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How to Analyze Investment in Agricultural Technology

Eric A. DeVuyst, *Associate Professor, Department of Agricultural Economics, Oklahoma State University*

As any farmer or rancher can attest, investment in agricultural technology is expensive. New livestock production facilities can require a multimillion dollar investment. New harvest equipment can run into the hundreds of thousands of dollars. Genetic testing of breeding stock can be equal or even exceed a year's average return on a per head basis. Further, the returns from adopting new technology are usually uncertain. For example, will buyers pay for genetic information? What if a producer discovers through testing that his stock does not have genetics desired by the market? While theoretical-based tools are available to analyze even the most complex decision problems, the information requirements or training needed to utilize these tools are often too onerous to be practical for most real world decisions. So, practitioners rely on alternative decision tools that have lower informational requirements. While economic theory and decision analysis are not likely to be favorite topics around the family dinner table, an understanding of what economic factors need to be considered is critical to achieving a farm's financial goals. Here I discuss three criteria for analyzing complex agricultural investment decisions and some tools that producers can use to aid in investment decision making.

Decision criteria

The three criteria are

- relative scale of the investment;
- perceived riskiness of the investment; and
- the degree of reversibility of the investment.

First is the relative scale of the investment. Relative scale might be in terms of percent of business being changed or in terms of dollars invested. For example, consider a US wheat producer considering changing 160 acres to a new variety. For a 2000-acre farm, this is probably a fairly minor change. In contrast, a 160-acre change for 320-acre organic farm is a major change.

Second is perceived risk. In the previous US farm example, a 160-acre change to a new variety is most likely a low-risk decision. Producers routinely make these decisions, seed companies and land grant universities routinely publish varietal trial results, and markets likely exist for the new variety. So, this decision has a low-level of perceived risk. For the organic farmer, a 160-acre change might have very significant consequences. The wrong decision could lose the farm. So, the decision might have a high-level of perceived risk.

Third is the degree of reversibility. Some decisions can be "un-done" at a low cost and in a short-time period. In the wheat example, the larger US producer can switch back to the old variety in the next growing season, a low-cost and short-time reversal. An example of a potential high-cost and long-time reversal is the decision to change hide color in a breeding herd. Individually and collectively, US beef producers have selected for black-hided cattle in response to market premiums. While a rational response to economic conditions, it would be costly and take several years to "undo" this decision. Few producers have the financial ability to sell off existing breeding animals and replace them in a short-time period, say one or two years. Most US producers would take eight to ten years to either replace their existing breeding herd by buying new bulls and breeding in the desired hide

How to Analyze Investment in Agricultural Technology (cont.)

color or buying replacement females over several years.

Before making an investment decision, producers should consider each of these criteria and weigh them relative to the expected returns from the investment. Even if the scale is large, the risks are high and reversibility low, an investment might still be advisable if the expected returns are large enough to offset the negatives.

Applied Decision Tools

Extension specialists and farmers can utilize several decision making tools or aids. As the complexity of decision making increases, so do the informational requirements of the tools. A number of these tools are available to producers. Most are variants of budgeting. Budgeting is used to test a production, marketing and/or investment plan on paper before real world implementation. These tools are used to identify bottlenecks to profitability, compare the profitability of alternative plans, and assess cashflow difficulties. These tools include:

- Partial budgeting;
- Enterprise budgeting;
- Whole farm budgeting;
- Cashflow budgeting; and
- Capital budgeting.

Resources available to producers

One of the roles of Cooperative Extension Service faculty and staff is to develop decision tools to assist producers with decision making. Before investing in new high-priced technology, producers can visit with their local Extension educator. The educators can help direct producers to appropriate decision tools. Many land grant universities provide enterprise budgets for a wide range of crops, livestock, fruits, nuts and vegetables. And, many of those budgets are available on the internet. For example, Oklahoma State University has enterprise budgets available on line (http://agecon.okstate.edu/budgets/). The University of Minnesota maintains a farm management budget database with budgets from several states (http://www.agrisk.umn.edu/budgets/). Also, some land grant universities have the ability to work with producers to generate budgets for specialized investments. Again using OSU as an example, the Food and Agricultural Products Center (http://www.fapc.okstate.edu/index.html) provides services to individuals and companies considering investment in agricultural-related technology and businesses. Producers can contact their local Cooperative Extension Service office to find resources available in their home state.

