

**Cost-effective horticultural product
transportation**

by

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ABSTRACT

Bell Nursery is an innovative company focused on growing high quality flowers and seeing their care through retail at Home Depot. Bell is the 11th largest wholesale nursery grower in the nation. Bell's sole focus is shipping products to Home Depot year-round. The company is owned by Central Pet and Garden, comprising thirty family farmers based mainly on the east coast. The company focuses on reducing emissions by only shipping within three hundred miles of our distribution centers. Within the entirety of the company, they face problems daily with transportation and budgeting.

From the Ohio location, they ship to 179 Home Depot stores throughout Ohio, Indiana, Michigan, Kentucky, and West Virginia. Since they currently employ only one semi driver out of the Ohio facility, they contract loads to a company out of Grove City, Ohio. During the spring and peak season, Bell pays roughly 17 contractor drivers daily to deliver products to our stores since there are not enough company drivers. Without box trucks and semi-truck drivers, the product would not reach the stores. The roles of these drivers are important to the success of the company. If they are not getting the treatment they deserve, Bell Nursery will overall lose revenue by not providing it to our drivers. The research question we are focusing on is this: How can Bell Nursery save money by evaluating transportation choices?

Using scenario analysis, the four scenarios will show that Bell Nursery should hire more employed CDL drivers and steer away from contractor drivers without looking at fringe benefits. The final scenario including the cost of fringe benefits will show the cheaper option is to continue contracting loads through an outside company.

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CHAPTER I: INTRODUCTION

“The freight transportation system in the United States includes an extensive network of highways, railroads, waterways, pipelines, and airways: 958,000 miles of Federal-aid highways, 141,000 miles of railroads, 11,000 miles of inland waterways, and 1.6 million miles of pipelines” (U.S. Department of Transportation 2021). Without the freight industry, consumers would not have goods in the stores, clothing to wear, or necessities in everyday life. The United States freight industry accounts for an estimated 1.29 trillion in 2024 and is expected to reach USD 1.57 trillion by 2029 (Intelligence 2023). Within the US trucking industry, agricultural and horticultural products account for a large sector of the estimated “\$940.8 billion in gross freight revenues from trucking” (Associations 2024). Agriculture is the backbone of America.

Horticulture is defined as the science and art of growing fruits, vegetables, flowers, or ornamental plants. In 2019, the United States Department of Agriculture (USDA) National Agriculture Statistics Service showed that horticulture operations “sold a total of \$13.8 billion in floriculture, nursery, and specialty crops” (Agriculture 2020). The 2019 Census also showed that the “corporately owned operations accounted for 75% of sales” (Agriculture 2020). Bell Nursery is owned by Central Garden and Pet, which is one of the largest garden and pet companies in the United States.

Bell Nursery is a commercial greenhouse business within Central Garden and Pet that supplies 179 Home Depot garden centers with flowers, houseplants, and other plants around the Midwest and East Coast of the United States. Bell Nursery comprises of thirty family farms and began with a local family farm in Maryland in the 1920s. The flowers range from annuals, perennials, tropical houseplants, mums, poinsettias, and other seasonal plants.

The busiest time of year is the spring season gearing up for Easter, Mother's Day in May, then continuing in the summer season while homeowners are planting flowerbeds. Bell Nursery farms grow all plants from seed or cuttings purchased from horticultural vendors. Preparation within the greenhouse starts in the late winter months to prepare for the spring. While the springtime is the busy season, the winter season is crucial to ensure that seed is sown and cuttings are placed in trays early enough for the young plants to be transplanted into pots and baskets in time.

Within previous years in the United States economy, there has been a push to cut unnecessary costs within companies. For decades, some companies were not efficiently using their resources, causing many to close or be bought out by larger firms. Since the COVID pandemic started in 2020, the agriculture industry has felt an ongoing drive to maximize profits. The COVID-19 pandemic had a significant adverse effect on the United States economy, from supply chain disruptions and labor shortages triggered by an unprecedented inflation. USDA implemented six relief and stimulus bills passed by the U.S. Congress to help "farm businesses and farm households through the COVID-19 pandemic" (Service 2023). This worked to ensure farms had the funds to continue to operate with the changing of labor and operating costs.

During this time a struggling greenhouse in a whirlwind economy, Bell Nursery, faced many challenges with labor and production. The company decided to invest money towards the H2A program which "allows U.S. employers or U.S. agents who meet specific regulatory requirements to bring foreign nationals to the United States to fill temporary agricultural jobs" (USCIS 2023). This is a government program which a company requests the number of workers it needs for the season, March through October, and works with H2A

agencies to procure the workers and manage their visas and their stay in the U.S. This ensured that the company could still function without the worry of having enough labor to continue with production.

