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"If it isn't Broken, Break it and Make it Better": The Economics of Repurposing a Pesticide Sprayer for Herbicide Application

Margarita Velandia, Professor, Department of Agricultural and Resource Economics, University of Tennessee Institute of Agriculture
Peyton Crosby, Plant Health Supervisor, Cherrylake, Inc.
Chris Marble, Associate Professor, Department of Environmental Horticulture, University of Florida
Zoe Turner, Undergraduate Research Assistant, Department of Agricultural and Resource Economics, University of Tennessee Institute of Agriculture
Le Chen, Assistant Professor, Department of Agricultural and Resource Economics, University of Tennessee Institute of Agriculture
Alicia Rihn, Assistant Professor, Department of Agricultural and Resource Economics, University of Tennessee Institute of Agriculture
Todd Gentry, Director of Production, Cherrylake, Inc.
Austin Spivey, Production Manager, Cherrylake, Inc.

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1. Preface

This publication assists with understanding the economics of repurposing a pesticide sprayer for herbicide application in nursery operations. Specifically, we describe the cost of converting a pesticide sprayer for herbicide application and the economic implications of purchasing a pesticide sprayer that is later modified for an alternative use.

This publication is not intended to be a definitive guide to production practices or technology modification, but it provides guidance on estimating the physical and financial requirements of comparable technology modifications for nurseries in similar contexts. Specific assumptions were adopted for this study based on a specific nursery example, but these assumptions may not fit every situation since production costs vary across nurseries depending on the following factors:

- Capital, labor
- Type of plants grown (e.g., plant height and form, container size, spacing and plant species)
- Cultural practices (e.g., granular vs. liquid or spray-applied herbicide application)
- Input prices (i.e., herbicide prices)
- Size of the operation
- Topography

To avoid unwarranted conclusions for any particular operation, readers must closely examine the assumptions made in this study, including operation size, herbicide program, labor and herbicide costs, and then adjust expenses, revenues or both as appropriate for their operation.

2. Herbicide Application Equipment

The nursery industry uses many different types of pesticide application equipment, including different types of sprayers, blowers, foggers and various granular application equipment (e.g., hand-shakers, hand-crank rotary spreaders). Because the nursery industry is highly diverse in terms of species produced, layout, production systems and the size of operations, each nursery will have relatively unique pesticide application needs, including equipment requirements. Previous reviews and research articles have detailed the advantages and disadvantages of various pesticide application equipment types, as well as the production systems in which these equipment types are most feasible (Failla & Romano, 2020; Giles et al., 2008; Khamare & Marble, 2025). In general, smaller nurseries can make all of their applications using relatively inexpensive equipment such as manual spreaders, backpack sprayers, different types of automated granular spreaders or small skid-sprayers. In contrast, larger nurseries typically require multiple tractor-driven systems to meet their pesticide application needs.

For weed control, container nursery operations primarily rely on preemergence herbicides, as they are the most cost-effective method of weed control and due to a lack of labeled selective postemergence herbicide options. Preemergence herbicides are formulated as either granulars and applied as dry material or as a spray-applied formulation that uses water as the carrier, such as wettable powders, emulsifiable concentrates or water dispersible granulars. The primary advantage of granular formulations is that there are more herbicide active ingredients and combinations of active ingredients labeled for over-the-top use in ornamental plant production, as they tend to cause less phytotoxicity in general compared with spray-applied formulations. In contrast, there are fewer spray-applied formulations available for growers, but they typically cost approximately 50 percent to 75 percent less than the comparable granular formulation, depending on the active ingredients. Many spray-applied formulations are often applied with tractor-driven equipment such as spray booms, and therefore, they can be applied more quickly than granulars and at a lower labor cost.

