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## **Strategy Development in a Turbulent Business Climate: Concepts and Methods**

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### **Abstract**

The accelerating speed of change in the food and agribusiness industries is resulting in more risk and uncertainty – the future is becoming much less predictable. The drivers of these uncertainties are also changing – strategic risk which generally has a low probability of occurrence, but large consequences has begun to replace tactical risk. Managing these risks requires not only new assessment tools such as scorecarding and mapping, but also more systematic decision frameworks. In essence, strategic risk management involves using the proper assessment and management tools so as to truncate the loss exposure and capture the profit potential of these risks.

**Keywords:** uncertainty, real options, risk scorecarding, strategic risk, strategy development

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## **Introduction**

Change and the uncertainty that results are not new to agriculture. The rate of change, however, appears to be accelerating. For example, biotechnology and genetic engineering have reduced the time lapse from trait identification to commercialization in corn genetics from 10-12 years to 7-8 years. The consolidation and restructuring of the food retailing industry has occurred very rapidly; consolidation of the chemical manufacturing and retail input supply industries has also occurred at an increasingly rapid pace. The rate of adoption of some new technologies such as biotechnology is much more rapid than that of the past compared for example to the adoption of hybrid corn.

Fine (1998) refers to the speed of change in an industry as “clockspeed,” and argues that competitive pressures and technological innovation driven by rapid scientific discovery has increased the rate of change in products, processes, and organizational structure. This increased rate of change, or “clockspeed” in 1) product and process innovation; 2) organizational structure in terms of mergers and acquisitions; and 3) reconfiguring of the supply/value chain through joint ventures, strategic alliances, acquisitions and other forms of vertical integration and coordination arrangements means that decision-makers must be alert to the increasingly rapid changes in their customers and competition, the business climate, and the science and technology that underpin their business and industry.

Decision makers often perceive change and uncertainty as a threat, and there is a natural tendency to resist threatening environments. Change and uncertainty also provide opportunity, and anticipating those changes enables managers not just to adjust, but profit from them. In fact, the business community appears to be increasingly focused on “managed” risks providing opportunities (Pascale 2000), whereas the capital markets have a much different perspective of risk as evidenced by the discounting and reduced value imposed on riskier projects or firms. This gap in perspectives of risk between business managers (entrepreneurs) and financial providers represents one of the more fundamental challenges in understanding uncertainty and its implications for the economic performance of the agricultural sector.

The purpose of this discussion is to present concepts and methods that might be used to frame and analyze strategic decisions in an environment of rapid change and uncertainty. We will proceed by first identifying some concepts that may prove useful in identifying risks and separating strategic risks from tactical risks. We will then briefly introduce and describe two analytical tools – scorecarding/mapping and a strategy decision tree – that can be used to assess strategic risks and analyze the potential approaches to mitigate these risks. Finally, the challenge of identifying and creating real options as an approach to managing strategic risk will be discussed. The discussion will illustrate the application of these concepts with

examples and vignettes; empirical or numerical testing and applications should be the focus of further work.

## **Sources of Uncertainty**

The risks and uncertainty faced in agriculture have traditionally been classified into such categories as production, marketing, financial, legal and human risks (Banquet, et. al. 1997). An alternative and possibly more useful taxonomy is to categorize risk and uncertainty as tactical/operational and strategic. As agriculture becomes more industrialized, strategic uncertainty is likely to become the dominate source of uncertainty and is typically more difficult to manage.

### *Tactical/Operational Risk and Uncertainty*

The tactical risk and uncertainty faced by agribusiness firms can be categorized as business risk and financial risk. Business risk is commonly defined as the inherent uncertainty in the performance of the firm independent of the way it is financed (Collins 1985). Thus, business risk includes those sources that would be present with zero or 100 percent equity financing. The major sources in any production period are price, cost, productivity and production uncertainty; a number of factors may influence this variability over time.

Financial risk or uncertainty is defined as the added variability of net returns to owner's equity that results from the financial obligation associated with debt financing (Collins 1985). This risk results primarily from the use of debt as reflected by leverage; leverage multiplies the potential financial return or loss that will be generated with different levels of operating performance. Furthermore, there are other risks inherent in using debt. Uncertainty associated with the cost and availability of debt is reflected partly in fluctuations in interest rates for loans and partly through nonprice sources. Nonprice sources, a type of institutional uncertainty, include differing loan limits, security requirements, and maturities which impact the availability of loan funds over time.

### *Strategic Risk and Uncertainty*

The focus of strategic risk and uncertainty is the sensitivity of the strategic direction and the ultimate value of a company to inappropriate strategic choices, ineffective strategy implementations, or uncertainties in the business climate. These uncertainties include: 1) political, government policy, macro-economic, social and natural contingencies, and 2) industry dynamics involving input markets, product markets, competitive and technological uncertainties. Tactical or operational risk is easier to manage than strategic risk and uncertainty, in part because information is generally available to measure these risks, and also because

of the availability of accepted instruments to transfer these risks to others, such as insurance and futures markets.