New and Updated Publications for Cattle Producers

- “Adding Value to Cull Cows: Part II.” AGEC-621.
- “Oklahoma Cropland Rental Rates: 2010-11.” OSU CR-230.
- “Oklahoma Pasture Rental Rates: 2010-11.” OSU CR-216.
- “Cow-Calf Standardized Performance Analysis.” OSU AGEC-222.
- “Broiler Production: Considerations for Potential New Growers.” OSU F-202.
- “Evaluating Financial Performance and Position.” OSU F-790.
- “Developing a Balance Sheet.” OSU F-752.
- “Developing a Cash Flow Plan.” OSU F-751.
- “Developing an Income Statement.” OSU F-753.
- “Deferred Taxes.” OSU F-939.

OSU fact sheets are available at:

http://osufacts.okstate.edu

Enter the publication number or topic in the Search field at the top right of the screen on the website.

And at http://agecon.okstate.edu/faculty/publications.asp

Search for:

- “QuickBooks for Agricultural Financial Records”

Also, don’t forget to look for resources on Beef Extension.com where you find not only publications but also software tools.

The Science of Making and Feeding Hay

Dr. David Lalman, *Professor and Extension Beef Cattle Specialist*, **Austin Sexten, Casey McMurphy,** and **Gant Mourer**, *Graduate Research Assistants, Department of Animal Science, Oklahoma State University*

Tremendous effort and expense goes into growing, cutting, baling, storing, transporting, and feeding hay in cow/calf enterprises throughout the U.S. The Southern region is no exception. In fact, recent data surveying 729 Oklahoma producers (Vestal et al., 2007) indicates that only 10% of cow/calf operations have a hay feeding season of 60 days or less. Most rely on harvested forages as the primary source of dietary nutrients for the majority of the winter. This is surprising, and perhaps unfortunate, as most economic analyses indicate that extending the grazing season, while minimizing or eliminating hay feeding is the way to go. This makes sense. After all, the Southern region of the U.S. does have a longer growing season and milder winters compared to our neighbors to the North.

One of the goals of our extension program in Oklahoma is to increase the percentage of producers that feed hay for less than 60 days each year. At the same time, it is evident that there is MUCH room for improvement in terms of the efficiency of hay storage and feeding practices. For example, in an early experiment (Bell and Martz, 1973), round bales of hay fed with no ring feeder resulted in 45% hay waste! In this same experiment, the Missouri group documented that a simple ring feeder placed around the bale resulted in 9% hay waste. Our cow/calf research group at OSU has recently conducted preliminary experiments aimed at finding critical control points where hay feeding efficiency and winter nutrition might be improved for cow/calf operations.

If producers are going to determine how many bales of hay they will need for the winter and know how much hay should be provided to meet cows' nutrient requirements, a handy thing to know is the weight of the bales. Do you really know what your bales weigh?

In one of our preliminary hay feeding experiments, 32 bales of prairie hay were harvested from one hay meadow using a single tractor, baler, and tractor operator. Each bale was weighed and sampled for later chemical analysis. If we only consider the dry hay content of each bale (subtract each bale's moisture content), the lightest bale contained 1,017 pounds of dry hay while the heaviest bale contained 1,507 pounds of dry hay. The mean (average) bale weight on a dry basis was 1,144 pounds with a standard deviation of 115 pounds. This indicates that approximately 2/3 of the bales would fall within the range of the mean plus or minus one standard deviation (1,029 to 1,259 pounds). Perhaps the moral of this story is to beware of weighing one bale of hay and thinking that you'll be "dead on" in terms of knowing what your bales weigh. What if you'd only weighed the little bale… or the big one for that matter?

Another handy statistic to evaluate how variable a value is when measured within a sample population (the 32 bales of hay in this example) is the coefficient of variation (CV). Sounds complicated doesn't it? Not really. The CV is simply calculated by dividing the standard deviation by the mean and multiplying by 100. In this sample population of 32 bales, the CV is 10%. Said another way, the average variability is about 10% of the mean bale weight. As a reference, when we weigh cattle individually within a herd, it is common to have a CV ranging from about 8 to 12%.

Now let's look at the variability of hay feeding waste. We measured the amount of waste created when each of these bales of hay were fed during the winter. The bales were fed in round bale rings with a metal skirt around the bottom 18 inches (see Figure 1). Four five-acre pastures were used and each pasture was equipped with a 30' by 40' concrete pad to facilitate accurate hay waste collection.

Figure 1. Round bale "ring" feeders with metal skirts were placed on large concrete slabs to facilitate accurate waste data collection.

Among the bales fed, the minimum waste (expressed as a percent of the original dry weight of the bale) was 1.1 percent and the maximum was 20.5 percent (see Figure

The Science of Making and Feeding Hay (cont.)