Granular herbicides currently comprise the bulk of most nurseries' weed control programs. Granular application equipment can range from small homemade shaker jars or gravity flow type spreaders (Spred-Rite, etc.) for small areas to large tractor-driven spreaders which might be used in field production systems. The most common type of granular application equipment used today is a hand-crank chest-mounted spreader or "belly grinder" type spreader. These spreaders are held at chest height with straps around the shoulders and neck. They are gravity-fed with an adjustable hopper and a rotating impeller that disperses the granular material in an arc pattern as the operator turns the crank. These spreaders are popular, as they allow for application in tight spaces, are relatively efficient in terms of labor use and are user-friendly. However, as they apply herbicide in a relatively large swath, they can be prone to applying large quantities of herbicide off-target (outside the container). These spreaders also pose other challenges in terms of calibration, as factors such as walking speed and hand-crank speed will vary from applicator to applicator, which can result in uneven applications. The latest technology in granular herbicide application is the use of agricultural drones. Many different makes and models are available, which can apply over 100 pounds of material, treating 0.5 to 1 acres of production space relatively accurately in less than 5 minutes. Use of this equipment is still in its infancy and mainly in the trial stage at several nurseries, but it will likely be more widely adopted in the near future.

While most nurseries are still on a granular-only preemergence herbicide program, many operations are beginning to implement more liquid/spray-applied herbicides due to the potential cost savings. Spray-applied herbicides can be applied in many different ways, but most operations use either small compression backpack-type sprayers, skid sprayers (hose and reel sprayers), or some version of a boom sprayer.

Backpack sprayers and other small compression sprayers typically hold around 2 to 4 gallons of water and are either manually compressed to provide pressure, or they may use battery-powered pumps. These sprayers are most commonly used to spot-treat weeds with postemergence herbicides, but can also be used to apply preemergence herbicides to plants, typically in smaller nurseries. Skid sprayers are mobile sprayers with a hose, spray gun, motor, and a tank that is usually mounted to a trailer. They are more labor efficient than a typical backpack-type sprayer because the tanks can be larger, thus a larger area can be treated before needing to refill, which decreases total application time. The primary disadvantage is the need for the hose, which can be cumbersome to move in and around potted plants.

For large-scale applications, most nurseries employ some version of a boom sprayer. These sprayers are equipped with a long horizontal boom with multiple spray nozzles. Hoses connect the nozzles to the spray tank, which is powered by either the tractor itself (PTO) or some external engine. With boom sprayers, the liquid is applied over the top of the crop canopy, which can result in better canopy penetration and more of the herbicide reaching its target, the container media surface. As part of these applications, most nurseries typically apply overhead irrigation immediately after the herbicide application to reduce the chances of crop phytotoxicity. Boom sprayers are now becoming much more widely used due to their efficiency from a time and labor standpoint. The primary concern with these sprayers is that many operations may have areas that cannot be accessed by the boom due to nursery infrastructure (shade houses, etc.) and a relatively high initial investment, depending upon the make and model of the equipment.

3. Cherrylake

Cherrylake is an integrated landscape company located in Florida with operations in nursery production and brokerage, landscape and irrigation construction, and landscape maintenance services. The company has been in business for over 40 years and reported consolidated revenue of $84 million in 2024, with 42 percent ($34.9 million) generated from its nursery production activities. The majority of nursery sales (88 percent) are to wholesalers and landscapers throughout the southeastern United States.

Cherrylake maintains 1,800 acres in production, of which 31 percent (550 acres) are dedicated to palm production. The company grows 84 varieties of trees, palms, and shrubs. Field production—consisting primarily of palms—represents 15 percent of total production, while container production accounts for 85 percent. Container sizes range from #1 (1 gallon) to 670-gallon, utilizing specialized Air-Pots and other techniques to promote root development and performance after transplant. More than 50 percent of container production, in terms of unit quantities, consists of #3 (3-gallon) material, including both shrub and ornamental grass species, as well as starter stock for larger container product lines. Shrub and ornamental grass production covers 29 acres, a relatively small share of total acreage; however, this detail is relevant as the next section will discuss a herbicide sprayer specifically designed for use in shrub production.