Most strategic risks cannot be managed or transferred through conventional approaches such as futures or insurance instruments or markets. Strategic risk is multidimensional, so managers cannot assume the simple one-to-one mapping between exposures and hedging or insurance instruments. Creative strategies must be developed to manage strategic risk exposure; these approaches include flexibility, adaptability, diversification, and options.

To illustrate, one of the strategic uncertainties farm and agribusiness firms are facing because of the industrialization of agriculture is contractual or relationship risk. The expanding use of contractual agreements and other forms of negotiation-based linkages between the various stages within the agricultural production and distribution system, combined with the decline in open market-based transactions, results in price risk being replaced with relationship or contractual risk for many agri-businesses. A grower may have a contract that guarantees a price for the crop, but what happens if the processor goes bankrupt? What happens to the contract (availability or terms) next year if the processor finds other suppliers in other areas who can satisfy his/her needs at a lower price? This risk is not unlike that of losing a landlord or a lender, but losing access to the product market has not traditionally been a significant risk in commodity based agriculture.

Another strategic risk that seems to be increasing in recent years is that of compliance or regulatory risk. Farm and agribusiness firms are facing increasing regulation in all aspects of their business transactions. Food safety/security and the environment are two rapidly growing regulatory areas that have been added to the traditional areas of regulation concerned with transportation, taxation, and labor use in recent years.

### *The Domain of Risk and Uncertainty*

When viewed from the broader perspective of both strategic and tactical/operational risks, the total risk that firms face is much more complex and pervasive than is often perceived. In fact, as the agricultural sector increasingly exhibits the characteristics of an industrial model, the types of risks it will face will also change. A taxonomy of the broader dimensions of risk that farm and agribusiness firms are facing is presented in Table 1. From both an analytical and managerial perspective, a major challenge in the future will be to take this taxonomy of risks and rank each of these based on both qualitative and quantitative assessments of the probability of occurrence and the magnitude of consequences.

**Table 1: Domain of Risk and Uncertainty\***

Categories of Risk	Illustrative Sources of Risk
Financing and Financial Structure	Debt servicing capacity, leverage, debt structure, nonequity financing, liquidity, solvency, profitability
Market Prices and Terms of Trade	Product price volatility, input price volatility, cost structure, contract terms, market outlets and access
Business Partners and Partnerships	Interdependency, confidentiality, cultural conflict, information sharing
Competitors and Competition	Market share, price wars, antitrust, industrial espionage
Customers and Customer Relationships	Product liability, credit risk, poor market timing, inadequate customer support
Distribution Systems and Channels	Cost, transportation, service availability, dependence on distributors
People and Human Resources	Health, contract terms, turnover, recruiting, training, retention, organizational culture
Regulatory and Legislative	Reporting and compliance, environmental, food safety, traceability, government trade negotiations, government farm subsidies
Political	War, terrorism, civil unrest, law, governing agencies, enforcement of intellectual property rights, change in leadership, revised economic policies, budget shortfalls
Reputation and Image	Corporate image, brand image, reputation of key employees, community relationships
Technological	Complexity, obsolescence, workforce skill-sets, adoption rate, diffusion rate
Financial Markets	Cash, interest rates, foreign exchange, portfolio misalignment
Operations and Business Practices	Natural hazards, facilities, disease outbreaks, contractual risk, internal processes and controls, management transitions

\* Adapted from Teach (1997)

## Scorecarding/Mapping Tools for Qualitative Risk Assessment

Traditional probability distribution techniques and more recent developments in application of value-at-risk and stress testing assume some form of objectively or subjectively determined probability distribution that can be used in the quantitative assessment of risk exposure. But much of the uncertainty that is part of today's agriculture can only be assessed qualitatively; sufficient numerical observations are not available to provide objective assessment of probabilities so as to develop market instruments for risk transfer and allocation, or use actuarial techniques to insure and mitigate risk. Although objective measurement of risk and uncertainty is

preferred to subjective assessments, the increasing relative importance of subjective risks in agriculture suggests that they cannot be ignored because they cannot be quantified. Until more objective evidence is available to build actuarially sound numerical estimates of risk, a systematic procedure to assess the frequency and consequences of these new uncertainties may be essential. This, in fact, is the emphasis of recent developments in scorecarding (Thornton 2002).

Risk and uncertainty scorecarding is similar in approach to that of credit scorecarding used by lenders to assess the credit risk of various customers. The concept is to take the taxonomy of risk and uncertainty for a particular business, and assess the severity of those risks in terms of probability of occurrence and magnitude of consequence, and to map this assessment into a management strategies matrix (Centrec Consulting Group LLC 2002). Table 2 and Figure 1

**Table 2: Risk Exposure Scorecarding\***

		Severity	
		Probability	Consequences
Business/Operational			
1	Operations and business practices	3	1
2	People and human resources	3	5
3	Strategic position and flexibility	1	4
Financial			
4	Financing and financial structure	1	1
5	Financial markets and instruments	2	4
Business Relationships			
6	Business partners and partnerships	5	5
7	Distribution systems and channels	2	2
Market Conditions			
8	Market prices and terms of trade	5	4
9	Competitors and competition	3	3
10	Customers and customer relations	4	2
11	Reputation and image	1	3
Policy and Regulation			
12	Political factors	1	5
13	Regulatory and legislative factors	3	4
Technology			
14.	Rate of change and innovation	4	4

