term, the Australian mining boom will exacerbate existing pressures for structural adjustment in agriculture. Growth in world population, along with growth in world income, indicates potential growth in aggregate world demand for various agricultural commodities. The demand side of farming will see much action. The detail about what will happen on the supply side remains unknown: which farmers, whereabouts in the world, producing what products in what ways with what new

methods, to meet the growing demand – remains unknowable. Evidence that world food supply has doubled several times in recent decades give sound reason to expect that the next required doubling of world food supply by 2050 can be achieved, but little is sure about the ways this will be done.

Looking Backward: the past as prologue

In twenty years of farming in Australia, much can happen. Before thinking forward about farming from 2012-2032, it is instructive to think back, to say, 1992, 1972, 1952, 1932, to recall how different was the farming environment of each of these twenty-year periods. It is ambitious to try to make the case that the difference in the rate of change in any of these arbitrary periods of time is any more or less different than any other time. In every time the rate of change in the environment dealt with by farmers is momentous.

In the 1930s, horses were replacing tractors amidst the Great Depression, with World War Two brewing. Low income problems in farming, a result of small farm, post-World War One closer settlement schemes, were rife. Wartime economy, major drought, shortages of agricultural commodities and high prices, occurred in the 1940s. The Rural Reconstruction Inquiries into the state of affairs in farming, led by Sir Samuel Wadham, were instigated. The 1950s and 1960s saw good seasons and prices, rapid developments in agricultural science, fixed exchange rates, massive immigration and consistent strong economic growth around the world, closer land settlement opening up new agricultural lands, emerging opportunities for pasture development, bigger machinery, bulk handling of grain. From the mid to end of the 1960s farmers battled widespread serious drought, while small dairy and wheat farmers struggled with low commodity prices and the high overhead costs of small farms. Commodity supply and low income problems led to the marginal dairy farm reconstruction scheme and wheat quotas.

Farming in the 1970s was characterised by upheaval in many industries (Makeham et al. 1979). There were oil price shocks, runaway inflation, high interest rates, market collapses

and temporary price spikes, a mining boom causing high exchange rates, tariff reforms. In 1974 the wool Reserve Price Scheme (RPS) was introduced. Following the Marginal Dairy Farm Reconstruction Scheme of the late 1960s, the 1970s Rural Adjustment Scheme was introduced. The aim was to speed the process of agricultural adjustment. Intermittent 'crises' in various industries were met with various poorly thought out 'stop-gap' measures tried to help struggling farmers to 'carry-on' (Makeham et al. 1979). In the late 1970s, Victoria's 30,000 dairy farmers were being paid \$5 for each of their cows they shot.

Widespread serious drought in 1982 was followed by a big wet year. The exchange rate and financial system was deregulated. Growing national balance of trade deficits led to a collapse of the value of the \$A. Well into the 1980s, the operators of the wool industry reserve price scheme set the price of wool way above world market prices. Unsurprisingly, demand collapsed while supply grew rapidly. One hundred and eighty million sheep, compulsive woolgrowers all, filled warehouses around the nation with wool no-one wanted to buy, except the woolgrowers themselves. The wool RPS, one of the greatest financial debacles and public policy failures in Australia's history, built a stockpile of 3 million bales of wool worth \$2 billion which hung over the industry for the next decade. Australia's once grandly significant wool industry was reduced almost to cottage industry status and has only partly recovered. On farms, technological change continued apace; minimum tillage emerged as a promising innovation; new weed control chemicals became available; grain feeding of dairy cows became standard, as did growing oilseed crops in cereal rotations. Cropping machinery and farm size continued to grow.

The 1990s started with economic recession, high interest rates, followed by gradual economic recovery to a sustained period of growth. Computer and telecommunication technology became regular parts of daily farm life. Precision machinery uses and electronic identification of animals were introduced. Rapid gains in genetic potential of beef, pigs and poultry occurred. The dairy industry was fully deregulated in 2000 and the wheat industry was deregulated by 2005. This spawned a host of new grain marketing and price risk management opportunities. A decade of drought and widespread shortages of irrigation water followed through to 2009. The mining boom resulting from high and sustained growth in the Chinese economy created the highest exchange rates for Australian farmers in 40 years.

