

CHOOSING AND INTEGRATING NEW CROPS AND PRODUCTS

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New ventures require hard analysis--both physical and economic--before money and other resources are committed. The fact of successful physical production does not guarantee success economically. The impacts of the entire farm, the family, the industry, and the U.S. and world economies need to be considered.

Many questions need to be answered. How does the new crop or product affect current operations and resource uses? Where is the market? What are transportation costs? When is the market? What are the quality requirements?

Also, hard analysis does not insure success. What are the physical and economic risks involved? How likely will the yield be lower than the expected yield? How sensitive is production to timing and input differences? How volatile is the price? Answering these questions can help a farmer envision the risk involved in a new venture.

In this paper, we look at a process for decision-making about new crops and products. Recognizing that analysis and information have a cost to them, we start with a simple analysis of the new crop or product by itself. If that analysis shows that profits are possible, the next steps are to analyze how the new venture fits into the entire farm and to develop an industry view of market demand versus supply. First, let's review some economic principles so we can apply them later.

ECONOMIC PRINCIPLES

Management is essentially the process of solving the problem of how to allocate available resources to meet the goals of the business and family. All problems of resource use involve one or more of three fundamental economic principles. These principles are easily recognized, understood and applied in budgeting and planning. These principles are described briefly here:

1. Increase the use of an input as long as the value of the added output (that is, income) is greater than the added cost,
2. Substitute one input for another input as long as the cost of the substituted input is less than the cost of the input which is replaced and the level of production is constant. This substitution can be a complete replacement or simply a change in the mix of inputs,
3. Substitute one product for another product as long as the value of the new product is greater than the value of the product which is replaced and the total cost is constant. This substitution can also be a complete replacement or a change in the mix of products.

These principles would be sufficient for all planning, if the manager had unlimited resources and perfect knowledge. Since this is not the case, three

additional ideas must be introduced as aids to the decision-making process:

1. If resources are limited, use each unit of resource where it will give the greatest returns;
2. When alternative choices involve different time periods, compare the alternatives on the basis of the present values of the resulting cash flows; and
3. When risk and uncertainty cloud predictions, different levels of prices, costs, and yields should be used to evaluate the potential variation in expected income and cash flow.

These principles and ideas are described and explained in more detail by Olson, McGrann and Nelson (1984) and Boehlje and Eidman (1984). They are used in planning at all levels of business: from day-to-day operations to long-run strategic management decisions. Let us look at the decision to incorporate a new crop or product into a farm and see how these principles are used.

A FIRST ANALYSIS

As a first step, an analysis of the crop or product by itself will show whether it is physically possible to grow or produce, whether a reasonable profit is possible, and how variable the yield, cost, and profit are.

Physical Considerations

Obviously, the first question is, "Can it be grown or produced?" This involves not only soil, weather, water, and other environmental factors but also management considerations of ability and knowledge. Universities' experiment stations and extension services are good sources of this physical data as are industry associations, private agencies, and neighbors who have grown or produced the new crop or product. This process is very specific to geographical area and the crop or product so it can't be dealt with extensively here, but it is very critical.

Economic Considerations

At this level of analysis, an estimate of potential returns is needed. This involves several steps: an evaluation of cultural practices; an estimate of the costs of production, storage, transportation, and marketing; and a market analysis for the expected price and its potential range. In short, an enterprise budget needs to be prepared for the new crop or product.

Evaluating Cultural Practices. There are many options on cultural practices. A farmer should not blindly accept recommended practices without questioning the assumptions behind those recommendations. The first two economic principles are very useful in choosing practices. The level of fertilization is dependent upon the price of fertilizer, the price of the product, and the expected responsiveness of each unit of fertilizer. The expected responsiveness is dependent upon the application method and timing, the soil structure, soil fertility, past practices, topography, rainfall--both amount and timing, temperature, and a host of other factors. So it is easy to understand why a recommendation may need to be adapted to specific areas and

even individual fields.