2). The mean waste was 8.6 percent with a standard deviation of 4.8 percent. Now you have the information required to calculate the CV, which is just over 52%! These CVs can be compared directly. The take-home message here is that even though the weight of the bales appeared to be variable (10%), hay feeding waste in this study was much more variable (52%). Apparently, we need to determine what factors contribute to this tremendous variation in hay feeding waste and work to minimize it.

Figure 2. Waste (hay collected and measured outside of the feeder) for this particular bale was determined to be over 20%.

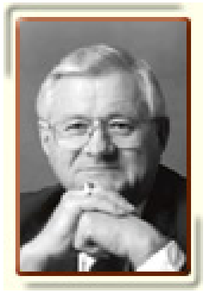
Another source of variation could be the chemical composition within each of the 32 bales harvested and fed. To understand this potential source of variation, a mechanical probe was used (Figure 3) to sample each bale twice. The two samples were blended on an equal weight basis and the composite samples were analyzed using wet chemistry in a laboratory.

Figure 3. A mechanical probe was used to collect forage samples from each bale.

The mean crude protein concentration was 6.6% on a dry matter basis. This is about average for prairie hay harvested in central Oklahoma during the month of July. One might expect that the chemical composition should be somewhat less variable than bale weights and feeding waste. After all, maturity and damage from rainfall and storage are major contributors to variation in harvested forage chemical composition. Of course, each bale in this experiment was harvested on the same day and exposed to exactly the same environmental conditions. Just like you might expect, variation in crude protein was low with a minimum of 6.2% and a maximum of 7.6%. The standard deviation was 0.34% and the resulting CV was only 5.2%.

Plant cell wall content is measured as neutral detergent fiber (NDF) in the laboratory and this value is used in some indexes and equations as one important component in determining nutritive value, predicting dry matter intake, and estimating market value. The mean NDF concentration of these 32 bales was 68.7% with a standard deviation of 1.3% and CV of only 1.9%. The low CVs for crude protein and NDF suggest that these 32 bales were very uniform in terms of nutritive value and that one would not need to sample more than 4 to 6 bales in order to be very confident in the laboratory's chemical composition data. Obviously, chemical composition of hay will vary much more among forage species, hay meadows, harvest dates, varieties, etc. This is why we encourage producers to spend the $12 to $50 to get each "lot" or "cutting" from one hay meadow analyzed in the laboratory.

We hope you have enjoyed taking a peek into the science of making and feeding hay. While we'd like to continue to work to minimize the amount of purchased or harvested forage needed to manage a cow/calf operation, it is apparent that there is much opportunity to improve on the efficiency of hay feeding systems. Your comments and suggestions are welcome and can be forwarded to david.lalman@okstate.edu.



When Is an Operating Arrangement a Partnership?

Neil E. Harl, *Charles F. Curtiss Distinguished Professor in Agriculture and Emeritus Professor of Economics, Iowa State University, Ames, Iowa. Member of the Iowa Bar, 515-294-6354, harl@iastate.edu*

A 2010 Tax Court case addressed the informality of a father-son farming operation that had been running for more than three decades. The gist of the controversy was that the father and son shared the income roughly on a 50-50 basis but the father consistently claimed more than 50 percent of the expenses which were used to offset a profitable accounting practice that, in the years in question, generated an average of $253,365 in Schedule K-1 income.

The case will undoubtedly create heartburn for many such operations characterized by vague and seemingly inconsistent rules for allocation of income and expenses.

What is a partnership?

When the arrangement was initially formed, in 1977, the father did not transfer any interest in the separately owned properties (held in the father's name) to the son and took no steps to clarify their respective interests in the livestock or equipment although the father and son had an understanding that all properties involved in the farming operation would pass to the son at the father's death. By 2004, the first year under scrutiny on audit, the operation had developed into a profitable cattle farming venture.

The father and son argued that the arrangement was a joint venture between two individual proprietorships although they offered little in the way of evidence as to the justification for the unequal allocation of expenses which had varied from year to year. As an example, the father deducted 11.4 percent of the operation's depreciation (including expense method depreciation) in 2004, 79.4 percent in 2005 and 47.2 percent in 2006. Moreover, the arrangement was never committed to writing. The Internal Revenue Service took the position that the arrangement was a partnership with two equal partners and pressed the issue to the point of levying accuracy-related penalties on the father. The regulations, for the years in question, presumed that all partners' interests are equal, on a per capita basis. That regulation was amended, effective for taxable years beginning on or after May 19, 2008 to remove the presumption, but the amended regulations were not applicable in Holdner.

The Tax Court agreed that the existence of a partnership for federal income tax purposes is a question of federal law, in accordance with a lengthy array of cases, The Tax Court noted that the Internal Revenue Code defines a partnership as ". . . a syndicate, group, pool, joint venture, or other unincorporated organization, through or by means of which any business, financial operation, or venture is carried on , and which is not . . . an estate or trust or a corporation."