The nursery employs more than 250 people, of whom 45 percent are H-2A workers. Like many U.S. nurseries, Cherrylake identifies labor availability as one of its greatest challenges and has relied on the H-2A program since 2016. Rising labor costs further compound this challenge. The adverse effect wage rate (AEWR) in Florida increased by 10 percent between FY2024 and FY2025 (Ayoub, 2024), putting pressure on gross margins as product prices cannot be adjusted at the same rate. However, this pressure may be mitigated by recent revisions to the AEWR calculation methodology, which aim to more accurately reflect current labor market conditions (Georgia Fruit and Vegetable Grower Association, 2025).

4. The “Big Boom”

Cherrylake made an investment of $100,000 in a pesticide sprayer/applicator in 2016 with the intention of improving application accuracy in their shrub production. Specifically, they wanted to increase pesticide coverage in areas difficult to reach, like under the leaves, where, for example, mites can be found. They also wanted to minimize drift and off-target application. There were no expectations related to labor savings, as they were simply switching the type of equipment pulled by a tractor, so in both scenarios, there was one operator involved in the use of the equipment. Nonetheless, there were potential pesticide savings related to improved accuracy and efficacy in managing pests. Increased accuracy and efficacy could have resulted in application rate adjustments and, therefore, a reduction in the volume of product applied.

Before making the investment decision, the operation benchmarked the performance of the equipment using information from other nurseries that were already using similar pesticide sprayers to the one they wanted to purchase. The equipment was customized for Cherrylake to meet their specific needs. Unfortunately, the equipment was used for less than one year because it underperformed in terms of application accuracy. A potential reason that could explain the performance issues, aside from design and engineering, includes the fact that the shrub production area is in an undulating topography. This could have affected the performance of the equipment at their operation compared to the performance information they gathered from other operations. Given the performance information, they made several adjustments (e.g., corrections, refits) and conducted different tests before they decided to stop using the equipment. For about four years, the equipment was not used.

As an innovative business, Cherrylake continuously strives to improve the business efficiency, economic, and environmental sustainability. As such, trying new technologies is an integral part of the innovative process, specifically if one's business is at the forefront of innovation. Being an early adopter of technologies entails a risk, but it is one that Cherrylake is willing to take.

In 2021, the business started exploring ways to repurpose the pesticide sprayer for liquid herbicide application in shrub production. This strategy reflects one of the founders' lessons that guides Cherrylake's business culture: "If it isn't broken, break it and make it better." The pesticide sprayer was stripped down to a trailer, a tank and a gantry. Cherrylake has an in-house team of mechanics and fabricators who were able to modify the equipment. The welders started building a 32-foot aluminum boom from scratch that was later mounted on the refurbished hydraulic gantry. By March 2022, the pump and all the plumbing parts were installed. By mid-June 2022, what they now refer to as the "Big Boom" was completed and ready for calibration and trials (see Figure 1). In February 2023, the "Big Boom" was in full use. The "Big Boom" was designed to be used for over-the-top-herbicide (OTH) liquid application. The cost of converting the pesticide sprayer for OTH liquid application in-house was about $5,000. Currently, about 79 percent of the 29 acres in shrub production (1gal-7gal shrubs) are under an OTH liquid application program and are sprayed with the "Big Boom." The remaining 21 percent of the area in shrub and ornamental grass production was not converted to an OTH liquid application program because of the stage of growth (within the first 14 days of liner planting), when liquid herbicides cannot be applied or because there was a tolerance risk associated with some of the liquid herbicides applied based on species.

Figure 1. *The "Big Boom" for Over-The-Top-Herbicide Application.*

5. The Herbicide Program Overview Before and After the "Big Boom"

Prior to using the "Big Boom" for herbicide application, Cherrylake was only applying granular herbicide. Two workers were overseeing the application of granular herbicide on the 29 acres in shrub and ornamental grass production. They manually pulled the weeds prior to herbicide application. Then they applied granular herbicide using granular spreaders such as the Spred-Rite G Granule Spreader (see Figure 2). Each worker was using one granular herbicide spreader. The cost of a granular herbicide spreader could be anywhere between $45 and $80, depending on the supplier. The tube and disk may need to be replaced over time, and the cost of replacing these components is very low. The granular herbicide was applied throughout the year, depending on the age and planting date of each plant.

