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## **Analyzing Risk in a Farm Business Plan**

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### **Abstract**

This paper deals with the problem of assessing the risks involved in a business plan. Business plans are popular for summarizing and assessing the potential performance of a new or existing business. They present a plan for the business's operations, human resources, marketing and financial performance. The financial performance in particular can be difficult to assess. Many think the financial plan should be very precise and try to predict what will happen financially in the future. This is next to impossible to accomplish. A more realistic approach is to plan for the future using reasonable estimates of what is most likely going to happen. Once this reasonable financial plan has been completed, the task moves to the search and control of the risks associated with the business. The two main sources of risk are; first, the risks stemming from the inherent nature of the business and the industry it is in (business risk) and second, how, and to what extent the business is financed by debt capital (financial risk). The next step requires searching for and discovering what the few critical variables are in a business plan, their impact on the financial performance of the business, how they can be controlled and if uncontrollable, developing contingency plans.

### **What is a Business Plan?**

A business plan is a document that outlines how a set of business goals are to be achieved. Typically the components of a business plan are the operations plan, the human resources plan, the marketing plan, and the financial plan.

The operations plan provides a detailed description of the operations of the business. It describes the organizational structure and shows the site plan,

including field maps, and any building and floor plans that the business may need. The operations plan also explains any technical processes and procedures, the work plan and flow of work used by the business. A major part of the operations plan is the capital budget which lists the capital cost of all land, buildings, machinery, and equipment that the business plans to purchase over the planning period. An estimate of the working capital which includes cash requirements, inventory, accounts receivable and accounts payable is also required. Finally, the operations plan should also be the place for the initial estimation of cost of goods sold, and administration, marketing and general expenses for each year in the planning horizon. The bottom line is that the operations plan must provide the reader with a reasonably good understanding of how the business produces products, procures inputs, produces the products/services that it sells, and delivers the products/services to the customer.

The human resources plan provides a detailed description of the human resource requirements of the business, including the total wage and salary costs as well as benefits. The bottom line is that the human resources plan must provide the reader with a clear idea of the human resources required and how those resources will be managed.

The marketing plan consists of two parts; a market analysis and a marketing strategy. The market analysis describes past performance, the market, the competition, the customers, the target markets, the match between the products/services and the needs of the customers. The marketing strategy section includes clearly stated sales and profit objectives, and descriptions of the pricing policy, the target markets selected, the distribution strategy, the selling and advertising program, and the marketing plan budget. The bottom line is the marketing plan clearly analyzes the market for the products/services provided and sets forth a marketing strategy.

The financial plan includes up to 10 year projections of net income and retained earnings statements, balance sheets, and cash flow statements. The financial projections are based on an economic forecast of expected inflation, interest rates (lending and borrowing), growth rates in sales, and growth rates in inputs and expenses. The financing budget determines the mix of short term debt, long term debt, and equity financing needed by the business. The overall financial performance of the business should also be assessed using net present value (NPV), internal rate of return (IRR), and external rate of return (ERR) calculations. The NPV uses a required rate of return on equity to calculate the present value of cash flows to equity for the planning horizon. The IRR represents the expected rate of return on the equity investment from the cash flows to equity over the planning period. The ERR represents the expected rate of return to the equity investors from the dividends paid to them over the planning period based on their original equity investment. The bottom line is the financial plan must demonstrate financial feasibility and clearly illustrate future expectations of income and cash flow, based on the operations, human resources, and marketing plans, as well as expected economic and financial variables.

### **Analyzing the Risks**

Almost all variables in a business plan will fluctuate. Too much concentration on these fluctuations often stymies decision making. On the other extreme a wise person once said “Those that don’t know the risks involved are usually the most willing to take the chances”. So, how much analysis of the risks is appropriate to allow business planners to make decisions without analyzing so much information that they are either totally confused and/or intimidated.