\*Source: Centrec Consulting Group LLC (2002)

provide assessment and mapping matrix tools that can be used to summarize the management implications of scorecarding. For each of the categories of risk and uncertainty identified in Table 1, the probability of occurrence and the magnitude of the potential consequences are evaluated on a scale of 1 to 5 with 1 defined as low and 5 as high for each scale. These numbers are recorded in Table 2. The pair of numbers serves as a qualitative assessment for each category of risk. For example, (2, 4) would indicate a probability of occurrence ranking of 2, and a 4 on the potential consequences scale. This pair of numbers then provides the coordinates to visualize that particular category of risk and uncertainty in the mapping matrix of Figure 1. Example assessment numbers have been assigned to the fourteen different categories to illustrate how they can be visualized by their score coordinates in Figure 1.

The different categories of risk and uncertainty are reflected by their coordinates in the map (Figure 1) along with the types of general strategies that should be used to manage the potential loss exposure (Centrec Consulting Group LLC 2002). The

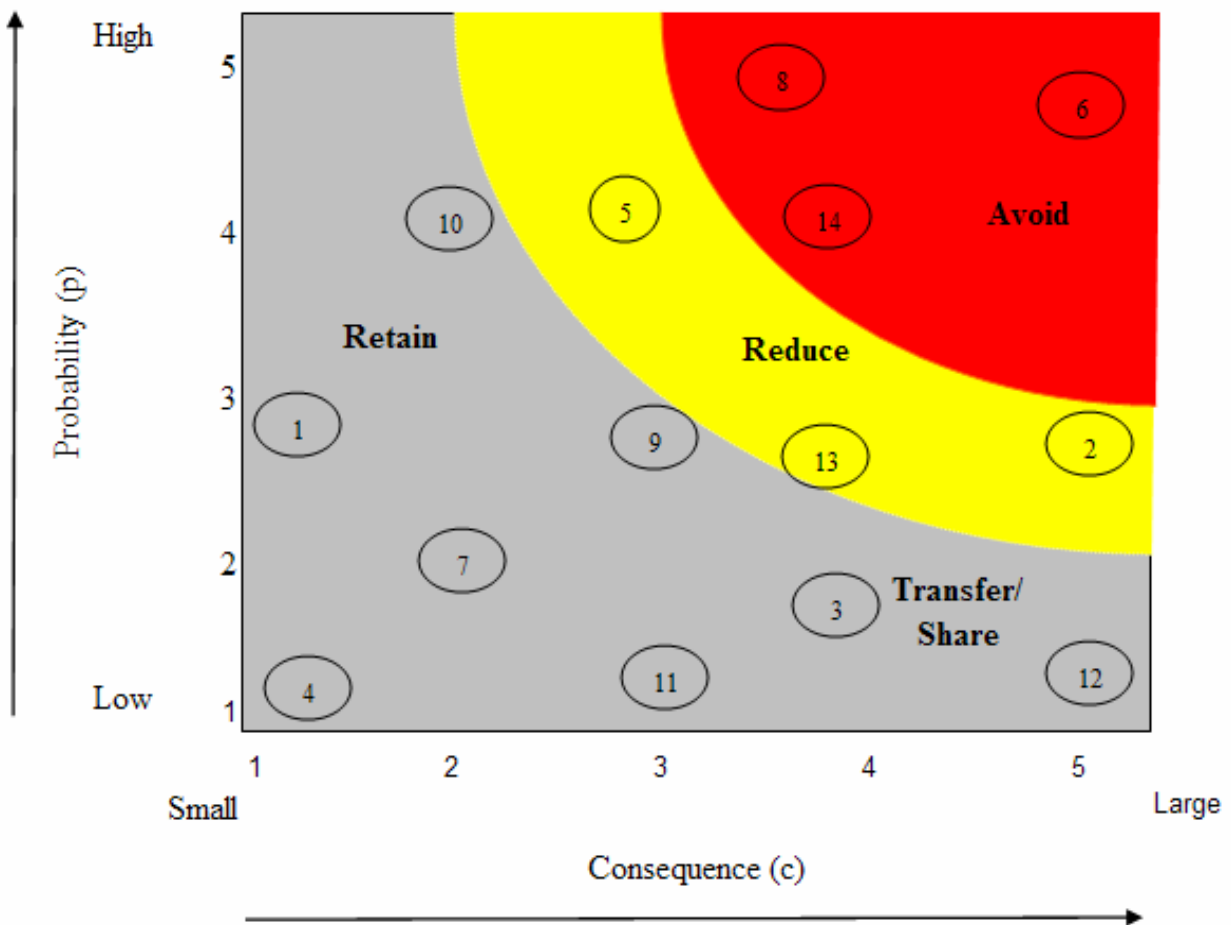


Figure 1: Mapping of Exposure and Management Strategies \*

\*Adapted from Centrec Consulting Group LLC (2002)