Since 2000 rapid growth of emerging economies in China, India, Russia and Brazil

has created world-wide growth in demand for protein. At the same time ill-advised policies subsidising biofuel production has diverted significant food and animal feed grains away from food and feed markets. Finally, in 2011 the world population reached 7 billion people on the way to 9 billion people by 2040. This growth in population means farmers, Australia and everywhere else in the world, face the biggest challenge they have ever faced to increase the supply of food in the world by 70 per cent over the next 30 years. This aim will not be helped by the reduced inclination for investment in agricultural research and development in wealthy countries.

Awareness of the possible precariousness of the match of world food supply to growing food demand was heightened in 2007 when droughts in both hemispheres of the world caused stocks of grains to reach record low levels, which along with diversion to biofuels and the Global Financial Crisis, causing a flight of capital into soft commodities, plus record high oil prices, causing inputs costs to rise, resulted in a large spike in agricultural commodity prices. As always, world-wide farmers responded: crop plantings increased and world supply and stocks recovered rapidly, and prices rapidly reverted to mean trends.

Consumers became more demanding about agricultural product quality. Public concerns about the state of the natural environment and the welfare of animals, concerns that have been growing strongly since the 1980s, grew apace in the 2000s. Growing concern about carbon dioxide pollution and medium to long-term prospects of future warming temperatures, leading to changing rainfall quantities and patterns, including increasing volatility of weather, has characterised the past decade.

Eternal verities

Successful farm business in coming decades will continue to face pressures that raise their real costs of acquiring and managing resources. This will occur because low income elasticity of demand for food means that growing national incomes end up as non-agricultural demand. Resources of land, labour, capital and management are competed away from agricultural uses. Prices farmers receive for their products will continue to be volatile, as they have always been, as supply fluctuates with weather and demand fluctuates with economic cycles. At times, rising real costs will coincide with declining real prices received, and farm incomes will be squeezed. At times, there will be the happy coincidence of good seasons, good prices and good returns to capital.

The imperative for farm owners and managers to continue to adopt new technology and both intensify and extensify their farm systems to maintain profit in the face of rising real costs will remain the main game. Farmers will use new, improved and more effective variable inputs that will contribute more output for the same or lower costs, and farmers will increase output relative to fixed costs, thereby reducing average fixed costs. One inevitable result of these actions: fine-tuning existing operations and expanding business size, changes the nature and complexity of farming and changes the exposure of the business to pressures from risks of volatility, and increases the need for flexibility in farm systems.

So farming, always the hard way to make a living, will become more complex, and for this reason, will be an even harder way to make a living. Farm decision makers will need to process more information than ever, and be operationally more adroit than ever. More and better information will be helpful in meeting the challenge of decision making under risk and uncertainty, but cannot change the risk and uncertainty affecting the farm business components, about which decisions are being made.

Decision makers still have to try to make good bets. The key to good betting is imagining the future with rigour: assembling relevant information in as complete a way as possible; being transparent about what is knowable and known and what is not knowable or known, and what is assumed, in the decision analysis and decision-making processes; and honestly facing the brutal facts of the business, with and without the potential change. Imagining the future with rigour means exploring in a logical, informed and rational way possible alternative sets of future circumstances – these different futures can be different changes or different timings of implementing the one change.

Implicit in the farm management process is a well-defined set of realistic, achievable goals. Setting goals involves imagining the future: visualising how situations might look at some defined future time and determining the preferred situation(s). Once preferred situations are determined, where we are trying to get to, the feasibility of getting there and how to get there become the questions.