Once old enough to receive granular herbicide, plants were maintained on a 56-day rotation. The two-man crew could apply granular herbicide on two to three different crops per day. The processes of pulling weeds and applying granular herbicide were spread over various time periods, depending on postemergence weed issues and the efficacy of the different granular herbicides in managing weeds. Although only two workers were needed for this weed management strategy, the amount of man-hours required to complete the process was higher than the amount needed to complete the equivalent OTH application. It was estimated that 4,420 hours per year were required to complete the manual granular herbicide application process in this program for 29 acres, which is equivalent to 152 hours per acre per year.

Figure 2. *Spred-Rite G Granule Spreader.*

In the current program, crops are treated by groups. There are four groups that the plants would be classified into based on age and planting date. Each crop receives a granular preemergent application for the first application at no fewer than 14 days after planting. Similar to the only-granular application, the OTH application rotation begins 56 days later. The liquid application rotation consists of four different active ingredients (ai) used in sequence. Once assigned to a group, plants will remain in that group and be treated every 56 days. In a 56-day rotation, each group will receive a herbicide application seven times in one year.

In the new program, pulling weeds is a process that is completed within 24 hours prior to the application of liquid preemergence herbicide. In the previous programs, pulling weeds was a process that was completed over an extended period of time, depending on pre and postemergence weed management needs. In the new program, selected members of the weeding crew are also responsible for granular herbicide applications for those crops where liquid herbicides cannot be applied due to growth stage and tolerance risk. From the 29 acres in shrub and ornamental grass production, granular herbicide is applied on only 6 acres due to these constraints. The OTH liquid application requires one operator to complete the process, which is the individual driving the tractor that is pulling the "Big Boom." Cherrylake is able to use the same tractor to pull the Rears cannon sprayer and the "Big Boom" herbicide sprayer, thus there is no need to buy new equipment to use the "Big Boom." It is estimated that the new herbicide application program requires 3,845 man-hours, which is about 13 percent fewer man-hours compared to the previous program.

6. Methods, Data and Assumptions Used for the Economic Feasibility Analysis

We evaluated the economic feasibility of and investment in the "Big Boom" using capital budget valuation. Capital budget valuation is the process of planning expenditures on long-term assets that result in cash flows over a period of time longer than one year (Brigham & Houston, 2016). We analyze the capital expenditure in the "Big Boom" as a capital expenditure project resulting in cost reduction, similar to a replacement project that considers the replacement of a serviceable but obsolete piece of equipment (Brigham & Houston, 2016). We first estimated the difference between free cash flows associated with the previous herbicide application program (i.e., granular herbicide only) and the new program (i.e., OTH liquid + granular). Free cash flow (FCF) is defined as:

$$\mathrm{FCF} = [\mathrm{EBIT}(1 - \mathrm{T}) + \mathrm{Depreciation\ \ and\ \ Amortization}] - [\mathrm{Capital\ \ Expenditures} + \Delta\mathrm{Net\ \ Operating\ \ Working\ \ Capital}],$$

where EBIT is defined as earnings before interest and taxes, T is the tax rate, and ΔNet Operating Working Capital represents changes in net operating working capital. Net operating working capital is defined as the difference between current assets and current liabilities (Brigham & Houston, 2016). The incremental cash flows are defined as the difference between the FCF for the granular application and the OTH liquid herbicide application. Since in this case transitioning from the previous herbicide program to the OTH program with the "Big Boom" did not result in any changes in revenue, rather differences in costs (i.e., labor and herbicide costs), including the depreciation costs associated with the "Big Boom", the incremental FCF is defined as the difference in costs modified by the tax rate (Brigham & Houston, 2016). We assumed no changes in net operating working capital resulted from transitioning to the new herbicide application program.