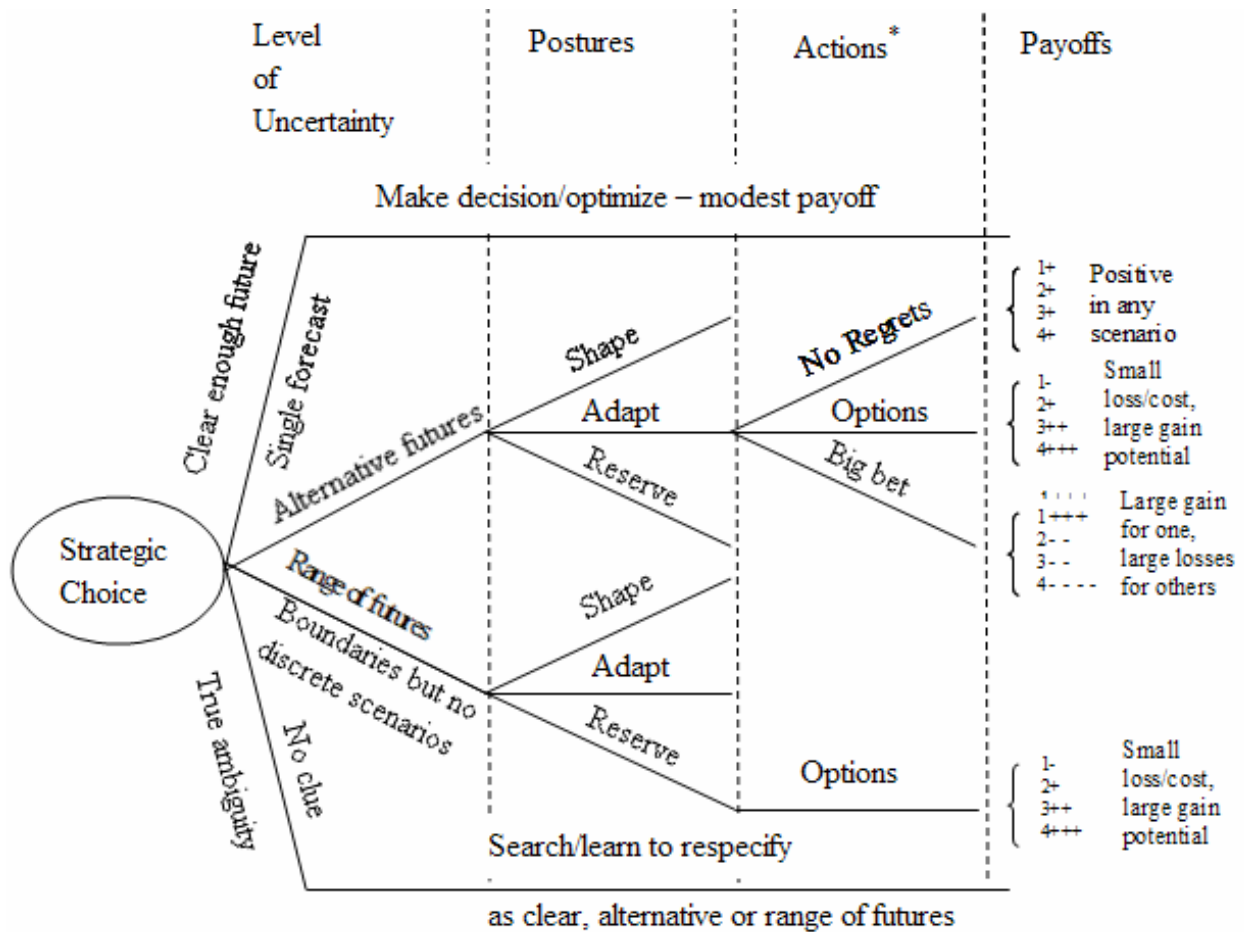
assessment provided by the graphical images of Figure 1 shows that for this hypothetical business, their greatest vulnerabilities are from business partners and partnerships (category 6), and possibly the dated nature of the technology used by the business (category 14). Most of the other loss exposures can be either retained or readily transferred/shared with appropriate market or other instruments. Note how this graphical representation provides a useful and meaningful synopsis of the many source of the uncertainty faced by the business and can be used to assess not only the key sources of exposure or vulnerability, but attempt to manage these uncertainties.

## **A Decision Model**

Moving from the general strategies in the scorecard to specific strategies for managing uncertainties when time is an element is a complex process. One useful way to frame this process is to use a decision tree. The decision tree in Figure 2 builds on concepts developed by Courtney et al. (1997). Courtney (2001) identifies four levels of strategic uncertainty: 1) a clear enough future where a single forecast of the future business environment is sufficiently narrow to point to a single strategic direction; 2) alternative futures where the business environment can be delineated in a few discrete scenarios; 3) a range of futures where the business environment can be defined by the range of alternative futures, but not by a discrete set of scenarios; and 4) true ambiguity where the future business environment is essentially impossible to predict. The tools used to manage strategic risks are contingent upon which of the four levels of uncertainty is associated with the strategic risk.

If a clear enough future has been identified, the decision environment contains little if any risk and uncertainty and an optimizing decision is possible. However, the payoff in this situation is likely to be modest since the uncertainty of the strategic choice is relatively low. At the other extreme, although true ambiguity is certainly a possibility, one of the first challenges and tasks of successful managers is to analyze the future with a focus on converting a decision environment of true ambiguity to one of at least a range of futures if not specific alternative futures. This process of narrowing the domain or space of the strategic risk will often assist the decision-maker in condensing the decision choices to a relevant set.