Other cultural practices may involve a choice of how to mix two inputs. For instance, pesticides may be applied on a calendar basis on the entire field or another input--pest scouting information--may be substituted for chemical input. In livestock rations, the prices of alternative feedstuffs need to be analyzed on a regular basis to take advantage of changes in relative prices. How often do you need to make these adjustments or evaluations? As often as the prices or other conditions change.

Once input decisions are made, the expected yield and the costs of production can be estimated. The yield may vary and have a large impact on the final decision. These costs are the major portion of an enterprise budget.

Developing enterprise budgets. Enterprise budgets contain the basic information about the inputs, products, costs, and returns from an enterprise such as corn, soybeans, dry beans, dairy, rabbits, or other production activity. In general business, enterprises may be referred to as profit-centers or cost-centers, such as machinery services.

Enterprise budgets must be developed carefully because they provide much of the primary information used for economic analysis. The economic principles outlined above are used in each step of the process to decide how best to produce a product.

The first step in developing an enterprise budget is to list all the products, operations, and resources associated with that enterprise. Products include the obvious ones such as corn, dry beans, and beef, as well as not-so-obvious products as stubble for grazing, bean stalks for bedding, and manure for fertilizer. Operations and resources include everything that is done for or because of that enterprise. For crops, operations and resources include land, tillage, planting, irrigating, spraying, harvesting, marketing, storage, transportation, management, etc. For livestock, operations and resources include land, buildings, feeding, veterinary costs, trucking, processing, marketing, storage, management, etc.

The object of this first step is to write down a reminder of every receipt and expense; values are estimated later. The most logical way to insure that this list is complete is to start at the beginning and think of everything that happens through the production period. It may be helpful to break this list into major stages. Crop production might be divided into tillage, planting, growing, harvesting, and marketing. Stages in a livestock enterprise might be receiving, feeding, moving, and marketing.

The next step in the enterprise budget development process is to identify the resources to be used for each activity listed in the first step. Which plow will be used to plow? Which tractor will be used to pull that plow and who will drive it? What kind of fertilizer will be used? What kind of insecticide will be applied? What medicines and veterinary services will be needed? This step does not specify quantities, prices or costs; the object is to get the specific names of all of the resources used in the enterprise.

After specifying all operations and resources, the next step is detailing specific physical information about those resources. How much fertilizer will

be applied in the fall? How much seed is needed per acre? How much hay and concentrate do the cattle eat? How fast will the trucks travel and how much fuel will they use? The object of this step is to quantify the estimates of resource use.

Finally, the next step is to search for prices and costs. Some estimates may merely involve a review of farm records or calls to dealers and brokers. This seems easy, but even this information must be selected carefully. This is a critical step in the process of obtaining correct answers to the questions being asked. This is not a time to be overly optimistic or pessimistic; it is a time to be objective and at-arm's-length from the business. Other costs, such as labor, repairs, or fuel, may be harder to estimate since their amount cannot be specified as easily as the amount of fertilizer, for example. For these items an average value based on farm records may be sufficiently accurate. Engineering estimates from manufacturers, universities, and government sources may be helpful when local records are lacking. The sources of price and cost information should be noted so the final budget can be more clearly understood and interpreted.

The final step is to calculate the receipts and expenses and prepare the budget report for the enterprise. Noncash items should be noted. Luckily, there are computer programs available to help take the drudgery out of these calculations.

The steps described above should be followed for each enterprise on the farm and for each enterprise that is being considered. A methodical approach to budget preparation will simplify the process and insure that each enterprise budget is as accurate as possible. Accurate budgets allow informed decision-making at the enterprise and whole-farm levels. No computer can compensate for poor preparation of the basic data.

Evaluating market condition. When talking about new crops and products, we are usually talking about relatively small markets--compared to corn or soybeans. Or we're talking about a market that is large but not a traditional market; for example, fresh tomatoes has a sizeable market in Minnesota but it is not dominated by Minnesota tomato growers. In either of these cases, a producer or potential producer needs to investigate the market place potential with much more care for a new crop or product than for corn, soybeans, or hogs. (Although even major product markets need to be analyzed critically before resources are committed to those markets.)