The court acknowledged that a partnership for federal income tax purposes is basically the same as the definition of a partnership for commercial law purposes but more detailed, although the federal statute controls for determining the existence of a partnership for federal income tax purposes. The Tax Court in Holdner then proceeded to cite approvingly to a 1964 Tax Court decision, Luna v. Commissioner, which listed eight factors that are relevant in determining whether an enterprise is a partnership for federal income tax purpose –

(1) the agreement of the parties and their conduct in executing its terms;
(2) the contributions, if any, which each party has made to the venture;
(3) the parties' control over income and capital and the right of each to make withdrawals;
(4) whether each party was a principal and coproprietor, sharing a mutual obligation to share losses;
(5) whether business was conducted in the joint names of the parties;
(6) whether the parties filed federal partnership income tax returns or otherwise represented to others that they were joint venturers;
(7) whether separate books of account were maintained for the venture; and
(8) whether the parties exercised mutual control over and assumed mutual responsibilities for the enterprise.

When is an operating arrangement a partnership?(cont.)

Interestingly, the Tax Court in the 1964 case refused to find that a partnership (or joint venture) existed. The Tax Court in Holdner found that seven of the eight factors supported the holding that the operation was a partnership for federal income tax purposes and the one remaining factor neither supported nor weighed against the court's finding.

The outcome

The Tax Court held that the arrangement in Holdner was a partnership for federal income tax purposes in the years in question (2004 through 2006) and that the individuals involved were equal partners in the partnership. It followed that the income, expenses and other partnership items had to be allocated accordingly.

Would the result have been different under the regulations in effect for taxable years beginning on or after May 19, 2008? That would seem to turn on the perceived importance of the presumption in the earlier regulations.

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Recent Trends in Oklahoma Pasture Rental Rates

Damona Doye, *Sarkeys Distinguished Professor*, and **Roger Sahs**, *Extension Assistant, Department of Agricultural Economics, Oklahoma State University*

Recent economic conditions have led to numerous assets shedding significant value and the impact of the devaluation on asset portfolios has impacted many. However, Oklahoma's agricultural real estate values have not fallen as compared to their housing and commercial counterparts. Farmland markets have benefited from low interest rates, strong commodity prices, and outside investors looking for alternatives with potential income and value growth. But will this strength continue? To help address this question, we examine recent agricultural rental rates in Oklahoma, an important indicator of relative land profitability.

Within Oklahoma, four sources offer insights into rental rates: OSU survey data, Oklahoma Agricultural Statistics Service county level data, the Oklahoma Commissioners of the Land Office auction results and the Kansas City Federal Reserve Bank's Quarterly Ag Credit Survey. Links to relevant websites are provided at the end of this article.

Let's look at these briefly in turn. Results of the OSU farmland leasing survey conducted with Oklahoma Ag Statistics in August document some differences in rental rates by region and type of pasture (Table 1). Averages are shown in bold with the range in reported values below the average. The state average rental rate for native pasture was $11.61 per acre per year with responses ranging from $3 to $28.20 per acre. This points out the great variability in negotiated rates, which may be associated with location, fencing, water, roads, hunting privileges or even personal ties. The average was up slightly from $11.18 in 2008. Native pasture rental rates were lowest in northwest Oklahoma at $10.07 per acre and highest in north central Oklahoma at $13.04 per acre. The state average rental rate for Bermuda pasture was $16.61 per acre, down $0.59 per acre from the previous survey, with responses ranging from $5 to $40. Rates were lowest in southwest Oklahoma and highest in north-central Oklahoma.

Table 1. Average Annual Pasture Cash Rental Rates ($/acre)

	NW	SW	NC	E	State
Native Pasture (range)	**10.07** (3-22)	**11.04** (3-25)	**13.04** (5-24)	**12.76** (3-28)	**11.61** (3-28)
Bermuda (range)		**13.95** (5-30)	**19.42** (10-40)	**16.80** (6-40)	**16.61** (5-40)
Other Pasture (range)		**12.60** (9-18)		**25.31** (13-45)	**16.10** (5-45)

Source: OSU CR-216

Pasture rental rates for small grain pasture aver-

Recent Trends in Oklahoma Pasture Rental Rates (cont.)

aged $0.39 per pound gain and $2.75 per hundredweight per month for winter grazing (November through March) Table 2). (A cautionary note: these results are based on relatively few responses.)

Table 2. Average Annual Small Grain Pasture Cash Rental Rates ($).