We used net present value (NPV), discounted payback period, and modified internal rate of return (MIRR) to evaluate the economic feasibility of investing in the "Big Boom." In order to estimate these criteria, we discounted incremental FCF, using a weighted average cost of capital (WACC) that was estimated at 8 percent.

Net present value (NPV) is the preferred criterion for evaluating investment decisions because it accounts for the time value of money and indicates how much an investment contributes to owners' or investors' wealth (Brigham & Houston, 2016; Kay, Edwards, & Duffy, 2020). The discounted payback period was also calculated, as many firms use it as a secondary decision criterion to accept or reject investment projects. Finally, we evaluated the rate of return of the "Big Boom" investment using the MIRR, which assumes cash flows are reinvested at the WACC (8%).

The NPV for our specific example is defined as,

$$\mathrm{NPV} = \mathrm{CF}_0 + \sum_{\mathrm{i}=1}^{8} \frac{\Delta\mathrm{FCF}}{(1 + \mathrm{WACC})^{\mathrm{i}},}$$

where, $\mathrm{CF}_0 = \$105{,}000$ represents the initial investment (i.e., the $100,000 sprayer plus $5,000 modification cost); and $\Delta\mathrm{FCF}$ is the difference in the FCF between the old and new herbicide programs, with the new herbicide program incorporating the "Big Boom." We selected eight years as the time horizon of the project, which reflects the seven-year recovery period assumed for equipment depreciation according to Internal Revenue Service (IRS) publication 225, "Farmer's Tax Guide" (IRS, 2024), plus one year to capture the unique circumstance related to the repurposing of an initial investment. As suggested by the IRS (2024), we focus on the depreciable asset or investment, which is the value of the asset ("Big Boom") once it is ready to be used for herbicide application. Although the pesticide applicator was initially purchased in 2016, the performance issues forced the retirement of the equipment for service. Since the pesticide applicator was not put in service, we maintain the initial value of the investment. Therefore, we did not depreciate the equipment until it was repurposed as the "Big Boom" and placed in service in 2023.

The discounted payback period is defined as the number of years before the total investment is fully recovered, plus the unrecovered cost at that point, divided by the discounted incremental FCF in that year (Brigham & Houston, 2016). In order to estimate the number of years before the total investment is fully recovered, we estimate the discounted cumulative incremental FCF associated with transitioning from the old to the new herbicide application program using the "Big Boom." Some businesses target a specific payback period, and if an investment results in a payback period above the targeted payback period, then the business rejects that investment. Cherrylake uses three years as its target payback period.

For this analysis, we assumed that incremental FCFs are mainly driven by herbicide and labor cost savings related to transitioning from the old to the new herbicide application program. Going from a granular program only to the OTH liquid application + granular program implies herbicide cost savings. Relative to the amount of active ingredients (ai) in the products, granular formulations used in Cherrylake's old herbicide program cost between 209 percent and 518 percent more than the same amount of active ingredients provided by liquid formulations used in the new program.

Additionally, as explained in the previous section, there is a 13 percent savings in labor hours when transitioning from the old to the new program (i.e., (3,845 hrs – 4,420 hrs)/4,420 hrs = -13 percent).

Data on annual total herbicide use for the new and old programs, as well as labor hours for herbicide application associated with each herbicide program, were gathered from Cherrylake's enterprise resource planning (ERP) record-keeping system. This ERP system is connected to an .aspx application that was developed in-house and tracks all plant/tree maintenance activities. We used 2025 prices paid by Cherrylake to estimate herbicide cost for the new and old herbicide programs. For consistency, we used the FY 2025 Florida AEWR to estimate labor costs, which is estimated at $16.23 (US Department of Labor, 2025) plus a $2 per hour surcharge to account for H-2A program expenses.