Courtney suggests that developing strategy in an uncertain environment is a two-stage process: first, choosing a strategic posture which defines the intent of strategy; and, second, selecting a portfolio of actions that are the specific moves or activities that can be used to implement the strategy. Three strategic postures are identified: 1) shaping the future where the decision-maker attempts to drive the industry toward a new structure of their own design, 2) adapting to the future where one takes the current and future structure of the industry as given and reacts to the opportunities that structure offers, and 3) a wait-and-see approach



**Figure 2:** A Decision Tree of Strategic Choices in an Uncertain Environment\*\*

\*The actions for the adapt posture apply to all adapt and shape postures in the decision tree. The action for the reserve posture applies all reserve postures in the decision tree.

\*\*Adapted from Courtney (2001)

where one reserves the right to play by making incremental resource commitments to enhance one’s ability to be a successful market participant in the future. These different strategic postures are illustrated in the decision tree of Figure 2.

If an adapt or shape strategic posture has been selected three different types of actions or moves can be made to implement the strategy: 1) no regrets moves that are expected to pay off no matter what future comes to pass; 2) an option which is designed to secure high payoffs in the best-case scenarios while minimizing losses in worst-case scenarios; and 3) a big bet which involves large commitments of resources that will either pay off big or lose big. If the reserve strategic posture is adopted only an option action may be chosen.

Some examples may illustrate the usefulness of this decision framework. Consider the dilemma of a retail agricultural chemical supplier who is trying to decide whether or not to introduce precision farming and variable rate application services to its customers. The level of uncertainty of the effectiveness of variable rate technology is probably best characterized as one of alternative futures with three scenarios: 1) it, in general, is not cost-effective, 2) it is cost-effective for most customers, and 3) it is cost-effective only for those customers who have highly variable soils. A strategic posture might be to shape the market by being a market leader, with the action being a big bet start-up of a new division to provide the full spectrum of precision farming services. Alternatively, a posture of adapting to the future might be implemented with an options approach action of investing in personnel and equipment for soil testing and yield mapping that could be used to support an expanded precision farming program including variable rate application, or could be used to improve the quality of recommendations, service and application with standard equipment. This decision framework could also be used to evaluate the alternatives to be considered in another critical retail dealer decision – the adoption of an e-commerce strategy.

The decision model is equally applicable to production and investment decisions. A key issue faced by many farmers is what strategy to use in expanding the land base in their business (rent vs. buy) given uncertainty about future prices and government programs. It is typically feasible to identify alternative scenarios for prices and government program payments that define the future, a form of scenario analysis using game theory or option valuation approaches is typically applicable. A most likely strategic posture is to adapt to the future or reserve the right to play; a big bet move would be implemented with a land purchase decision; whereas a no regrets move might be implemented with a crop share lease where future risk of prices and government payments are shared between tenant and landlord. An option move might be implemented with a longer-term cash lease that includes an option premium and a right to purchase the property at some future period. Note that these different approaches to managing the strategic risk may be adopted by different players in the same market as a function of their financial condition and their risk attitudes.

An additional example illustrates how this decision model can be used to analyze and understand the current restructuring of the pork and dairy industries and the strategic decisions being made by some of the key industry participants. With the profound changes in technology and rapid structural changes in these industries, the future may be best described as a range of business environments rather than specific alternative futures or true ambiguity. Given this level of uncertainty, some market participants have determined that they can shape the future of the industry by their decisions, particularly in the context of market size and structure, supply chain linkages and qualified supplier programs, geographic location, and product attributes. Thus, these firms have taken a shape the future strategic posture, and

implemented that posture with big bet actions or moves that are in some cases preemptive in nature, and in other cases are focused on dominating a particular segment of the market. Recent examples of this strategic approach might be the backward integration of packers such as Smithfield into pork production, Tyson's acquisition of IBP to be a supplier of animal proteins to food retailers, or forward vertically alliances in the milk industry between large scale producers, processors and food retailers.

## **Real Options Approaches to Risk Management**

Financial options theory provides a conceptual framework for measuring and pricing risk, and is widely used in financial markets to transfer and price interest rate, foreign exchange rate, commodity price, stock price and other risks through both organized futures and options exchanges and privately negotiated arrangements such as strips and swaps in the financial markets. More recently the concepts of options theory have been extended beyond the financial markets to investment and strategic decisions relating to physical assets in an uncertain environment – real options (Dixit and Pindyck 1994, Amran and Kulatilaka 1999).

The basic premise of real options theory is that many investments (as well as most strategic decisions) involve risk and uncertainty concerning future payoffs and costs, but the decision can often be divided into stages and sequenced so that more information is available after the first stage which will influence the probability as well as the potential size of the expected payoff. In these circumstances, the initial stage investment or commitment is much like buying a call option, i.e. the opportunity but not the obligation to make additional investments or commitments at a later stage.

