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Approaching the Task of Optimizing Investment Decisions by Using Economic Modeling

Introduction

Most investment decisions are made to either grow a business or improve profitability. Investment used to improve the management, infrastructure or the raw materials of production must be balanced against the anticipated returns on investment (ROI) used for that improvement. The Hybrid Economic Model can be used as a trade-off tool to consider the returns that could be expected from an investment compared against the same investment but made in a different area. By examining the profit to investment ratio, investment can be made in an economically rational manner with funds channelled to areas with the highest return on investment. Important points to consider that will influence the ROI include the following:

1. level or stage of production where the change might occur,
2. whether there is a multiplication effect down the production chain,
3. the current level of production,
4. the expected improvement.

If the current level of performance is relatively high, the investment required to achieve a significant improvement may also be high. This

can best be explained by the law of diminishing returns.

The law of diminishing returns

Put simply the law of diminishing returns describes how in a production system with fixed and variable inputs, beyond some point, each additional unit of input yields less and less additional output. A simple example is optimizing the production of a harvestable crop, such as corn, by looking at the effect of two main inputs, fertilizer and seed. Figures 1 and 2 demonstrate two different aspects of diminishing returns with increasing investment and how the profit to investment ratio can be affected.

Figure 1 shows that as the quantity of fertilizer increases so does the yield but only up to a maximum point. Applying more than 240 units, yield begins to dip as either the fertilizer begins to bind nutrients or becomes toxic to the very crop being produced. The rule here is that more is not always better. At some point we also need to consider the price of both seed and fertilizer. If the crop price is low and fertilizer price high, it may be better to accept lower yields as the increased fertilizer cost does not make up for the marginal increase in yield.

Similarly, if fertilizer is relatively

cheap and crop returns high, then maximizing yield may be the best option. The best fertilizer application rate will vary depending on the price of both the crop and the fertilizer but we need to keep in mind that the optimum yield will not necessarily result in the optimum economic return.

Figure 2 demonstrates another aspect of diminishing returns with increased investment but this time with the amount of seed being planted given an optimal fertilizer application rate. We initially see a large increase in yield as the growing space is under utilized and additional planting and growing area is available. With a seed quantity above 50 units, crop yields plateau while the cost of production continues to increase due to the cost of the additional seed. Yields increase marginally with each increase in seed quantity but at some point the increasing cost is not accounted for by the additional yield. In other words, the investment to profit ratio is decreasing with every additional input increase. This situation is similar to fertilizer in that the optimum yield point does not correspond with the optimal economic point.