Conventional risk analysis begins by studying the probability of certain events occurring and measuring the resulting impact of these events on business profits. So conventional risk analysis needs some form of probability estimation. Historical data is often used for this purpose. Data on prices, consumer preferences, demand, supply, business cycles, weather etc. can all be analyzed to

produce historically based probabilities and correlation coefficients. This results in probability distributions based on the past of certain events occurring in the future. In order for these probabilities to be accurate for the future, history has to repeat itself precisely as it had occurred in the past. History has often repeated itself but not usually exactly as in the past. Often the temptation is there to adjust these historical based probabilities to better reflect what may happen in the future. This enters into the realm of subjective probabilities that are really educated guesses about what will happen in the future. Unfortunately once these guesses are written down they tend to be regarded as facts. These multiple guesses result in a myriad of statistical information that calculates the impacts on business profits of these events occurring. This information includes means, standard deviations, coefficients of variation and correlation coefficients all in the name of helping the decision maker. In fact most of this information confuses and may hinder rather than help. The business planner then has to choose from a range of actions that could have different impacts on business profits. Of course if the probabilities or guesses are changed then different impacts on business profits occur. The bottom line is the business planner either has little confidence in the results and/or is completely confused by the analysis. Either way the analysis of the risks in this manner is of little benefit to practicing business planners.

A more realistic and beneficial way of analyzing the risks in a business plan is know and understand the two main sources of risk, that is business and financial risk. Business risk is the inherent risk in the business and depends on the nature of the industry in which the business is involved. Business risk deals with capital requirements, sales volumes and fluctuations, prices and the degree to which the business has control over prices, labour costs and availability, and a myriad of other industry related variables. Financial risk stems from how the business is financed and the effects of debt financing on potential profits. Financial leverage is the measure of the amount of debt capital relative to the amount of equity capital in the business and the resulting effect it has on the financial performance and financial risks faced by the business.

### **Financial Risks and Leverage**

Often business planners don't realize how big a contributor financial leverage is to the risks faced by a business. Therefore the business plan should reflect the true rate of return of the business, which is the IRR resulting from a business plan using only equity capital and no debt capital. The level of this true IRR is the rate of return the assets are generating without the leveraging effect of debt capital. If the true IRR is less than the cost of debt, the resulting IRR when debt capital is borrowed will be lower than the true IRR and continue to drop when more debt capital is borrowed. If the true IRR is greater than the cost of debt, the resulting IRR when debt capital is borrowed will be higher than the true IRR and continue to rise when more debt capital is borrowed. Both of these results add financial risks to the business. The dropping IRR with more debt capital is obviously detrimental to the business. However, the rising IRR can also be detrimental to the business if planners forget that the increased returns are a result of financial leverage and not the inherent strength of the business. The business has added the risk of interest rate changes, changing terms of repayment, prepayment penalties, changes in service charges and other borrowing related risks. In addition the added financial risk of borrowing more debt capital magnifies the effects of the inherent business risks.

### **Business Risks and Critical Variables**

Analyzing the inherent business risks in a business begins with searching for the critical variables. Critical variables come in at least two tiers. The first tier of critical variables consists of things in the business that have a relatively high probability of changing a significant amount and if they do the business will be severely affected, either negatively or positively. Planners usually know which variables are tier 1 critical variables and what needs to be done if the business is to be a success. Examples of common tier 1 critical variables are units of sales, growth in sales, and prices for products in start up businesses and labour availability in certain other businesses. Managing tier 1 critical variables may

mean trying to secure production and/or price contracts or making sure adequate labour is going to be available at all times. Not all businesses have tier 1 critical variables, but if they do they should be controlled as much as possible.

Tier 2 critical variables are things in the business that, if they change by a relatively small amount, will greatly change the financial performance of the business either positively or negatively. Tier 2 critical variable may include tier 1 critical variables as well as others. The search for tier 2 critical variables entails selecting an individual variable in the financial model and changing it slightly to see its impact of the financial performance of the business. Examples of common tier 2 critical variables are units of sales, growth in units of sales, selling prices, unit labor costs, availability of skilled human resources, supply and/or cost of direct material inputs, amount of equity financing available, interest rates, actions of competitors, and government regulations. There are usually only 1 to 6 tier 2 critical variables in most businesses. Recognizing tier 2 critical variables is a simple way of helping decision makers concentrate on the areas of the business that have the biggest financial impact.

Scenario analysis in which worst and best case scenarios are evaluated is the next step. All or most of the tier 2 critical variables move in a pessimistic direction for the worst case and in an optimistic direction in the best case. Both the worst case and best case scenarios should be realistic. These scenarios give a feel for how bad or how good things could be for the business if all the tier 2 critical variables move in the same direction at once.