Cherrylake has an S-corporation business structure and therefore does not pay income taxes at the entity level. Cherrylake passes corporate income, losses, and deductions to its shareholders, who are taxed at the individual level (Goodman, White, & Whitten, 2024). Although previous court rulings have suggested a 0 percent tax rate for S-corporation valuation purposes, some business valuation professionals argue that not applying a tax adjustment to projected earnings will overstate the value of a company (Brough, 2005). Here, we assumed a tax rate of 23 percent, which is the estimated average tax rate for a representative sample of S-corporations between 2018 and 2021, according to Goodman, White, and Whitten (2024). We used the modified accelerated cost recovery system (MACRS) 200 percent declining balance method to estimate the "Big Boom" depreciation (Kay, Edwards, & Duffy, 2020). Specifically, we multiplied the "Big Boom" initial value ($105,000) by the appropriate percentages or recovery rates for a 7-year asset according to IRS Publication 946 (IRS, 2025).

7. The Economics of Repurposing a Pesticide Sprayer for Herbicide Application

As stated above, the differences in FCFs between the old and new herbicide programs are primarily from labor and herbicide costs. In the third column of Table 1, we present the average annual herbicide costs between February 2019 and February 2023, before the "Big Boom" was adopted. These costs were estimated at $33,570 for the 29 acres in shrub and ornamental grass production, or $1,151 per acre. In the second column of Table 1, we present the annual average herbicide costs for the new herbicide program (OTH + Granular). The difference in herbicide costs, or cost savings, associated with transitioning from the old herbicide program to the new OTH program for the 29 acres in shrub and ornamental production, was estimated at $9,528 or $327 per acre. These savings are related to the fact that spray-applied formulations used by Cherrylake cost approximately 67 percent to 92 percent less than the comparable granular formulations used by this nursery. It is essential to highlight that these cost savings are specific to this nursery's operations and their herbicide application program, which includes particular herbicide products applied and prices paid for products. We will assume constant annual savings after the "Big Boom" adoption to estimate the NPV and discounted payback period.

Table 1. Herbicide Cost Before and After the "Big Boom."

	OTH + Granular	Granular Only
# of Acres	29.16	29.16
Annual Cost Total	$24,042	$33,570
Annual Cost per Acre	**$824**	**$1,151**

Table 2. Labor Use and Labor Cost Before and After the "Big Boom."

	OTH + Granular	Granular Only
Annual Labor Hours	3,845	4,420
Annual Labor Hours/ Acre	132	152
Annual Labor Cost/ Year	**$70,094**	**$80,577**

Table 2 shows labor costs associated with the old and new herbicide programs. When transitioning from the granular herbicide application program to the OTH liquid application + granular, the estimated labor hours savings per year were 575. We assumed the wage rate to be the Florida FY 2025 AEWR ($16.23), plus a 12 percent cost over this wage rate ($2/hour) associated with H-2A program costs, including application, filing, border stamp, consulate, agency fees, as well as transportation and housing costs. This additional cost is estimated based on Cherrylake Nursery's estimated costs of using the H-2A program. The average annual labor savings associated with the "Big Boom" were estimated at $10,482 or $361/acre.

Table 3 shows the estimated NPV and discounted payback period. The investment in the "Big Boom" suggests a positive NPV ($2,009), which means the "Big Boom" adds value to the owner's wealth, although this value is minimal. The discounted payback period is about eight years, consistent with the equipment's seven-year recovery life. Finally, the MIRR suggested an investment rate of return of 8.3 percent, which is about the same as the WACC (8 percent). This result could be interpreted as meaning that the return on the "Big Boom" investment equals the minimum return the company must generate to satisfy its investors and lenders.

Table 3. Net Present Value, Discounted Payback period, and Modified Internal Rate of Return Estimates for the "Big Boom" Investment.