There are several ways to enter a new market profitably. The first and most obvious way is to be a lower cost producer who can cut below current marketers. A market with increasing demand is also fairly easy to enter profitably. If these two conditions are not met, entering the market will be harder. A better quality product is helpful, and so is a constant supply. Observing the market for so-called "market windows" when no one else is supplying the market (or the cost is higher) is another chance for entering. Also, success at entering a market may depend upon who you know, trust, stability, and loyalty; these become more important when trying to hold onto to a market.

When evaluating market conditions, the basic question for success is "how likely will the price be above the costs to produce and market?" Areas to be studied include prices, quantities, and market structure. Needed information

includes average prices, average quantities, trends in the past few years, and volatility of prices. Market structure includes information such as historical areas of production and consumption; number and size of producers, wholesalers, and retailers; and other factors which affect the marketing of the product.

The relationship between price and quantity should be studied; if the quantity marketed has been increasing, has the price gone down? Up? Remained steady? While rigorous analysis is needed for a definitive answer, reviewing the raw data may shed light on the balance between supply and demand. If supply is becoming larger than demand, prices will probably be decreasing. If supply is not keeping up with demand, prices will probably be increasing. It is this latter condition that holds the most promise for profitable new and increased production.

Understanding market structure can help increase the probability of profitable decisions. If a producer is not in the farm-to-consumer chain now, how can he/she get into that chain? Who buys the product from the farmer? Where is that person or business located? Who are they dealing with? Is there a minimum volume needed to attract the attention of a buyer? Can individual producers join together to deliver a sorted, constant quality, and stable supply for local retailers? Also, when and where is the product sold?

A producer should strive to find information about the future production plans of current and potential producers. This may be difficult due to the desire for privacy and lack of information source. Producers should be in contact with product and grower associations and aware of press reports of future plans. Some "thin" markets (i.e., small quantities) can be swamped with small increases in supply and prices will drop drastically.

Obtaining information about the ultimate consumers of the product is also crucial to success. If the group of consumers is growing, that bodes well for increasing production. If the group is shrinking or remaining constant, producers will not be able to increase production and maintain prices. Advertising and promotion may "create" new consumers, but that effort is probably too large and long-run for the beginning, relatively small producer. A social demographic study of current and potential consumers can be very useful for decision-making, but that is a study more appropriate for an industry or other agency to perform or finance.

Once the market conditions have been analyzed, the producer should have an idea of expected prices. Couple that with expected costs, the producer now has an idea of expected returns. However, the variability of those returns can also impact the actual profitability of the enterprise.

Risk and uncertainty. Even though prices may be expected to be higher than costs, a profit is not guaranteed. Uncertainty from many factors can affect the actual price that is received, the yield produced, the quantity and quality sold, and the costs incurred. These uncertainties need to be evaluated for their impact on the probability of failure.

Sources of risk and uncertainty include business risk, financial risk, regulatory risk, and moral risk. Business risk is composed of two parts: production risk due to weather, pests, mismanagement, etc. and price risk due

to changes in market supply and demand conditions. Financial risk is the risk of losing more equity due to higher levels of borrowing. Regulatory risk is the risk of government and institutional rules being changed which affect potential profitability; examples are the uncertainty around government program rules and institutional quality standards. Moral risk is the risk due to uncertain ethics; growers of Jerusalem artichokes in recent years know about moral risk.

There are several methods for dealing with risk: (1) reduce risk, (2) compensate for risk, (3) understand, accept, and work with risk, and (4) use a combination of methods. Risk can be reduced by choice of activities: buying insurance; environmental control such as irrigation, hot caps, or pesticide use; or diversification (some growers won't put more than 10% of their acreage in a highly volatile crop). Risk can also be reduced by obtaining better information or by shortened lead times (e.g., annual crops versus perennial crops). Risk can also be compensated for by redundancy (e.g., the ability to buy back contracts), and flexibility (e.g., willingness to change plans or to design buildings to allow changes in use). Understanding, accepting and working with risk involves (1) forecasting what may happen in terms of a range of results not just a point and (2) developing scenarios of what may happen. Scenario development is discussed more fully later in this paper.