Options thinking explicitly considers the benefits of delaying a decision or financial commitment in an uncertain environment. In essence, there are two financial benefits of any delay in committing funds. First is the interest or earnings received on those funds not committed but instead invested elsewhere while one waits. This benefit accrues no matter what happens to the risk or uncertainty during the delay. A second benefit of delaying is that in most cases additional information can be gathered which allows for a more complete analysis that will more accurately reflect the true value of the investment.

Delaying has a benefit irrespective of what one finds out about the payoff – whether it is bigger than originally thought or smaller than originally anticipated. The more uncertainty there is about that payoff (whether negative or positive), the larger the value of the option to delay of making the investment decision. In essence, delaying a decision to have more certainty about either good or bad events in the future has value for two reasons: 1) to capture the benefits of completing the investment if they are higher than expected, and 2) maintaining the flexibility to avoid a mistake if the

benefits are not as high as expected. Having the opportunity to obtain more accurate information about the future is valuable, even if that future is negative.

A related benefit of delaying is the learning that might occur during that delay. This concept of learning is beyond that of obtaining new information about the payoff associated with the uncertainty. Learning involves new ways of framing and specifying the decision problem. Learning activities, thus, can result in: 1) respecification of the problem, 2) identification of new events or respecification of events, 3) estimation of new probability distributions for the events or the revision of those probability distributions, 4) identification of new actions or respecification of actions, or 5) identification of new consequences or payoffs, or the respecification of payoffs. In essence, learning goes beyond obtaining new information because it may result in the identification and definition of a new strategy to handle an uncertainty rather than simply a more accurate specification of the current uncertainty.

Real options concepts have the potential to be particularly useful in analysis of strategic risks where the decision-maker has the ability to make decisions over time and these decisions change the value of the investment. For example, decisions concerning the profitability of capital investments including R&D expenditures, and the timing and staging or sequencing of such decisions in an uncertain environment can be best understood as a real options problem. Managing this sequencing process and taking advantage of the new information revealed during the time delays are critical to proper strategic management. New information might be of the following forms:

1. additional information about odds or likelihoods (the probabilities) concerning the uncertain events that might occur, thus giving the decision-maker more confidence in the original estimates of the probability distribution.
2. changes in the environment surrounding the decision problem which alters the original probability distribution, i.e. changing the likelihood of an event's occurrence.
3. changes in the environment which actually alter the results or consequences of various decisions, in essence an increase or decrease in the actual payoffs used in the analysis.

Real options theory can also be useful to understand and evaluate the payoffs and risk of joint ventures and strategic alliances. A number of alliances, joint ventures and similar vertical linkages have been formed recently in the grain and input supply industries. Licensing and other agreements are increasingly dominating the biotechnology industry. From a strategic positioning perspective such arrangements

compared to acquisitions might be viewed as acquiring an option, or as a preemptive move, yet maintaining flexibility until new information is available. Folta and Miller (2002) have applied real options theory to strategic alliances in the biotechnology industry. In similar fashion, real options concepts may be useful in understanding recent developments to form downstream linkages in the grain and oilseeds industries. Thus, real options is a strategic risk management tool that enables decision-makers to make more informed and accurate strategic decisions over the course of time by incorporating additional information and learning.

## **Identifying and Creating Options**

An options mindset and options thinking is critical to successful management in turbulent times. Accurate analysis of real options opportunities is one of the important skills of options thinking and mindset. But an equally and maybe more important skill is that of identifying and creating real options. In fact, successful management in turbulent times may be as dependent on the creativity in designing, crafting and recognizing options as it is in the decision model to value and choose the correct strategy. We will briefly review here some of the concepts useful in developing skills in option recognition and design.

### *Option Typology and Categories*

Different categories of real options have been identified by various authors, but in general the following categorization appears to capture most of these classifications.

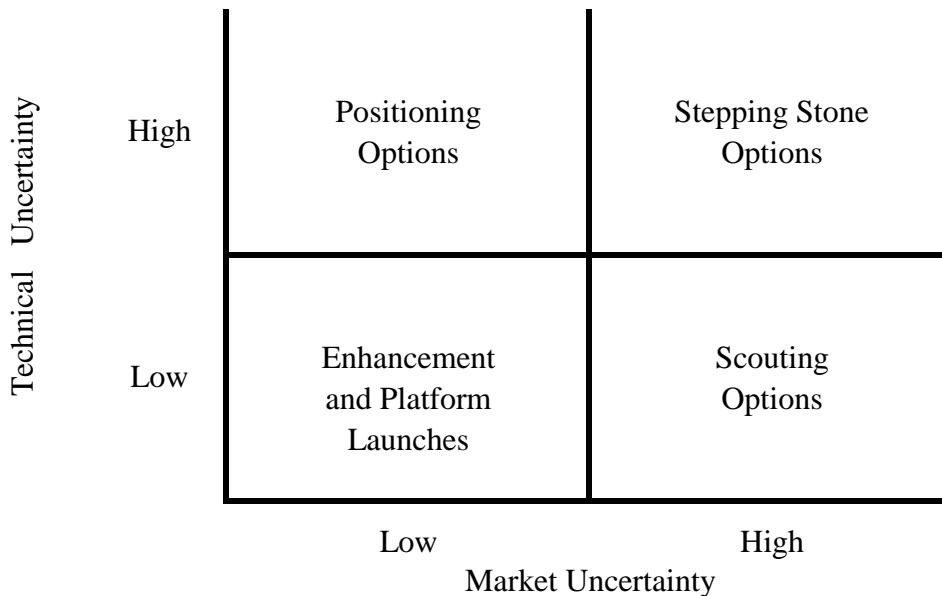
- 1) Growth/expansion options – This category would include alternatives for new markets, new products, new customers, and new ventures in general which become prospects or possibilities that would not be open or available without the initial commitment of resources.
- 2) Contract/divest options – This option category is characterized by the flexibility to reduce the commitment or divest of some of the resources at high residual values or minimum costs if unexpected events should occur.
- 3) Exit/abandon options – Although this category might be perceived to be a subset of the contract/divest category described earlier, exit or abandon options are different in that the option is exercised to mitigate substantial losses or loss exposures.
- 4) Pause/wait options – This category includes conscious deliberate decisions to delay action or a choice until a specified future event occurs, at which time a choice will be made or a new choice set identified.