Farmers invariably identify their major challenges as managing increasing complexity (Kingwell 2010), including successfully incorporating new technology into their systems and increasing the size of their business, as well as managing labour profitably and arranging successful succession. These challenges always rate

highly because they are tasks directly and largely under the control of farmers. These are also areas in which there is growing knowledge and specialist expertise available. Obtaining the help of experts in specialist fields remains one of the investments with the best returns farmers can earn.

Another challenge facing Australian farming is having to operate in a society in which increasingly farming is a foreign country. The profound ignorance of farming of well-off urban dwellers cannot be exaggerated. The consequent farm-urban disconnect has serious implications for agriculture. Public concern for the natural environment and the welfare of farm animals increasingly affect what farmers do and how they do it. Such demands, including demand for alternative uses and values of natural resources, grow as societies become wealthier.

Looking forward: the future is always surprising

Farming has always been about managing change. As ever farmers will face the challenge of incorporating new technology into their systems, and of making sound decisions about changing their businesses in response to changes in the natural, technological, economic, political and social environments in which they operate. Predicting the state of these environments is fraught: surprise will rule.

In 1950 it would have been folly to try to predict the detail of the changes in conditions of demand and supply that make up the environment of farming today; or the changes in populations and attitudes to farming; or the mix of recreational and commercial farming; or farm scales that exist around Australia today. While the comparative advantage of individual firms at any time in any locale determines the forms and performance of economic activities, comparative advantage is a dynamic concept. For instance, the nature of economic activity and the detail of operations of firms operating currently in any district or wider region are vastly different to what was happening in the different circumstances of the same locales 30 years or 50 years ago or more.

However, 100 years ago, as now, there were farm businesses run well and operating efficiently. This means earning returns on capital, considering risk, that compare well with the risk and earnings of alternative uses of capital in the economy. At the same time, there were many farm businesses, poorly run, that earned far lower returns on capital. (Only sometimes could the operators claim that they already knew how to farm better than they were inclined to do). In 50 and 100 years time, the same will be the case: a

proportion of firms combining land, labour and capital in an area will earn returns commensurate with the risks and returns of alternative investments, some firms will earn much less.

What is known, and will not be surprising, is that currently profitable farm systems will not be the future profitable farm systems. The question though is not one of comparing the future with the current. When contemplating the futures, the right question is 'How does my business look following a change to the farm system in the expected changed future conditions, compared with how my business looks without the change to the farm system in the expected changed future conditions?' The *status quo* is not a future option.

Future growth in productivity

Changes in productivity are measured by changes in the physical amount of output that results from changes in the physical amount of the inputs used in production. An increase in productivity from one year to the next means a firm produces the same output in the two successive years with less measured inputs in the second year, or produces more output in the second year with the same measured inputs as the prior year. Investment in R, D&E provides the new technology that enables farmers to move their production systems onto new production functions, i.e., increasing technical efficiency or productivity.

Farmers thus face two main challenges: managing their existing system profitably (allocative efficiency) and changing their system by implementing new technology (moving onto new production functions with improved input:output ratios). They are constantly doing both these things. The main sources of improvements in physical input:output relations - growth in productivity in farming - are:

- Using the given set of resources better (technical efficiency)
- Changing scale of operations and getting output benefits from the scale effects of inputs (scale benefits)
- New technology that changes quantity of inputs and outputs and improves technical efficiency by producing more output per unit of input in farm systems (technical change) (Coelli et al. 2005).

A problem in public discourse is that different notions of the terms "production", "productivity" and "profitability" are used by different participants, often in the same conversation. Production is total output, either in gross value or total quantity. Productivity is a ratio of measured quantities of inputs and outputs, but not including all inputs. Profitability is the result of all of the

amalgamated effects of technical relations between all inputs and outputs, how the inputs are combined, and including the effects of changes in prices received and paid. Profitability is what matters to farmers running businesses on a year-to-year basis: it provides the wherewithal to reward capital invested and supply savings for reinvestment.