Greenhouse labor was not the only concern during the COVID-19 period and after. There is a shortage of commercial drivers that precedes the pandemic. Yet, the pandemic exacerbated this shortage, which has had a challenging impact on the company's ability to recruit Commercial Driver's Licensed (CDL) drivers. A CDL requires the driver to have a separate test besides a normal license to operate a semi-truck and trailer. The company faced questions about how to transport products safely and effectively to Home Depot stores with saving on transportation costs. The result was to contract loads to an outside company. The company currently employs only one CDL driver. This means Bell Nursery is spending thousands of dollars to ensure there are truck drivers to deliver plants to the stores to an outside company, not its own employees. The research question we are focusing on is this: How can Bell Nursery save money by evaluating transportation choices? Using scenario analysis, the method will clearly show Bell Nursery should transition from contractor drivers to employed CDL drivers.

The basis of this research on finding cost-effective methods for transportation within a horticultural business contributes to the continued success of the company. Continuous growth ensures new employment opportunities and that produces local economic impacts. If a more cost-economic way to save Bell Nursery money was presented, this could bring more financial cash flow for the firm's operations.

CHAPTER II: LITERATURE REVIEW

This chapter will review literature related to transportation and freight around the world. Transportation around the world varies between countries, specifically first-world countries versus third-world countries. Countries with established roads, highways, and railroads have the most access to resources. When you think about the United States, we have access to grocery stores by car, vacation by planes, or a restaurant on a lake by boat. In developing countries, they are still accessing the fresh produce market by mule carts. As citizens in the United States, we have access to roads that can take us to most stores within thirty minutes. Of course, this depends on if you live in a rural area or in a city, but most of America has direct access to their needs and wants.

Khan, et. al (1968) explained the level of the economy is directly proportional to the development of transportation. We find this true in the aspect that the United States has visible access 24/7 to all types of transportation, so our economy has more potential for growth every year. In this literature, the “development of road transportation is of fundamental importance in stimulating the economic development of the underdeveloped countries” (Khan et al., 1968). The recognition of this underscores the expansive and well-developed transportation systems in developed countries. The United States has road transportation, such as semi-truck and trailers, to transport not only basic life necessities, but products like house plants in our homes. This connects directly with this study because since the United States has such a high level of transportation, we have the ability to transport products into stores such as flowers that in another country may not even have the access or the funds to go to a store to decorate their home.

Dusty Ray wrote an article in 2017 based on rural occupational transitions which focused on transportation and truck drivers. In this article, he explained the importance of the trucking industry by stating this: “without trucks and the people who drive them, neither roads nor buildings would be built; the food we eat would not be produced; the stores we shop in would be full of empty shelves...” (Ray 2017). The garden centers in retail stores would be empty, no work for horticultural businesses, and Bell Nursery would no longer exist without transportation. Transportation is the backbone of America, which is why it is so important to focus on the part of the business that means the most. Bell Nursery transportation has tremendous opportunities to improve their transportation system, while continuing to maximize profits.

The literature written by Maleki and colleagues was another piece of literature reviewed. His work, previously published in 2023, provides information about today’s transportation system and builds up a foundation for this study. The “efficiency of transport systems plays a vital role in facilitating better access to markets, employment opportunities, and additional investments” (Maleki et al. 2023). While the economy is everchanging, the transportation industry must consider fuel costs, weight of freight, shipping fees, supply chain demand, and many other factors.

While trying to find a balance between varying freight costs, the company must find ways to be as efficient as possible. Swenseth and colleagues discussed that at times “upwards of 50% of the total annual logistics cost of a product can be attributed to transportation” (Swenseth et al. 2002). According to the research by Swenseth and Godfrey, to calculate the total cost of transportation, “it must first be possible to identify transportation cost functions that emulate reality and simultaneously provide a

straightforward representation of actual freight rates” (Swenseth et al. 2002). By providing real transportation costs and multiple load examples, the research provided in this study can help transform the future of logistics within Bell Nursery.

CHAPTER III: METHODS

In this chapter, we will discuss the method relevant to this study. Scenario analysis is a method used to strategically plan different approaches to find the answer to a question. The origins of scenario analysis “lead back to the Manhattan Project in 1942, where the limits of using probability in decision-making led to computer simulations of atomic explosions,” which Michael Reilly published in an online article in 2010. (Reilly, Michael). The impact of scenario analysis on the global scale could be “strengthened with participatory processes involving key actors at other geographical scales” (Reilly, Michael. 2010). By using local geographical factors, this would ensure that studies are completed with the most accurate information based on the company’s location and local influencing factors. This analyzes possible events that could happen as well as possible results.