- 5) Sequence/follow-on options – In this category, decisions are consciously time sequenced to both minimize current commitments and maximize future opportunity.

This classification attempts to capture most single options; multiple interacting or embedded options that are in essence an option on an option would combine these various forms of individual options. Specific activities or actions that fit these various categories will be described later.

*A Portfolio of Options*

McGrath and MacMillan (2001) suggest that an important element of successful entrepreneurial behavior is identifying a portfolio of options. Their categorization of option alternatives is most useful in framing the growth/expand category described earlier. They are particularly concerned about technical uncertainty and market uncertainty in their discussion of using an options mentality to frame entrepreneurial behavior. Given these two categories of uncertainty, they identify three types of options that an entrepreneur should include in his/her portfolio. Positioning options are included when technical feasibility is highly uncertain, a dominant standard or design does not exist, or regulatory acceptance is uncertain. Scouting options are characterized by uncertainty as to what market segments want in their product/service offering. Stepping-stone options are purposely positioned as experiments to learn and may involve sacrificial products and services that are likely to fail, but will reveal useful information about both technical



**Figure 3: Building a Portfolio Options\***

\*Source: McGrath and MacMillan (2001)

performance and market acceptance. In the language of venture capitalists, the approach to stepping-stone options is “fail fast, fail cheap, try again.”

Figure 3 summarizes the McGrath and MacMillan (2001) portfolio approach to new business ventures that combines options with enhancement and program launches. In the spirit and context of a portfolio of alternatives, McGrath and MacMillan suggest that the successful entrepreneur must not just include enhancement and platform launches in his/her set of new business venture alternatives, but must include positioning, scouting and stepping-stone options as well. Once various dimensions of technical or market uncertainty are resolved, some options in the portfolio can be exercised and converted into launches while others are allowed to expire.

### *Some Real Option Examples*

The kinds of activities that might be considered in the process of designing and creating real options for agribusiness firms are summarized in Table 3. The activities identified in Table 3 should be viewed only as a partial list of the business decisions that could be framed with an options mindset. Yet the breadth of the activities noted is indicative of the fact that options thinking can be used in almost all functional areas of the business (note that the options approach to financing including the use of financial options – puts, calls, swaps, etc. and other option instruments including options to buy, sell, and convert – are not included in Table 3).

Many of the historical real options applications have included asset acquisitions such as sequenced investments, leases with a formal or informal option to buy, excess capacity or peak load investments, and pre-emptive investments. Resource commitments to activities, particularly basic R&D compared to applied and technology transfer R&D, can possibly be best viewed with an options mindset where new discoveries in basic science can open up numerous avenues for application and commercialization. The choice between various less than full commitment business models such as joint ventures, strategic alliances, licensing agreements, etc. can be analyzed with an options framework where the purpose of the initial commitment is to facilitate endogenous learning and capture tacit knowledge that can be used to inform decisions about further resource commitments. Introducing a new product to market using an outsourcing approach to manufacturing initially, and then building a manufacturing facility and switching to insourced production if the market potential actually develops is another example of an options approach business model. From a different perspective, participating in a value chain as a qualified supplier or contract grower might be viewed as an option to access future opportunities in terms of new products, new markets, or new technology which might become available on an exclusive basis only for value chain partners. An options approach can readily be



**Table 3: Alternative Option Activities in Agribusiness**

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- I. Asset Acquisitions
    - A. Sequenced investments
    - B. Leases
    - C. Excess capacity
  
  - II. R&D Investments
  
  - III. Business Models
    - A. Joint ventures
    - B. Strategic alliances
    - C. Licensing agreements
    - D. Contract production/qualified supplier
  
  - IV. New Business Ventures
    - A. Start-ups
    - B. Acquisitions
  
  - V. Technology Adoption
  
  - VI. Market Development
    - A. Influencers
    - B. Bundling/cross-selling
  
  - VII. Information Systems
    - A. Documentation/traceability
    - B. Knowledge/learning
- 

used to frame and inform new business venture decisions including start-ups and acquisitions, as well as technology adoption decisions.

