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Farm Managers Evaluate Biotechnology

Technological advancements and breakthroughs have occurred regularly in agriculture. Improvements include environmentally controlled confinement livestock facilities, leaner and more efficient animals, improved animal nutrition, better crop production systems, hybrid seeds, and disease control. A mass substitution of machinery for labor has also helped bring U.S. agriculture to its present highly productive status. While biotechnology represents an arena where some dramatic new discoveries are likely, the tools farm managers use to evaluate whether to use a particular new technology will most likely be tools now available—such as budgeting, cash-flow analysis, and systems analysis. The bottom line is to determine the greatest economic return.

Impacts on Dairy and Hog Farms

For some, a partial analysis of the operation may be sufficient (see Part III, Chapter 6 on partial budgeting). However, this form of analysis should be used with caution, as many technologies may have impacts beyond the specific enterprise. Managers need to thoroughly examine the interactions on their farms. For example, bovine somatotropin (BST) use in a dairy herd may at first appear to affect only the dairy enterprise. But recommendations on BST include changes in nutrition level and rations with higher energy, so an inventory of cropland and feed handling facilities may be necessary to determine whether existing resources can provide adequate rations. Specific environmental conditions may also be needed.

Porcine somatotropin (PST), like BST, can affect the whole system as well as a particular enterprise. Little is known about the differences in expected production response from PST use in confinement, partial confinement, or pasture swine production systems. Hogs fed PST may be more vulnerable to extreme temperatures, so swine facilities may need to be modified. Moreover, impacts across production systems may not be neutral. PST improves the feed efficiency and average daily weight gain of hogs, producing a leaner product which reaches market weight faster. Thus, the systematic flow of animals

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Porcine somatotropin improves the feed efficiency of hogs, producing a leaner product that reaches market weight faster. (USDA Photo by Tim McCabe, ARK-62462)

through the system may be changed. This has implications for level of facility use: Demands for grow-finish space may lessen while demands for breeding farrowing facilities may increase.

Use of PST may also change the behavior of animals. The hogs eat more often and thus are more active, increasing the chance for aggressive behavior. Also, they spend more time at the feeder. Less aggressive hogs may have more difficulty competing, so increased pen space per hog and increased feeder space may be needed.

Evaluating New Technologies

Farm managers will need to identify probable impacts of the new technology on their farm operations. To do so will require knowledge about the technology, its use, and expected production impacts. Changes that accompany a technological advance can include:

- Reduced production costs per unit
- Reduced risk
- Increased production
- New products
- Improved product quality

Economic evaluation of biotechnological advances can be difficult, and subjective judgments may be necessary where data are not available for the type of operation being evaluated. Furthermore, results under research conditions are typically more favorable than those that can be achieved on the farm.

Effective evaluation of technology adoption decisions will involve a number of factors:

- Level of production management intensity
- Level of business management ability
- Business financial health
- Availability and quality of resources

Effective use of many biotechnological products will require improved production management. Some technologies will be complex, requiring a clear understanding of animal biology and all the integrated production relationships. Information on disease population dynamics and epidemiology may also be needed. Intense production management skills will be necessary to effectively integrate all factors—such as changes in crop rotations or the need for quality feedstuffs. For example, cows receiving BST have increased nutrient requirements because milk production levels increase. Swine receiving PST have increased protein needs. In both cases, the net effect is that the cost per pound of ration increases. These impacts need to be compared to the value of increased production, keeping in mind that increased quantities of products available will lower the price received.

Successful adoption of many technologies will require a strong financial position of the business along with well developed business management skills.

Some technologies will introduce a level of instability into the industry over the adoption and adjustment process. Top level business management skills will be needed to effectively manage this instability. Since effective use of some biotechnologies may require costly remodeling of production facilities, survival will be difficult for those in a weak financial position.

Risk

An important decision variable is that of production and income variability. Evaluation of the impact of the technology on production variability is needed since some technologies will reduce variability while others will increase it. Increasing expected production levels may also increase production variability, as well as income. Adoption will depend upon the risk aversion of the producer along with the ability to absorb the potential increased risk levels.

The new technologies may perform very well when all factors perform as needed and in unison; however, an imbalance may dramatically reduce production. This further amplifies the increased pressure for intensive management.

Fixed Costs

The upfront or fixed cost of technology and its effective adoption is an important consideration. Technologies which have high upfront costs for factors such as information and knowledge gathering, purchase fees, and set up can have differing impacts depending on farm size. Large farms may be able to economically incorporate the technology while it would be too costly for smaller operators. Smaller producers may need to rely on outside expertise and advice for effective incorporation of the product.

Management Options

The relatively large and specialized farm operations have effectively streamlined the process of gathering information and management expertise. They are highly specialized. In comparison, a medium-sized family farm may have from two to six or even more enterprises. Staying current on new production technologies and other forces interacting to cause price or income shifts is a difficult task; the more enterprises on the farm, the more difficult the task becomes.

To remain competitive, the operator may become a specialist in managing some enterprises, and use a consultant or other help for intensive management information for the remaining enterprises. Thus, the operator can capture some of the advantages of both diversification and specialization. This movement to increased use of consultants could be provided by the Extension System, professional farm management firms, or other agencies. This need for information and management advice will come from owner-operated farms as well as those managed for a fee.

Records and Management Skills

The availability of biotechnological products will not alter the success formula for farming. The key to success is, and always will be, effective management. For some technological products, the importance of this success formula will be magnified, and without good management, firms are less likely to survive. Technology has an impact on farm size and effective operating level. Some technologies can be used

effectively regardless of farm size. However few, if any, technologies are uniformly effective in every size operation. Some technologies may have fixed start-up or purchase fees that are not related to the volume of production. Thus, larger operators will generally continue to have an inherent advantage over smaller operators.

Biotechnological advancements will further increase the need for good recordkeeping—magnifying the need for effective and intensive management. Managers will need better records to aid in management decisions. Knowledge of production levels and goals are needed. Operations with subpar management may gain little from adoption of biotechnological products, but those with top level management will be in position to make needed adjustments to effectively utilize the technology. For example, response of BST in dairy herds has been shown to be directly related to the quality of management in herds. Herds with effective health and nutrition programs, efficient milking practices, and proper environment respond more positively to BST than do herds with subpar management.

Biotechnology is not a product that will make a below average manager an above average manager. On the contrary it will likely magnify the weaknesses. Management and production intensity need to be at a high level before adopting innovations. Do not use technology to try to replace good management. That would be a formula for disaster. The management capacity of below average managers must be improved for effective product utilization. The premium for top-level management will grow.

Programs aimed at developing and nurturing intensive management are needed. Management effectiveness will be a dominant variable in, and must precede, successful adoption of technological advancements.

Marketing

Some biotechnological developments may lead to production of specialized products. This will increase the need for effective marketing to take advantage of any product premiums. This too may require product identification from producer to consumer. Open markets typically do not handle identification and separation of specialty products well. The needed marketing techniques, such as production and/or marketing contracts, may expand for this type of product.

Producers need information on management strategies and systems necessary to adopt and use new biotechnology products. Development of this information may eliminate much trial and error in the adoption process.

How will information on these products be developed and distributed to producers? And by whom? Private and public resources are both needed, though the most effective combination is open to debate. The demand for consulting services, both public and private, will likely increase, as it will be very difficult for operators to remain current on all factors affecting all enterprises on the operation. Only the highly specialized and large operations will be able to develop their own information base. Other farmers will need to incorporate some of this information from outside sources.