Next, breakeven levels on a cash flow, net income and economic basis should be calculated for the most important tier 2 critical variable. The cash flow breakeven indicates how poorly things could go before the business runs out of cash. Net income breakeven indicates how poorly things could go before the business cannot make an accounting profit. The economic breakeven sets the NPV to 0 at the required rate of return and thereby indicates how poorly things could go before the

required rate of return on equity investment is just met. The results are best displayed in tables or charts.

The final step in the risk analysis process is to formulate contingency plans. Contingency plans are to come into effect when something happens that is out of the control of the business planner. These will counter adverse effects and take advantage of positive ones. Business planners cannot make contingency plans for every possible thing that could happen that is out of their control. However, developing contingency plans for when the tier 2 critical variables move in adverse directions is doable.

The bottom line is that the risk analysis is meant to provide business planners with a much better feel for the risk level, that is, what are the chances that the business will be a success.

### **Risk Analysis - Example**

The example used here is a 1,417 hectare (3,500 acre) mixed farm in the Dark Brown Soil Zone of Saskatchewan, Canada. The farm has 1,214 hectares (3,000 acres) cultivated and sells wheat, canola, lentils, and feed barley. It also has a 200 cow herd and sells weaned calves.

### **Financial Risks and Leverage**

The base run of the financial model for the farm produced an IRR of 9.5% using a mixture of debt and equity capital and assuming no inflation on asset values. The value of the farm assets including land, buildings, and machinery is \$2,900,000(Canadian Dollars (CAD)) and there is a \$500,000CAD long term debt outstanding. Therefore the farm as it is currently operated is quit profitable business and could use debt capital to its advantage. The IRR rises to 12.0% when an additional \$1,000,000CAD is borrow at 6%. The IRR rises to 14.6% when \$1,500,000CAD is borrowed at 6%. These increases in the IRR are caused by financial leverage and increase the financial risks faced by the business. In fact



the IRR increases even faster as more debt is borrowed. Highly leveraged businesses can go bankrupt quickly if anyone of a number of variables change, such as, sales volumes, prices, direct material costs, and/or a number of borrowing risks including interest rate changes, changing terms of repayment, prepayment penalties, changes in service charges etc.

### **Business Risks and Critical Variables**

Sales volume and thereby yields, is most likely to be a tier 1 critical variable for the mixed farm. Farm businesses, like the mixed farm, spread their risk of poor yields by having several different cropping enterprises and buying crop insurance. The addition of the cattle enterprise also helps to spread production risks. Prices could also be a tier 1 critical variable in this case and again the risk of market fluctuations has been spread between several crop enterprises and a livestock enterprise. In addition, the wheat and feed barley are marketed through the Canadian Wheat Board (CWB) and prices are pooled amongst all the farmers delivering to the CWB. Finally, forward pricing contracts are also available for the canola, lentils, and calves.

The next step is to examine the business for tier 2 critical variables. Tier 2 critical variables are calculated by measuring the impact of changes in the variable in question on the NPV of the business, given a required rate of return of 20%. If a small change in the variable results in an NPV of 0, then the variable is critical. If a large change in the variable is required to get the NPV to equal 0, then the variable is not critical.

As can be seen in Table 1, the mixed farm has 3 tier 2 critical variables. Total sales and average prices are the most critical as they have to drop by about 33% before NPV is equal to 0. By this stage management should already have done something to control the level of sales and prices as they are tier 1 critical variables. Direct costs for fertilizer, chemicals, and fuel is the second most critical tier 2 variable as they have to rise 78% before NPV is equal to 0. Finally the

quantity of sales and price of Wheat is the third tier 2 critical variable as they have drop by 95% before NPV is equal to 0. All the other variables tested are less critical than these three. The cutoff point between a critical and noncritical variable is somewhat arbitrary and will change from business to business.