	Double Declining Depreciation Method
NPV	$2,009
Discounted Payback Period	7.77
MIRR	8.26%

Sensitivity analysis

In the analysis above, we assumed labor and herbicide costs were constant, and, therefore, savings related to transitioning from the only granular program to the OTH herbicide application program were assumed to be constant over time. This assumption is not realistic since, in general, labor and herbicide costs have increased over time. To test how such increases affect investment performance, we estimated NPV, discounted payback periods, and MIRR for two alternative scenarios. Specifically, we estimated these values for scenarios where labor and herbicide costs increase by 1 percent and 3 percent annually. We present these calculations for all scenarios in Table 4. These results suggest that the contribution of the "Big Boom" use to owners' wealth increases as the costs of herbicides and labor increase. For the scenarios presented below, the discounted payback period decreases by one to two years compared to the baseline scenario presented in Table 3. The results suggest that repurposing the pesticide sprayer into the "Big Boom" was a financially neutral to slightly positive investment under realistic assumptions, with clear upside potential if labor and/or herbicide costs continue rising.

Table 4. Net Present Value, Discounted Payback period, and Modified Internal Rate of Return Estimates for the "Big Boom" Investment, Assuming 1 Percent and 3 Percent Increased Costs.

Increased Cost Scenarios	NPV	Discounted Payback Period	MIRR
1%	$17,937	6.58	10.15%
3%	$51,642	5.41	13.54%

Finally, we wanted to estimate all metrics (i.e., NPV, discounted payback period, and MIRR) using the market value of equipment similar to the "Big Boom" that is already available for purchase. We obtained a quote for customized equipment with similar specifications to the "Big Boom" from a company specializing in customized equipment for storing and applying liquid chemicals. The cost of this equipment was estimated at $69,950. We assumed a seven-year useful life for this equipment. In Table 5, we present the NPV, discounted payback period, and the modified internal rate of return for this investment, assuming the FCFs associated with this investment are the same as for the "Big Boom." In this case, all metrics suggest accepting this investment, with the NPV indicating it adds value to the owner's wealth and yields a rate of return above the minimum return the company must generate to satisfy its investors and lenders. Furthermore, the discounted payback period suggests that the investment will pay off in less than five years.

Table 5. Net Present Value, Discounted Payback period, and Modified Internal Rate of Return Estimates for an Equipment Similar to the "Big Boom."

	Double Declining Depreciation Method
NPV	$22,153
Discounted Payback Period	4.85
MIRR	12.39%

8. Other Factors to Consider

Beyond direct cost savings, there were several additional benefits associated with the "Big Boom" and transitioning from granular to OTH liquid application. First, switching to OTH applications allowed Cherrylake to reallocate a pickup truck that was being used by the two-man crew to carry the granular herbicide for application. Additionally, the company was able to utilize an existing spray tractor to pull the "Big Boom" in between its regular pesticide spray rotations, thereby increasing the use of an existing asset. Furthermore, with the new OTH liquid application program, they were able to reallocate labor, since they were able to complete herbicide application tasks in a shorter period of time, which allowed workers to be reallocated to other activities, such as pruning and fertilizer application. Finally, it is important to acknowledge that although in this publication we focused on herbicide and labor savings associated with the "Big Boom" use, there are other costs associated with the use of this herbicide sprayer, including repairs, maintenance and fuel, which, although small, need to be considered by a nursery evaluating the investment on a herbicide sprayer, similar to the "Big Boom."

9. Discussion

The example above suggests that Cherrylake's ability to repurpose an unused pesticide sprayer for herbicide application generated modest financial gains and several operational benefits. An investment that initially appeared unsuccessful was transformed into one that contributed slightly to owners' wealth while improving labor efficiency and equipment use, thanks to the creativity of Cherrylake's production team. It is important to highlight that the discounted payback period suggests a long time (i.e., seven to eight years) to recover the investment. This is not surprising given that the pesticide sprayer was repurposed for an alternative use. When assuming a more reasonable cost for the "Big Boom" based on market value information ($69,950), the discounted payback period suggests it would take about five years to recover the investment. It is important to note that Cherrylake considered selling the pesticide sprayer, but it was not an easy task, given that the equipment was not commonly used by other nurseries and was custom-made for them. Finally, it is important to mention that in the analysis presented above, we ignored the uncertainty associated with labor and herbicide costs. Future studies could evaluate the likelihood of profitability under uncertainty by conducting a stochastic discounted cash flow simulation analysis.

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