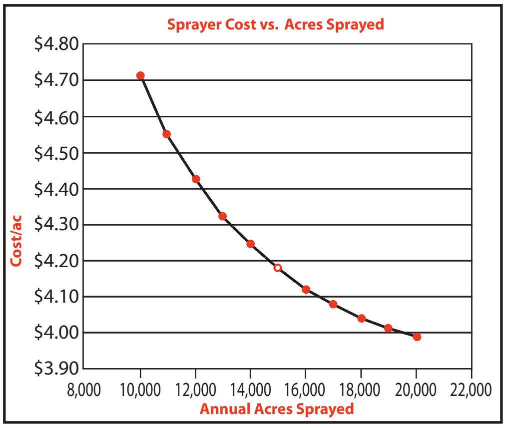
Purchasing a Sprayer — Demystifying the Payback

Because many farmers relied on custom applicators in the past, justifying a sprayer investment is a new exercise. Here are some of the considerations, and tools, to help make an informed decision.

By Mike Lessiter, Editor/Publisher

Unlike many pieces of farm equipment, a sprayer is not something that Dad or Granddad absolutely had to buy. When spraying became common to cropping operations, there was an opportunity to outsource it to a custom applicator and avoid tying up the capital and adding to the responsibilities of the already overworked farmer.

But times have changed. "The recent trends toward less tillage, brought about by advances in farm chemicals, especially herbicides, has sharply increased the availability and interest in self-propelled crop sprayers that can be used for both pre- and post-plant treatments," says Terry Kastens, ag economist at Kansas State Univ. Now that farmers have become more skilled on the chemical side, they're paying more attention to application costs, timeliness and equipment selection. And for many farmers, this means taking on their own applications for better control over their destiny, should capacity from the custom applicator dry up when a problem strikes.



The costs per acre decreases dramatically by the total acres sprayed. Terry Kastens believes that most users doing more than 15,000 acres have opportunities for greater efficiencies due to field size, layout and other factors.

An Online Spreadsheet Tool

Kastens and Kevin Dhuyvetter, also of Kansas State's ag economics department, have written papers on evaluating sprayers and compiled an "OwnSprayer" spreadsheet model for growers to use. It is available online at www.agmanager.info/farmmgt/machinery/OwnSprayer.xls.

Their model examines the following variables in evaluating a sprayer.

- ✘ **Sprayer's class, age & accumulated hours at the time of purchase**
- ✘ **Sprayer's expected purchase price** — dollar amount expected to be paid, not factoring a trade-in.
- ✘ **Sprayer's market price** — determines a number of other costs, including a new equivalent price used to determine accumulated repair costs over time and thus annual repair costs. It also initializes the market value series that determines annual depreciation, opportunity interest costs and property tax/insurance/shelter costs.
- ✘ **Cash downpayment**
- ✘ **Number of seasons the sprayer will be used before it is sold**
- ✘ **Boom width and travel speed** — Used to calculate the theoretical acres per hour.
- ✘ **Sprayer's operating efficiency** — "Relative to many field operations, and partly due to fast travel speeds, crop sprayers are generally not very efficient," says Kastens. "Substantial time is spent moving from field to field, slowing down for turnarounds and tendering the sprayer." According to the Farm Machinery Operation Cost Calculations (FMOCC), a field range of 50-80% is estimated for pull-type sprayers operating at 3-7 mph. "Self-propelled sprayers are less efficient. We suggest values in the 30-50% range." The field efficiency determines the actual acres covered per hour.
- ✘ **Number of acres covered annually by the sprayer** — The total number of acres covered and the actual acres per hour predict the number of hours expected to be put on the sprayer each year — a key variable for determining repairs, market depreciation and labor costs.
- ✘ **Relevant labor information** — Because of time spent traveling to and from fields and sprayer service time, labor hours are typically greater than the sprayer's engine hours. "Unless the farmer has more accurate information, we suggest that the labor needs will be 1.1-1.5 times the sprayer engine hours," says Kastens, or an additional 10-30 minutes of labor per sprayer engine

hour. A realistic hourly wage, with payroll taxes and fringe benefits, must also be included.