**Table 1: Tier 2 Critical Variables – Mixed Farm**

<b>Variable</b>	<b>Base Case (NPV = \$(1,014,148))</b>	<b>NPV = \$0</b>	<b>%Change</b>	<b>Critical Rankin g</b>
<b>Wheat Sales (tonnes)</b>	<b>1200</b>	<b>2345</b>	<b>95%</b>	<b>3</b>
Canola Sales (tonnes)	465	1238	166%	
Lentils Sales (tonnes)	375	937	150%	
Barley Sales (tonnes)	770	2488	223%	
Calf Sales (head)	180	908	404%	
Cull Sales (head)	20	638	3090%	
<b>All Sales (tonnes)</b>			<b>33%</b>	<b>1</b>
<b>Wheat Price (\$/tonne)</b>	<b>\$ 270</b>	<b>\$ 527</b>	<b>95%</b>	<b>3</b>
Canola Price (\$/tonne)	\$ 400	\$ 1,065	166%	
Lentils Price (\$/tonne)	\$ 550	\$ 1,375	150%	
Barley Price (\$/tonne)	\$ 180	\$ 582	223%	
Calf Price (\$/head)	\$ 425	\$ 2,140	404%	
Cull Price (\$/head)	\$ 500	\$ 15,950	3090%	
<b>Average Prices (\$/tonne)</b>			<b>33%</b>	<b>1</b>
<b>Direct Costs (Chem, Fert. Fuel)</b>	<b>\$ 547,964</b>	<b>\$ 118,039</b>	<b>-78%</b>	<b>2</b>
Hired Labour Wage (\$/hour)	\$ 16.65	\$ (117.71)	-807%	
Management Salary \$/yr	\$ 45,000	\$ (281,763)	-726%	
Initial Capital Purchases (\$)	\$2,900,000	\$ (13,184,889)	-210%	
Finished Goods Inventory (days)	50	(2,997)	-6094%	
Interest Rate on Long Term Debt	6%	-196%	-3373%	

Table 2 presents the results of a best case, worst case, and base case scenario analysis for the organic mill. In this case the first and second ranked tier 2 critical variables (average sales, average prices, and direct costs) are all changed at once, a 10% adverse change for the worst case and a 10% beneficial change for the best case. The results indicate that a 10% adverse change in the first and second ranked tier 2 critical variables at once results in an IRR of 2.9%. This is much lower than

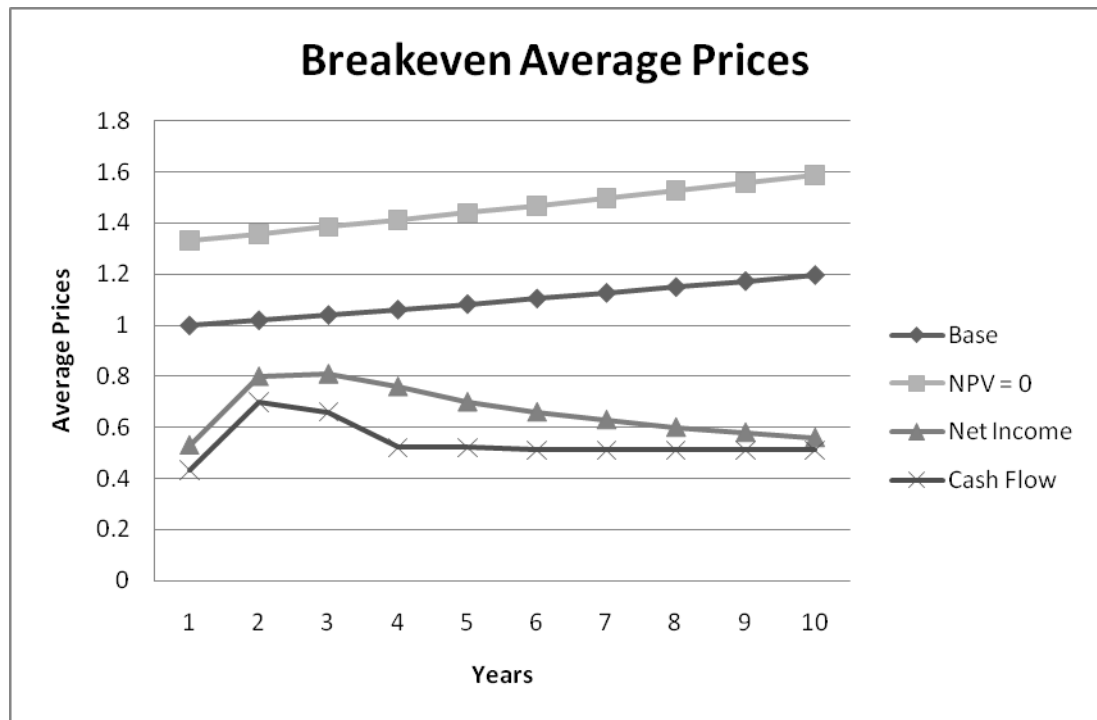
the base case (9.5%) and the required rate of return (20%), but is still positive. A 10% beneficial change in the first and second ranked tier 2 variables results in an IRR of 14.5%. The results of the scenario analysis indicate the mixed farm can withstand a reasonable amount of fluctuation in the first and second ranked tier 2 critical variables.