A First Conclusion

At this point, the analysis should show whether the new crop or product has any potential for profit. The variability of the profit has also been analyzed. Before proceeding with the analysis of incorporating the new enterprise into the whole farm, a decision must be made concerning its profit potential. If the profit potential is too low or the risk too high, further analysis may not be necessary. This decision is very individualistic; two people may make different decisions based on the same information. If the new enterprise looks worthwhile at this point, a whole-farm analysis is needed to see how it affects all parts of the business.

INTEGRATION INTO THE WHOLE FARM

If the new crop or product is deemed to be worthwhile by itself, the next step is to decide if it fits into the whole farm in physical, financial, and logistical terms. Physically, there may be interactions between the new and current enterprises that may be positive or negative. Financially, the new venture's profit, cash flow and risk contributions need to be compared to present enterprises. Logistically, operations and resource requirements need to be considered and replanned or obstacles may cause performance to be lower than planned.

Physical considerations

A new enterprise may interact with other enterprises such that the enterprise plans and budgets need to be modified. For example, a livestock enterprise will produce wastes which can be used as a fertilizer on crops. The commercial fertilizer requirements can be decreased by the amount of nutrients contained in the wastes. The crop budget will have decreased commercial fertilizer costs and will share in the waste application costs. The waste management facilities

and equipment may need to be modified to allow for storage until application is possible and waste storage facilities may need to be designed to maintain nutrient quality (with consideration given to economic costs and gains).

Another example is the addition of a legume into the crop rotation. Physical considerations include the positive nitrogen fixation and the potential negative impacts (such as diseases) on other legumes such as soybeans and alfalfa hay.

Financial considerations

After the final modifications of the enterprise budgets have been completed, a final decision on whether the new venture is included in the farm needs to be made. This decision entails three areas: profit, cash flow, and risk.

Profit is used as a slang word here. What needs to be actually considered is the return to fixed resources, that is, gross receipts minus operating expenses. For a new venture to be included in the farm, the return to resources needs to be larger--on a per unit basis--than other enterprises' returns. However, the decision should not revolve on the return only; cash flow and risk are important, also, and may "veto" a positive decision based on returns alone.

Cash flow impacts can be positive or negative. They are positive if they show inflow and outflow in different patterns than current enterprises. For instance, if dry beans can be harvested and sold earlier than corn, operating loans can be paid off sooner and the farm's interest bill decreased. However, beginning or up front cash requirements may be negative due to (1) higher interest bills, (2) decreased credit available for other enterprises, and (3) increased breakeven levels and thus larger chances of financial failure. The negative impacts are more likely to occur if the cash flow pattern is identical to current patterns.

Risk involves the potential variation from the expected return. A new enterprise may have an expected return higher than current enterprises, but the variation may be higher than for other enterprises. A farmer's response to this increased risk may include total exclusion, partial inclusion, or ignorance of risk. The decision rests on the farmer's desire to take on risk and the ability to take on risk. Some farmers have most of their acreage in "stable" crops and then "roll the dice" on a very small portion, say 10% of the land, or less.

How the new enterprise behaves in relation to current enterprises can affect the decision also. A new enterprise that is riskier by itself may lower a farm's total risk exposure if the new enterprise varies in different patterns than current enterprises. For example, dry beans have different risk variations than corn and soybeans, so total risk exposure may decrease if dry beans were added to a corn-soybean farm. But that is dependent on many factors.

A new computer program is now available from the Minnesota Extension Service to assist farmers in risk management decisions. It is called the Agricultural Risk Management Simulator (ARMS). It requires enterprise budget information and price and yield expectations, variations, and correlations. ARMS allows a

user to see how different strategies of enterprise mix, crop insurance, and forward contracting affect both expected income for the whole farm and the variance of that income. It takes away the mathematical drudgery and allows the assessment of the information.