- ✘ **Fuel per hour & price per gallon —** Fuel per hour should be the expected gallons per hour that are consumed by the sprayer. Additionally, farmers must consider oil and lubrication as part of the fuel costs. The FMOCC estimates oil and lubrication to be another 10% of fuel, says Kastens.
- ✘ **Repair adjustment factor —** This is necessary to allow for repairs that increase as sprayers age with use. The Kansas State model uses a complex formula to arrive at this figure.
- ✘ **Property tax, insurance & shelter —** This is considered to be a fixed percent of the sprayer's market value. Assuming no property taxes, the FMOCC suggests a value of 1.5%.
- ✘ **Interest rate, income & self-employment taxes —** Typically, federal income tax rates for sole proprietors are either 15% or 28%, with state rates at 4-5%. For many users, a dollar of expense saves both income tax and self-employment tax, as does tax depreciation. Depreciation recaptured when a used sprayer is sold garners only income tax.
- ✘ **Tax depreciation**
- ✘ **Tendering costs —** A tendering cost of $1-1.50 per acre is reasonable, though tendering costs varies widely for different situations due to different application rates and field sizes.

Opening Eyes

According to Kastens, one of the most unique things he and Dhuyvetter learned through their work was the inherent mechanical inefficiency to spraying. "That efficiency level — we assume around 35% — is what surprises people the most," says Kastens, noting that a 100% level would be full utilization of the machine, which is not possible in spraying. "Tractors and combines don't have nearly as much non-field coverage time." He attributes the lack of efficiency to travel speeds, wide boom widths that cause a lot of time spent on headlands and overlaps — or "a lot of driving around." The inefficiency with sprayers is the biggest difference vs. determining equipment paybacks for other farm equipment, says Kastens.

Farmers who've used Kastens' and Dhuyvetter's model have discovered that used equipment often exists that can get the job done. "As with any spreadsheets, most farmers realize that there is a used machine that they can buy that will lower costs enough to pursue ownership where they would not otherwise be able to consider it.

"The spreadsheet modeling always opens eyes to the economies of size. For the smaller size farm, they're often better off hiring it out. But it's eye-

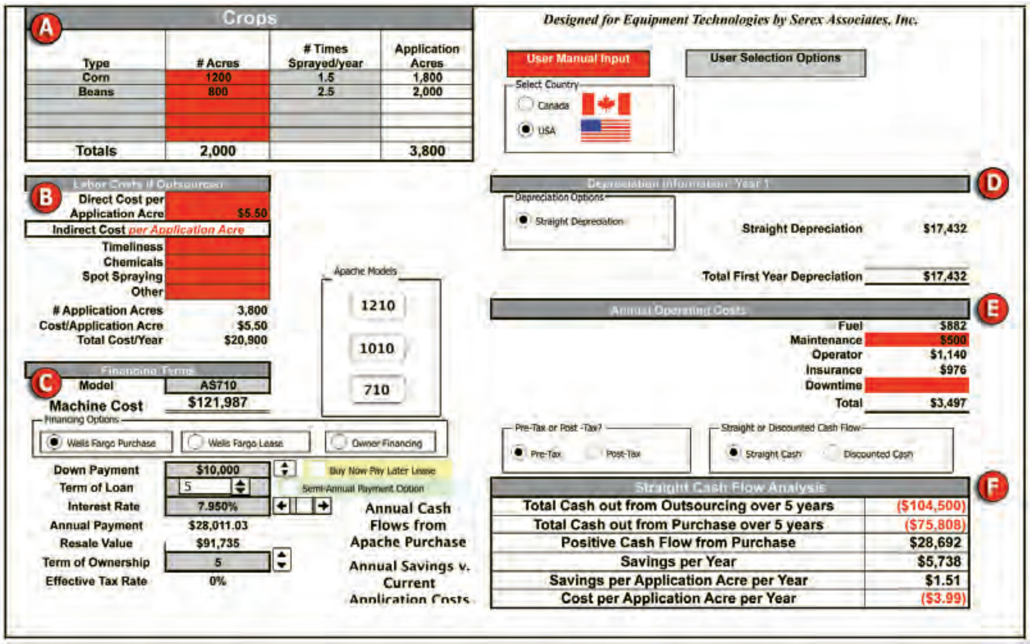


Chart 3: Equipment Technologies' spreadsheet-based modeling tool is shown for the Iowa farm operation described in the text. This model, which features fields for entering data as well as relational databases to draw from, concluded that this corn and soybean farmer could purchase a nearly $122,000 sprayer for a savings of $1.51/acre vs. continuing with the custom applicator.

opening how much costs fall when the sprayer will be used more intensively."