Tim Benton wrote an article about using scenario analysis within the world food system. The world food system is ever-changing and difficult to navigate with the loss of crop land worldwide. Benton used scenario analysis to address the future of food. Since the food system is currently unsustainable and there is a push for sustainability, “scenario analysis can be a useful tool for imagining plausible futures as an aid to unlocking ‘business as unusual’ thinking” (Benton, Tim. 2019). This directly reflects the study of transportation options within the horticulture industry. The question is: how can Bell Nursery become more sustainable within the transportation department?

Scenario analysis was the best choice to determine what changes Bell Nursery should look at making for the longevity of the company. Looking at scenarios and choices between hiring more employed CDL drivers or continuing to hire contract drivers, this will help form

the basis of a change within the company. Not only will this minimize costs for the company, but it will also maximize profits and productivity within the workplace.

As for methods to obtain data, the loads were randomly selected from the company's archives. All load paperwork is saved for a year in the office of the greenhouse. The 15 loads used in this study were all different, delivering to stores in multiple states. There was no order in selecting as this would simulate loads within a random year, random week, and random day. No load is the exact same as another, as every individual load has a different number of plants, carts, or stops on the trip. Fifteen loads were selected for their destinations, distance, number of delivery stops, and total travel duration. The driver's contracted cost and product prices for each load were also pulled into the dataset used for the study.

After choosing scenario analysis as the method, it was then time to choose loads of plants that would be a good choice to study. There were 15 loads that were evaluated with different mileage, number of stops, and hours to complete. Bell Nursery currently uses an application called PC Miler to input the store numbers, then the software routes the stores in the fastest and most efficient route. The logistics manager then puts this order and mileage into a software system where they can print paperwork, cart labels, and manage our inventory. All the loads were over 500 miles to show price comparisons. A semi-truck refer trailer transports 41 carts full of plants. For reference, 72 hanging baskets or 10 potted houseplants fit on a cart in Figure 3.1 and Figure 3.2.

Figure 3.1: Plant Cart Example 1, Ohio



Figure 3.2: Plant Cart Example 2, Ohio



When it comes to pricing for contractor loads, there is the price per mile and a set price per stop (per store). Both the price per mile and price per stop were determined in a contract between Bell Nursery and the contractor driving company. Every year, Bell Nursery rebids with contractor trucking companies to get the best price per mile and per stop. For the 2023-2024 season, the price per stop is \$30. If a truck stops at 5 stores, it is \$150. All the loads in this study were over 500 miles, meaning the price per mile that the contracting

company gets paid is \$2.50 per mile. The chart below shows the price per mile for loads under 500 miles.

Table 3.1. Pricing for Contractor Price per Mile.

Miles	Price per Mile
0-200	\$7.50
201-500	\$3.50
501+	\$2.50

After diving into what a long contractor load would look like money-wise, we then will look at a local driver and the expenses involved. Bell Nursery owns some trucks, but some are rented from Penske Rentals. Penske Truck Rental is a nationwide truck leasing company that rents out semi-trucks, box trucks, and other vehicles for commercial or consumer usage. The rental price varies depending on if it is a semi versus a box truck. The logistics manager estimates a semi-truck rental to be around \$1,000 a month. This equates to around \$33 a day. If our semi driver that Bell Nursery employs takes a 21-hour load, it would cost the company \$1,233 for the truck rental.

Another cost of a company employed driver is International Fuel Tax Agreement (IFTA) taxes and truck insurance. IFTA is “an agreement between the lower 48 states of the United States and the Canadian provinces, to simplify the reporting of fuel use by motor carriers that operate in more than one jurisdiction” (Wikipedia, 2022). These are annual expenses and cannot be quantified for one trip but are not substantial enough to factor into the research.

Diesel exhaust fluid (DEF) is a liquid used in diesel engines to reduce the amount of pollution created by the engine. This is quantified to be an estimated \$50 per trip. The last

cost associated with a Bell Nursery employed driver is trailer maintenance costs. While Bell Nursery already owns trailers, there are annual costs that must be included. These maintenance repairs are typically tires, brakes, and lift gate upkeep. These expenses are typically around \$5,000 per year, which is equivalent to \$13.70 per day.

The expenses for an employee of Bell Nursery would be the following for a 21-hour trip:

Table 3.2. Estimated Costs for Bell Nursery Driver.