An options approach may also be useful in making decisions to enter new businesses such as production and marketing of specialty crops. In most cases, transitioning from commodity crop to specialty crop production and marketing involves investments in specialized machinery and equipment in an uncertain environment concerning future growth in demand, price premiums, yield drag, storage and identity preservation systems, etc. If the required investment must be made up-front with limited capacity to make adjustments, the expected benefit stream or the expected payoff may not justify the outlay. Conversely, if critical investments such as storage facilities for identity preservation can be made in the first year, while delaying investments in specialized planting, harvesting and

transportation equipment until new information is available on the magnitude of the price premium; the option value of delaying part of the investment outlay may convert an unacceptable business venture into one that is acceptable. An example of sequential expansion in livestock production would be constructing finishing barns initially, and then a breeding/gestation/nursery unit two or three years later if initial uncertainty concerning pork prices and feed costs subsequently suggests that margins will be on the higher end of the original probability distribution function rather than the lower end of that function. These examples suggest not only the benefits of using the options approach to making investment or strategic decisions, but also indicate the value of making such decisions sequentially when possible.

Two areas where options' thinking has significant unrecognized potential are in market development and information systems investment and deployment. With respect to market development, the logic of investing marketing resources to identify and sell to influencers can be most logically framed and analyzed as a real options decision where the high payoff potential is the incremental customers that the influencer impacts. Likewise, common marketing strategies including bundling, customer lifetime selling, and loyalty programs can be logically analyzed as real options problems or issues.

Assessing the potential of investing marketing resources to attain a specific customer segment based on their future business (i.e. lifetime customer valuation) is also best framed as a real options problem. In the financial markets some customer segments – for example home purchasers who desire a mortgage – may generate a current and future net revenue stream depending on the size of their current and expected future activity – mortgage loans as the homeowner moves to more expensive houses. Other potential customers such as small businesses may need additional financial products and services over time – loans, cash management, payroll services, asset management and investment services, trust services, etc. Informed analysis of the potential of this traditionally described “cross-selling” activity can be framed as a real options problem where acquiring the customer today with a loan or cash management product/service creates both a “growth and a follow-on option.” In essence, there is the potential for the customer to purchase related products and services in the future. Assessment of lost-leader marketing strategies, price discounting or pricing below cost, and product cannibalization to enter new markets or maintain market share also might best be framed as real options problems.

Assessing the potential payoff to invest in information documentation/monitoring and measuring systems for crop and livestock production is also a problem best analyzed with a real options framework. Generally, data on production and growing conditions that is not captured and catalogued today cannot be recreated later, or only at significant cost. The value of that data (i.e. the value of information) may be uncertain at the time of capture, so a traditional investment analysis may suggest a

negative Net Present Value (NPV). For example, GPS driven precision farming data on yields may not create sufficient improvement in agronomic practices to generate a benefit stream of reduced costs and increased efficiency to justify the resource commitment. However, if the information system creates the prospects of a new venture such as producing higher valued products for a processor who requires documentation, or accelerates endogenous learning that improves efficiency and productivity more rapidly than would occur without the information system, the investment has created a “follow-on option”. When valued with real options analysis techniques as opposed to traditional NPV, the “follow-on option” may significantly increase the expected payoff from the investment in GPS.

Thus, the payoff of gathering time-dimensioned information may not be readily apparent at the time of capture, but it may create opportunities which would be unavailable without that historical information. Such examples as documentation and traceability systems in the production and distribution industry, or data sets that allow data mining and use of techniques such as statistical process control to understand determinants of performance and implement continuous process improvement systems, are additional examples where the current benefits may be limited, but the future opportunities created are substantial and can only be assessed with an options framework. Similar arguments apply to resource commitments to knowledge and learning activities (whether experiential, real-time learning or formalized training and education) where the current and direct benefits may be limited, but the future opportunity set is expanded dramatically.

## **A Final Comment**

The accelerating speed of change in the food and agribusiness industries is resulting in more risk and uncertainty; the future is becoming much less predictable. Not only is the future more uncertain, the drivers of that uncertainty are also changing; strategic risk which generally has a low probability of occurrence, but large consequences, is becoming an increasingly important component of the decision environment. Strategic risks have one overriding characteristic compared to traditional operational/tactical risks; they are more typically unforeseen. Some might describe them as unanticipated surprises. Managing these risks requires not only new assessment tools such as scorecarding and mapping, but also more systematic decision frameworks that can be best structured as decision trees.

Possibly one of the most important dimensions of the increasingly turbulent business environment is the critical role that time and the proper management of time plays in making strategic decisions. Traditional approaches to capturing the time dimension using dynamic modeling that explicitly includes the impact of the future on current decisions, as well as current choices on the future, generally does not adequately capture the full impacts of the time dimension. Managing time not only allows one to systematically obtain new information about the decision

problem or learn and use that new knowledge to redefine the problem, it also often enables one to transform a problem with significant loss exposure to one with limited exposure using options thinking. Managing time to redefine a strategic choice in an uncertain environment into a growth, divest, exit, pause or follow-on option that truncates the loss exposure and allows capture of the profit potential transforms strategy under uncertainty from a defensive posture of minimizing losses and protecting positions to an offensive posture of creating and capturing value.

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