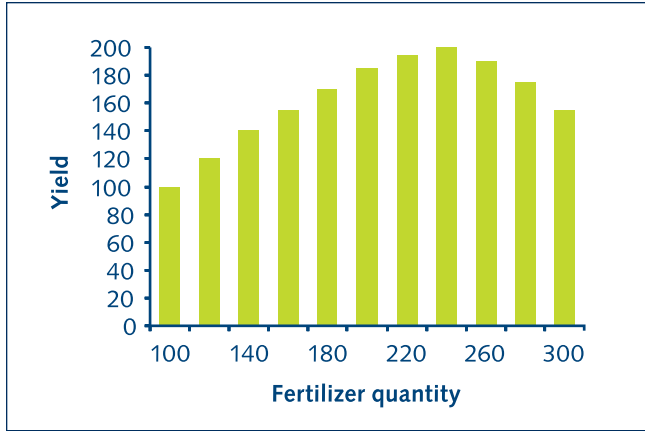


Figure 1
Crop yield at different levels of fertilizer application

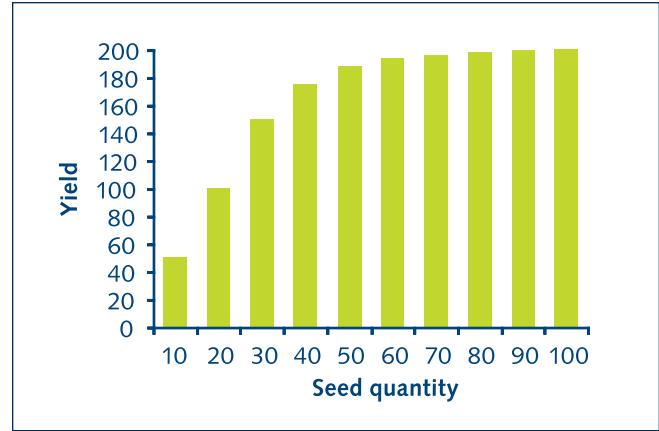


Figure 2
Crop yield at different levels of seed application

Similarly, turkey production has investment versus return decisions throughout the entire production chain. Each of these involves investment to achieve an improvement in a production parameter such as increased eggs, poult, breast meat yield or decreasing feed conversion. In order to make the best economic decision the benefits must be weighed against the cost of achieving those gains, keeping in mind the law of diminishing returns.

Each of the improvements above occurs within a specific production unit: breeder division, hatchery, commercial production and processing plant, respectively. The economic benefits to improved production can be accessed in two ways: first, the effect on the margin of the specific production unit, and second, the effect on overall company margin. Both are important depending on perspective. Individual unit performance is important to a manager controlling that unit, while overall margin is

important to all. The Hybrid Economic Model can be used to examine the effect of an action in either the unit itself or the cumulative effects on the whole operation.

If we take for example the breeder division (breeders and hatchery), it will primarily be judged by its poult cost which can be affected by any of the first three examples given in Table 1, i.e. selection, labor or hatchery equipment. It is appropriate to assess

this unit on poult cost for investment in parent-stock labor and hatchery equipment at both/either an individual unit or whole enterprise basis.

If the investment results in a decreased delivered poult price then it would warrant further investigation to determine the rate of return or payback which will be dependent on the number of poult placed (remember the law of diminishing returns).

Investment	Potential Economic Benefit
Increased parent stock selection	Improved commercial weights
More labor per laying flock	Increased fertile eggs per hen
Upgrade or replace hatchery equipment	Increased hatchability
Upgrade faulty commercial feed equipment	Improved feed efficiency
Increased number of workers on the processing line	Improved breast meat yield

Table 1
Investment and potential economic benefit

Parent stock selection, the first point in Table 1, is more complex because it will add cost to the breeder division (higher poult cost) with the economic benefits occurring in divisions downstream. Commercial production will benefit through heavier weights and decreased FCR and the processing plant will benefit by improved breast meat yield. Consequently, if the breeder division was evaluated as a stand alone unit this would result in a potential decrease in overall company profitability. Finding the optimal selection pressure in this case is a trade-off between commercial gains, tom utilization and parent stock price. This technique works by increasing investment to boost returns with the additional investment recouped in the returns together with an increase in profit.

Another way to consider the allocation of resources across an integrated company is the investment to benefit ratio between production units. Reallocating the same total investment between units may decrease the performance in one unit but significantly increases the performance of another. If the net effect is an increase in bottom line or overall profitability then the reallocation of resources is economically justifiable.

Some of the issues that could be explored using the Economic Model at each of the different levels of production include:

Multiplier breeder and hatchery

1. Will increasing breeder density decrease housing costs enough to account for a possible decrease in production due to fewer nesting boxes per bird or higher breeder mortality?
2. Is increasing the labor input (with added labor costs) justified by the anticipated increase in settable egg production?
3. Does a turkey strain with different reproductive potential, have the desired commercial performance to justify the difference in performance at the multiplier level?
4. Will a change in parent stock selection intensity produce the required improvement in bottom line profitability to account for the change in male parent stock cost?

Commercial grower

1. Will the costs for a more expensive feed ration be recouped through added weight, better feed conversions or yield in the plant?
2. Does a longer growing period increase the output per growing barn area or profit per live weight delivered to the processing plant?
3. What is the effect of late mortality on feed conversion?

Processing plant

1. Does extra yield outweigh the extra costs in production and processing?
2. What are the optimum slaughter weights given processed breast meat price?
3. What is the value of decreasing condemnation rates?

These are just a few of the questions that could be critically evaluated with an economic model to ensure that resources are allocated effectively to maximize return on investment and overall company profitability.