A Cost-Justification 'Walk-Through'

To illustrate how to calculate a cost justification for a sprayer, the experience of a typical Iowa farmer, who didn't think a sprayer could be justified on his 2,000-acre farm, is described here. This article applies the scenario to a proprietary spreadsheet-based program developed by Equipment Technologies and Serex Associates.

Equipment Technologies CEO Matt Hays, a certified public accountant by trade and an admitted statistical "gearhead," helped develop the model with statistics and operational professionals from Indiana Univ. The model has been used by Equipment Technologies staff and dealers for 2 years.

This hypothetical examination considers a 2,000-acre farm operation that is 60% corn, 40% beans and currently relies on a custom applicator for the spraying.

A. Crops

Here, the data on the operation is provided. As mentioned, the operation grows 1,200 acres of corn and 800 acres of soybeans. In the farmer's region of Iowa, corn is typically sprayed 1.5 times per year, and beans 2.5 times per year. This results in 3,800 application acres.

B. Labor Costs, If Outsourced

The farmer has been paying a custom applicator $5.50 per acre sprayed, for a total of $20,900 annually.

Other factors to consider are timeliness, chemicals, spot spraying and miscellaneous items. While difficult to quantify in the model, these are elements that should be considered, as they factor into the decision. In this example, the farmer realized that these were legitimate issues, yet didn't have data to include in the justification.

"Farmers acknowledge that there is a premium to be paid for getting the spraying done when it's needed," says Hays. "When it's not done on time, there can be a definite impact on final yield. The application window for spraying can be tight due to crop development, moisture and general weather conditions. How much yield is lost really depends on how badly missed the application is, but when a disease common to corn or beans occurs and the custom applicator's open capacity disappears, this could make a difference between a year that's in the black and in the red."

Chemicals are another variable to consider, says Hays. "Generally, the farmer is paying a premium for chemicals when buying them from a custom applicator — it's part of the applicator's business model." According to Hays, farmers doing their own spraying have realized a 10-15% savings by shopping around for the best deal on pesticides and fertilizer.

C. Financing Terms

Next, data on the actual unit and its cost are considered. In this model, the farmer wanted to see the numbers run on a 750-gallon sprayer, or in this manufacturer's case, its AS710 model. In this example, with options that include the Raven SCS 4400 rate control and radar, Rotaflush, Hypro chemical eductor, foam markers, fence row nozzles (both sides), front and rear fenders, and combo-boom (allowing 60- or 80-ft widths), the transaction machine cost came to $121,987.

Next, grower-specific data are entered. This farmer plans to make a financed purchase (5-year terms) and has $10,000 for a down payment. The database drew an interest rate of 7.950%, which resulted in an annual principal and interest payment of $28,011.03. This figure represents $7,111 more than the cost of paying the customer applicator. The next point, however, is a key one in the evaluation, says Hays.

The farmer expects to keep the unit for 5 years, which is entered into the "Term of Ownership" field. Once this number is entered, the model draws on Apache's database of transactions from its dealers, which is updated annually. According to Hays, the model "throws out" outlying mini-

To Pull or Not to Pull: That is the Question

With the continued increase in farm size and the steady move toward less tillage and GMO crops, a growing number of producers are looking to buy their own high-capacity crop sprayer. The debate that naturally follows is whether to buy a self-propelled machine or a pull-type sprayer.

Granted, a self-propelled machine is always ready to go when the producer needs it. Plus, it's much more suited to chemical applications in tall crops like corn that has already begun to tassel. Yet some farmers may not put enough hours on a self-propelled machine to justify the initial cost.

The other option is a pull-type sprayer. In some cases cases, a top-end pull-type sprayer can be purchased for one-third of the cost of a low-end self-propelled sprayer.

A pull-type is attractive to customers who wish to maximize their tractor utilization. By using an existing tractor, the producer avoids any additional investment in horsepower, as well as the on-going expense of maintaining a separate powertrain. There is also a savings in the maintenance of the additional electrical and hydraulic systems, air conditioner, etc.

With tank capacities up to 1,600 gallons, many pull-type sprayers can go longer between refills than some self-propelled sprayers. That factor can easily make up for any speed difference, making a pull-type sprayer just as productive, if not more so, at a fraction of the cost.