Logistical considerations

Resource use is a very critical issue in farming. This includes not only land but also machinery, buildings, and labor. Logistical considerations include the amount and timing of resource demands. Crops which require fall tillage may not be compatible with crops which are harvested late. Livestock labor demands may conflict with each other and with crops at certain times of the year. These potential bottlenecks can be analyzed and saved through mathematical programming, such as linear programs of field time, machine use, and labor requirements, or through use of calendars of operations.

While calendars of operations require more manual work and manipulation, they are manageable and understandable. Programming is excellent but may require more commitment of time, money, and educational effort if the user is not currently ready.

Calendar of operations are very similar to monthly cash flow statements except the units are hours not dollars. For each resource, a tractor, for example, the hours available each month are estimated based on the hours the operator is willing to work, the hours needed for maintenance, and the available days for field work weather permitting. The demands for each resource are determined from the operations and other jobs that need to be done in each month. This process should be done for resources which are potentially critical in important months: tractors, trucks, planters, labor. By comparing the hours available to the hours needed, a farmer can predict any shortfalls or bottlenecks. Solutions to bottlenecks are: (1) changing the date of operations (after considering the impacts on yields, etc.), (2) obtaining more resource hours (by purchasing more equipment, hiring more labor, obtaining custom machine work, etc.), or (3) changing the enterprise mix to alleviate the bottleneck.

Each part of the integration process requires an analysis of the impacts on each enterprise and on the whole farm. The integration decisions are complicated but are needed to increase the chances for financial success.

Dealing with uncertainty

Even after analyzing or thinking about analyzing, a new venture, the uncertainty of the future may be so great that we cannot comprehend how to start. One way to deal with the uncertainty is to (1) develop scenarios (that is, possible events) about the future, (2) predict the results under each scenario, (3) analyze the scenarios and their results, and (4) choose the option (or plan) which seems to do the best in the face of the potential events.

The first step is to develop the scenarios of the future. This can be done in several steps and are adapted from Porter (1985).

I. Identify uncertainties:

A. Examine each element affecting the farm and classify them as:

1. Constant: they are unlikely to change in the future.
2. Predetermined: they are predictable; their trends are stable.
3. Uncertain: they depend on unresolvable uncertainties.

B. All three types are part of each scenario but the uncertain elements are what differentiate the scenarios.

II. Divide uncertainties into:

A. Independent: the uncertainty is independent of other elements (e.g., interest rates for farmers).

B. Dependent: the uncertainty is determined by independent uncertainties (e.g., the supply of vegetables in Twin Cities market is determined by competitor's production).

C. Only independent uncertainties are used to develop scenarios. The dependent uncertainties are known once assumptions about the independent uncertainties are made.

III. Identify causal factors for uncertainties and make assumptions about them.

A. Practicality may limit how "far back" to go to choose causal factors.

IV. Develop internally logical and consistent scenarios.

A. A knowledge of how the system works is needed.

B. What are the "second-order" effects of assumptions? Variables may be interrelated.

C. A good scenario will not have conflicting assumptions and second-order effects.

V. Limit the number of scenarios by:

A. Reducing the number of scenario variables to only those crucial variables with large impacts.

B. Reduce the number of assumptions about each variable. The choice of assumptions affected by four factors:

1. The need to bound the uncertainty (i.e., credibility).
2. The regularity of the impact (how sensitive is it to small changes).
3. The manager's belief (to test and evaluate and to change).
4. Practicality (as defined by analysis time and comprehension ability).

VI. Analyze scenarios for:

- A. Future results on the industry and/or farm.
- B. Implications for profit potential and thus attractiveness to competitors.
- C. Competitive advantages for farm.