Small Grain Pasture Winter grazing (Nov-March) (range)	**0.39/lb of gain** (0.35-0.50)	**25.28/acre/season** (10-38.44)
Small Grain Pasture Winter grazing and-Grazeout (Nov-Oct) (range)	**0.48/lb of gain** (0.40-0.65)	**31.64/acre/season** (8-120)

Source: OSU CR-216

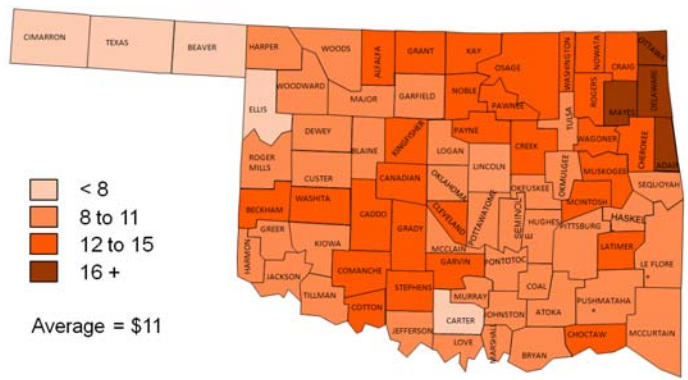
The USDA/National Ag Statistics (NASS) data for Oklahoma provides a historical context for pasture cash rents, showing that pasture rental rates rose steadily from the 1960s to the early 1980s, bounced around in the 1980s during the farm crisis, then declined until around 2000, increasing steadily since then (Figure 1). Pasture cash rents averaged $11.00 per acre in Oklahoma in 2010.

Figure 1. Oklahoma Pasture Cash Rental Rates, 1960-2010 ($/acre).

Source: USDA NASS

For the past several years, USDA/NASS has also reported county level cash rental rates for pasture. The 2010 county rates were used to develop Figure 2 which shows how average rates vary across the state. Average rental rates are highest in northeast Oklahoma and also above the state average in wheat-producing areas of the state which tend to be above average in productivity. Counties in the northwest with lower rainfall have lower average rental rates.

Figure 2. 2010 Rental Rates for Pasture by County ($/acre).



Source: USDA NASS, 2010
* Indicates rate for Other (Combined) Counties

The Oklahoma Commissioners of the Land Office land auction results also provide some county-level data on rental rates though auctions are not held in every county every year. The legal description, number of acres, minimum annual rent required as determined by the OCL appraisers, the high bid, and high bidder are reported.

In its Third Quarter 2010 Survey of Tenth District Agricultural Credit Conditions, the Federal Reserve Bank of Kansas City reports that farmland values are climbing and credit conditions improving for the 10th District. (The 10th district includes Colorado, Kansas, Nebraska, Oklahoma, Wyoming, the northern half of New Mexico and the western third of Missouri.) They report that district annual farmland cash rental rates were also up, with less dramatic gains for rental rates compared to land values with ranchland rental rates up 2%.

Summary

Pasture rents have risen steadily in recent years. Whether you are renting land for yourself or renting pasture to others, knowing the market rates for your area is important. The different sources for rental rates offer different insights and should be considered when negotiating land values and cash rents in a particular situation. Fair rates are negotiated between informed parties who may value property characteristics differently. Written agreements are an asset to all parties to ensure that important issues are addressed.

Recent Trends in Oklahoma Pasture Rental Rates (cont.)

Agricultural land values and cash rent information:

Kansas City Federal Reserve Bank: http://www.kc.frb.org/research/indicatorsdata/agcredit/
Midwest Plan Service Free Lease Forms: http://www.mwps.org/index.cfm?fuseaction=c_content.view&pageID=257&catList=239,254,257
Oklahoma Commissioners of the Land Office Fall Auction Data:
http://www.clo.ok.gov/REM/REMLeaseResults.htm
OSU CR- 216, Oklahoma Pasture Rental Rates: 2010-11.
http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-7364/CR-216web10-11.pdf
OSU AGEC-214, Developing Cash Lease Agreements for Farmland,
http://osufacts.okstate.edu/docushare/dsweb/Get/Document-1793/AGEC-214web.pdf
USDA NASS Charts and Maps of Land Values and Rental Rates:
http://www.nass.usda.gov/Charts_and_Maps/Land_Values_and_Cash_Rents/index.asp
USDA Land Values and Cash Rents 2010 Summary:
http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1446

Damona Doye
515 Ag Hall
damona.doye@okstate.edu
405-744-9836

David Lalman
201 Animal Science
david.lalman@okstate.edu
405-744-6060

Oklahoma State University
Stillwater, OK 74078