**Table 2 Scenario Analysis for an Organic Mill**

Critical Variables	Scenario Analysis +/- 10%		
	Worse Case	Base Case (NPV = - \$1,014,148)	Best Case
All Crop Sales (tonnes)	-10%	0	10%
Average Crop Prices (\$/tonne)	-10%	0	10%
Direct Costs (Chen, Fert. Fuel)	\$ 471,064	\$ 428,240	\$ 385,416
NPV	\$(1,567,383)	\$(1,039,862)	\$(540,934)
IRR	2.9%	9.5%	14.5%

Figure 1 presents the results of a breakeven analysis using average prices as the tier 2 critical variable. Using average sales would result in a very similarly shaped chart. There are 4 lines in Figure 1 representing, first, the base run, then the economic breakeven (NPV=0), the net income breakeven and the cash flow breakeven. The base run represents the prices used inflating at 2% per year. The economic breakeven is the price level needed throughout the 10 year planning horizon to get the NPV = 0 (with a required rate of return of 20%) with inflation still at 2% per year. The economic breakeven analysis is used to determine whether the business is likely to proceed at all, can the business return enough to investors to make it worthwhile? The net income breakeven analysis is most critical for long-term viability and is the level of the critical variable that keeps the net income generated each year at zero. As can be seen in Figure 1 it rises in the first couple of years and then falls eventually coming very close to the cash flow breakeven at the end of the planning horizon. This is most likely due to the amount of depreciation being calculated as this would be the major difference between net income and cash flow generated annually as long

as working capital (inventories, accounts payable, and accounts receivable) stayed relatively constant. The cash flow breakeven analysis is most critical for short term survival and is the level of the critical variable that keeps the net cash flow generated each year at zero. As can be seen in Figure 1 the cash flow breakeven price is lower than the net income breakeven price in all the years of the planning horizon.



**Figure 1 Breakeven Analysis for an Organic Mill**

The final step is to make contingency plans for the most important critical variables. In this example, as in most mixed farms, the financial success hinges on prices, yields, and direct costs. The farm is well diversified and can handle substantial negative change in any one enterprise. However, crop insurance and forward contracting of prices and costs should be seriously considered for at least some of the enterprises and costs.

**Conclusions**

Business planners have to make risky decisions all the time. It is important for them to do this in an organized and realistic way. The calculation of probability

distributions, correlation coefficients, and coefficients of variation on a number of variables, some of which are not critical to the financial performance of the business, does not provide the business planners with the information needed. In fact, it often confuses and stymies decision making. A more realistic and practical approach is to know and understand that risks that arise from both business and financial sources. First, managers need to know the impact of financial leverage on their business. Second, they need to know the tier 1 and 2 critical variables arising from the inherent risks faced by the business. Once these 1 to 6 critical variables are known, worst and best case scenarios can be examined, their breakeven levels can be calculated, and contingency plans made.

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### **Professor William (Bill) Brown**

Bill has been teaching and conducting research in the Department of Bioresource Policy, Business and Economics at the University of Saskatchewan since 1978. His teaching and research interests are in the areas of farm and agribusiness management, planning and finance. He has supervised over 90 undergraduate groups completing agribusiness plans and numerous graduate students at the MSc level. Professor Brown has participated in numerous conferences and outreach programs dealing with agricultural issues throughout Saskatchewan and Canada. He has also been involved in agribusiness training and development projects in China, Kazakhstan, the Kyrgyz Republic, Guatemala, Mongolia and Mexico.