Confusion reigns. A farm consultant or scientist may be talking about partial technical efficiency (physical output/a single physical input), and thinking they were saying something about profit; economists may be talking about changes in Total or Multi-Factor Productivity (value of all output/value of many but not all inputs) averaged across an industry, and over time, while recognising that it is the combined effect of changes in productivity and changes in the prices received and paid on individual farm business which is what matters. Someone interested in investment in R, D&E might be mistakenly thinking that measured changes in industry productivity over time can be attributed to particular investments and indicate where good future investments can be made in R, D & E. (In practice, analysis of prospective investments in agricultural R, D & E have to be made on case-by-case analysis of potential gains in farm systems).

The net effect of improvements in physical input:output ratios is to reduce the average and marginal cost per unit of output and/or increase the value per unit of output, thereby maintaining or improving profit in the face of rising real costs of inputs and declining real prices of output. Achieving economic efficiency directly helps farmers achieve their goals, such as making profit, paying their bills, growing their wealth and managing risk. Output per unit of input is relevant and helpful to these ends, though the principle of diminishing marginal returns means that the level of total production that gives maximum technical efficiency – maximum average product per system or per individual input - is not the same amount of production as that which gives maximum economic efficiency. Hence, some confusion: increasing the quantity of inputs used in order to increase annual profit can reduce measured average technical efficiency/productivity.

Change in productivity as analysed and reported are measures of change in quantity of output relative to change in quantity of inputs used, on average, across samples of farms in an industry. Though maintaining and improving productivity is one key to maintaining and improving profit, changes in measured industry productivity do not indicate what is happening to profit at an individual farm level.

Measures of productivity over the long run tell something about resource use in agriculture, aggregated across many firms. This measure can be compared with what competitors are achieving and indicates something about changing relative competitiveness. Changes in productivity also tell something about the technical capacity of farm businesses in a sector, on average, to offset rising real costs of inputs or declining real prices of outputs (worsening farmer terms of trade). Also, there is likely to be a relationship between investments in agricultural R D&E in a prior time and improvements in measures of productivity ten to thirty years later.

From the viewpoint of understanding about prospective changes in industry structure or potential for farms in particular industries to grow and prosper, or struggle and decline, or how well farmers are farming, or the welfare of farm families, there is no substitute for analysis of the profit performance, balance sheet and debt servicing capacity of individual farm businesses.

Potential impediments to productivity growth that will restrict continued farm profit in the face of rising real costs over time are:

- Insufficient capital supplied for investment in agricultural R D&E,
- Poor investments in specific areas of agricultural R D&E,
- Insufficient supply of agricultural scientists to conduct the needed R D&E, and
- Barriers to adjustment to farm intensification and extensification.

These potential impediments to future productivity growth and maintenance of profit are all matters that are, to varying degrees, within the influence of both the private and public sectors of the agricultural and general economy. For instance:

- Farmers could contribute more resources to agricultural R D&E through their publicly matched levies to RDCs,
- The public could contribute more resources to R D&E, and to attracting and training agricultural scientists,
- The public could remove and reduce barriers to farm change, such as subsidies that enable the continued survival of farm businesses that are poorly run, unprofitable and have no future,
- The public could rationalize land use planning regimes that inhibit profitable deployment of resources, and
- Public agricultural R,D&E investments concerning hotter and drier future climate, and rougher weather, could focus primarily, and to a greater extent than at

present, on supplying technical and risk information that will enable private business-people in the distant future to make well-informed decisions about running their business.

Increased focus on researching the science of future farming conditions will be more beneficial than the high-level soothsaying that comprises much prognosticating about social and economic forms of a future carbon-constrained world.

Farming with a price on carbon

For farm businesses, changes in weather and in climate are economic problems. The scientific and the social cannot solve the problem. Economic solutions encompass the scientific and the social. As a price on carbon becomes established in Australia and increasingly around the world, farmers and consumers of their output will increasingly incur some of the costs of carbon dioxide emissions produced by farm activities and by the activities of the producers of inputs that farmers use. Some opportunities for income earning from sequestering carbon too may arise in some situations, albeit of a limited nature. Sound information about mitigating emissions from farm activities and changing systems in the face of higher carbon-related costs will be vital. Supply of credible information about carbon in farming systems is increasing on a daily basis.