VII. How many scenarios should be analyzed?

- A. Analyze scenarios in a sequence that yields insight for the selection of a strategy:
 - 1. Analyze polar scenarios.
 - 2. Analyze the most likely scenario(s).
 - 3. Continue until the impact of scenario variables is understood.
 - 4. Major discontinuities should be included.
 - 5. Cover the range of credible possibilities and to expand the thinking of the future.
- B. Analyzing only the "most likely" scenario ignores other possibilities and may omit important events.
- C. Two scenarios are better in the polar sense, especially if both are equally likely. The problem is trying to capture all possible events in the two scenarios.
- D. Three scenarios are better but may degenerate to most likely, optimistic and pessimistic. Then optimistic and pessimistic are "ignored" and the problems of only one scenario return. Also, problems come in trying to define what optimistic and pessimistic mean.
- E. Four scenarios or more (of equal probability) show the degree of uncertainty and allow evaluation of the opportunity costs of the various strategies.
- F. Iterative: Once strategies are planned, what might happen to change the plan?
- G. Too many scenarios can cause confusion and lack of comprehension.
- H. Another method is to look for "themes" in the trends and develop scenarios around those themes.

VIII. Probabilities of scenarios happening.

- A. Probabilities are hard to estimate for many problems, but they are needed in order to sort out the future.
- B. One method is to develop probabilities for variables and then calculate joint probabilities for scenarios.
- C. How do you find information for your farm?
 - 1. Your records--historical probabilities.

2. County averages: except variation is wrong (too low) because of using averages. Also, the county average may not be the individual farm average.
 3. Even a few observations from a neighboring farm are better than no information.
- D. However, when you are dealing with very little information, even probabilities you can estimate are uncertain.

IX. Scenarios and strategy.

- A. If we know a scenario will happen, each scenario may lead to a different strategy.
- B. Choose a strategy which is robust; that is, viable regardless of what happens. But that may be expensive in term of both costs and lost income.
- C. Choose a strategy for only one scenario.
- D. Try a strategy of being ready to move with all or several scenarios. However, a farm may end up stuck in the middle and unable to adapt.
- E. Strategy selection.
 1. Bet on the most probable.
 2. Bet on the "best" (i.e., most profitable).
 3. Hedge on what will happen (i.e., keep a door open).
 4. Preserve flexibility (don't shut a door).
 5. Influence the outcome (i.e., what happens).
 6. Combination of (1) and (5).
- F. Factors to consider.
 1. First-mover advantage.
 2. Initial competitive position.
 3. Costs or resources required.
 4. Risk
 - a. Timing of resource commitment.
 - b. Degree of inconsistency of strategies for alternate scenarios.
 - 1) The opportunity cost.
 - c. Relative probabilities.
 - d. Cost of changing strategies once uncertainty is resolved.
 5. Competitor's expected choices.

- X. Scenarios help focus on the forces of the marketplace and other environments. They help us see the future with imperfect information. However, they may be the best view of an unknown future we have.

PREPARATION OF A BUSINESS PLAN

After a new crop or product is selected and integrated into a farm, a business plan should be prepared so the farmer can write down his/her reasons and plans and so that a third party, such as a potential creditor can be convinced of the worthiness of the plan and farm. The plan should be written by the farmer and not just taken from a generic report. Items that need to be included are:

1. Cover page with the names of the business and the principals involved.
2. Executive summary of the plan and resource needs. This should be only 1 to 2 pages.
3. An overall description of the business: scope, location, history, etc.
4. The production plan: enterprises, locations, timing.
5. The marketing plan: to whom, location, when, how, transportation, quality, form of product, etc.
6. Market competition--who else produces and where. Why can the business compete against them?
7. Management and staff: who will do what?
8. Financial data:

- Balance sheet
- Cash flow statement
- Resource inventory
- Income projections
- Scenario analyzes
- Historical data

9. Supporting information

- Resumes
- Financial statements
- Letters
- Other items relevant to the plan

By preparing this written business plan, a manager is forced to consider many avenues, options, problems, and solutions. It also shows a potential creditor that thought and work have been done previous to asking for money and resources.

A FINAL NOTE

A final note is on the need for all this analysis, writing, and searching. At the beginning of this paper, I said that hard analysis is needed to make good decisions. Sadly, good decisions do not guarantee profits in an uncertain world. But lack of planning certainly increases the chances of failure. It is much better to lose a lot of money on planning paper than in your own bank account. And all this work can make even good businesses better.

Good luck in your endeavors and new ventures!

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