The first step is to consider how much the farmer can afford to pay and how many acres need spraying, on average, per year. If a farmer covers 3,000 acres per year, a 1,200-gallon model with 60-foot booms can cost as little as $1.73 per acre compared to $2.20 for a 1,600-gallon model with 90-foot booms. Naturally, the price difference diminishes as the acreage increases. On the other hand, users need to consider what their time is worth, since a bigger sprayer gets the job done a lot faster.

Either way, the capital expense difference between a pull-type machine and a self-propelled model in just one year is like getting a 38-bushel-per-acre yield increase on a 2,500-acre corn crop. The pay-back for a pull-type sprayer simply requires fewer acres sprayed each year than a self-propelled machine.

Conversely, it doesn't pay to cut corners on a sprayer just to save a little money. Since sprayer performance directly affects crop yields, producers can't afford low-cost sprayers that deliver uneven coverage, inaccurate boom control or fail to thoroughly mix chemicals.

The higher-quality sprayer may cost more up front, but considering the benefits and resale value, a good-quality model doesn't cost any more in the long run.

— Pat Meenen, president, RHS/Bestway Sprayers, Hiawatha, Kan.

mums and maximums to arrive at a normalized average figure. According to the model, the resale value of this unit (with the options selected) at the end of 5 years is $91,735.

"This is an important consideration," says Hays. "It's like renting vs. buying a home. If you looked only at the annual payment, you could conclude that it made more sense to stay with a custom applicator. But, the farmer ends up with an asset worth $90,000, so he's built equity at the same time as getting more control over his cropping application."

D. Depreciation Information

Using straight depreciation, the model pulls from an IRS-prepared depreciation table, to show that the first-year depreciation of the unit is $17,432.

E. Annual Operating Costs

This section shows the costs that the farmer could expect to incur from handling the spraying himself. Diesel fuel for 3,800 acres covered (based on a formula of $2.90 per gallon and 12.5 acres per gallon) is expected to be $882. Maintenance was estimated at $500, and the operator costs were $3,000 (based on $15/hour at an application rate of 50 acres/hour). Insurance is projected at $976, which is pulled from a database of both dealers and insurance carriers.

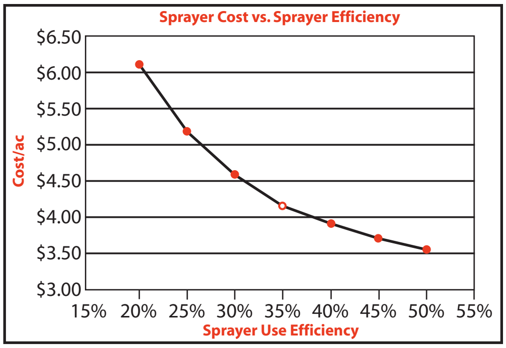
F. Cash Flow Analysis

The model allows analyses of both straight cash flow and discounted cash flow (factoring in the time value of money), as well as on a pre-tax and post-tax basis. In this example, the farmer simply wanted to see the numbers in the easiest way possible, which was a pre-tax basis with straight cash flow analysis.

The total cash out from outsourcing over 5 years was $104,500. This was the cost of remaining with the status quo — continuing to pay the custom applicator. Actually, this may be conservative, as the estimate is based on 2006 season rates of $20,900, with no adjustment made for inflationary costs, including the higher-priced chemicals or the applicator's labor.

The next line, "Total cash out from purchase over 5 years," is factored by the annual payment ($28,011.03) for 5 years plus the downpayment ($10,000) and 5 years of annual operating costs ($17,485) minus the resale value ($91,735). This figure factors the net cash outflow after acknowledging the equity in the machine, or what Hays calls "monetizing the value of the purchase transaction."

The positive cash flow from the purchase was $28,692, which is divided by 5 years to arrive at an annual savings of $5,738. Comparing the farmer's per-acre application cost of $3.99 to the custom applicator's $5.50 rate, results in a savings per acre of $1.51. FC



Kastens' chart shows the cost reductions possible with increased gross sprayer efficiency, which is determined by boom size, speed of travel, acres sprayed and the hours on the machine. "Gains in efficiency are found in getting to where there's less overlap, moving better with auto-guidance and doing a better job on the headlands," he says.