Physical capacity for additional sequestration of carbon is limited, while the additional costs incurred by locking-up carbon include both the opportunity cost of the land use as well as the extra nitrogen and phosphorus that is locked-up along with extra carbon in direct proportions, and which exceed the value of the carbon (Passioura et al. 2008). Further, extra carbon sequestered in soil increases emissions of the greenhouse gas nitrous oxide, especially under high rainfall conditions. Farmers will find the opportunity cost of locking away carbon in soils is high and the returns over 100 years are low. Carbon sequestration in soils will not be a widely attractive proposition in most farming situations (Eady et al. 2011). Forestry has more going for it in this regard, in areas where it rains plenty and trees grow well, even after allowing for risk of fire and disease (Eady et al. 2011).

In the context of the cost of carbon prices on farm systems, when allowance for future productivity growth is incorporated in analyses, the impost of carbon-related charges on farm system cash flows appear potentially modest. For instance, these costs pale into insignificance compared to factors like a change in exchange or interest rates, or

debt levels, or a decent and timely fall or absence of rain.

While much focus of carbon costing is on 'pass back' to farmers in the first instance, as agricultural supply world-wide incurs additional costs associated with carbon, and with long-run supply more responsive than long-run demand for agricultural commodities, consumers will bear the larger share of the cost of carbon. Taxes are not paid fully where they are laid.

The main relevance of pondering about future farming in a carbon constrained economy with a warmed climate is in changes in risk associated with the major strategic decisions the operators of farm businesses will be making. The operational and tactical risks will be managed as now, on a day-to-day, season-to-season basis. Research that focuses on risk associated with rare events that have big impacts will prove productive.

There is also a mismatch between the needs for farmers to farm well on a day-to-day basis, responding to weather conditions, and the needs of science and of policy understanding about climate change over 30, 50 70, 100 years. Long-run changes in averages over large geographic areas have little meaning to particular farm systems dealing with fluctuations around artificially contrived 'average' situations which never actually exist.

Farm management analyses

The whole farm approach, allied to the principle of diminishing marginal returns to extra inputs, with a proper appreciation of profit, finance, growth and risk, will still be the only valid approach to farm management economic analysis and farm decision analysis. Without doubt, lacking this farm economics framework, flawed single-input focused technical, partial, average methods of thinking about the management of farms will continue to be used in farm advisory work by agricultural scientists and consultants. There is much scope for progress to be made in the farm advisory and research investment fields.

In a methodological sense, risk analysis and risk management is progressing. Tools for analysing risk in decision making are improving. Straight-forward probabilistic analysis in budgeted outcomes and methods of scenario analysis are useful improvements. Certainty equivalents and their alignments to standardised estimates of low, medium and high risk aversion is now straight-forward using stochastic efficiency with respect to a function (SERF), and standard investment analysis criteria of IRR and NPV will be refined by analysis of real options and their value. Risk tools such as weather derivatives may develop into operational management aids;

increasingly unwanted price risks will be sold. Improvements to decision analysis will better inform decision-makers in the complete, transparent and honest consideration of risk, used in forming their judgments about how much to bet on which opportunity. There remains much farmers have no control over. Consequently, a prudent strategy for business management is to manage well those elements, and risks, over which there is some control. Prepare, don't predict.

Concluding comment

Investment in agricultural R, D&E makes possible improvements in agricultural productivity that over time maintain and improve farm profitability. Removing impediments to farmers coping with change will help them. So too will wider understanding of the farm economic framework for farm analysis and decision analysis, allied to more and better economic and technical information that assists farm decision making about strategic changes to farm systems, under greater uncertainty than ever.

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