Employee Wage per Hour	\$22 / hour
Miles	948 miles
Fuel Costs	158 gal. of fuel at 6 miles per gallon = \$655
DEF	\$50 / trip
Lease of Semi	\$33 / day
Trailer Maintenance Costs	\$13.70 / day

These costs were calculated using Microsoft Excel and formulations. The equations used were the following:

Bell Nursery CDL Driver Load = (Employee Wage x Hours) + DEF + (Price for Lease of Semi x Hours) + (Price per Gal of Fuel x Miles / MPG) + Trailer Maintenance Costs

Contractor Load = (Price per Mile x Miles) + (Stop Fee x Number of Stops)

CHAPTER IV: RESEARCH AND RESULTS

All loads varied in miles, number of stores, the hours it took to complete and return to the facility, and pricing. The price per mile for the contractor loads were using the \$2.50 price per mile in the original scenario. The Bell Nursery employee wage was \$22 in the below scenario.

Table 4.1. Original Scenario Results of 15 Sample Loads - \$2.50 Contractor Price, \$22 Employee Wage.

Trip #	Miles	# Stores on Trip	Estimated Hours	Price of Load (Contractor)	Price of Load (Bell Employee)
1	1165	9	29	\$3,182.50	\$1,712.41
2	1188	10	30	\$3,270.00	\$1,754.95
3	615	5	11	\$1,687.50	\$833.32
4	957	5	24	\$2,542.50	\$1,422.20
5	670	7	13	\$1,885.00	\$925.91
6	930	6	23	\$2,505.00	\$1,376.32
7	748	9	17	\$2,140.00	\$1,084.41
8	705	10	15	\$2,062.50	\$1,001.82
9	776	9	17	\$2,210.00	\$1,107.74
10	544	9	10	\$1,630.00	\$750.78
11	708	9	15	\$2,040.00	\$1,004.32
12	1212	28	32	\$3,870.00	\$1,821.70
13	1401	24	34	\$4,222.50	\$2,025.95
14	766	17	16	\$2,425.00	\$1,076.03
15	660	8	12	\$1,890.00	\$894.20
Average	870	11	19.9	\$2,504.17	\$1,252.80

After finding the averages of the 15 loads for both contractor loads and Bell Nursery loads, the results showed the total it would cost the company to pay a contractor for a day and week, along with the same for Bell Nursery employed driver loads. During the busy spring season, there are an estimated 17 loads going out to stores daily. Finding the total cost that the company is spending daily and weekly is crucial to show how much money the company is spending on transportation at one given facility. Table 4.2 shows the comparison between the contractor loads (left column) and Bell Nursery loads (right column).

Table 4.2. Summary Table of Average Price of 17 Loads per Day and per Week for Scenario #1 (\$2.50 Contractor Price and \$22 Employee Wage).

Average price of 17 loads per day for a day	\$42,570.83	\$21,064.79
Average price of 17 loads per day for a week	\$212,854.17	\$105,323.97

After calculating which trip would be cheaper for the company, one can see the clear option – hiring more drivers through Bell Nursery and not contracting loads out to an outside company. The average load cost out of the fifteen loads for a contractor driver was \$2,504.17, while the average for a Bell Nursery CDL driver was only \$1,252.80. When hiring a local semi driver and sending them on a 957-mile trip (trip number 4), it would save the company \$1,120.30. This amount saved was only for one trip. On a longer trip of 1,401 miles (trip number 13), \$2,196.55 would be spared. In the spring when the company ship products out seven days a week with 17 loads a day, it would save around \$106,365.81 weekly on average if all loads were driven by Bell Nursery employees.

The second scenario that was analyzed was lowering the price per mile to \$1.50 for contractors and keeping the employe wage constant at \$22 per hour. The results for this are shown below, still showing the Bell Nursery driver loads are cheaper for the firm.

Table 4.3. Second Scenario Results of 15 Sample Loads - \$1.50 Contractor Price, \$22 Employee Wage.

Trip #	Miles	# Stores on Trip	Estimated Hours	Price of Load (Contractor)	Price of Load (Bell Employee)
1	1165	9	29	\$2,017.50	\$1,712.41
2	1188	10	30	\$2,082.00	\$1,754.95
3	615	5	11	\$1,072.50	\$833.32
4	957	5	24	\$1,585.50	\$1,422.20
5	670	7	13	\$1,215.00	\$925.91
6	930	6	23	\$1,575.00	\$1,376.32
7	748	9	17	\$1,392.00	\$1,084.41
8	705	10	15	\$1,357.50	\$1,001.82
9	776	9	17	\$1,434.00	\$1,107.74
10	544	9	10	\$1,086.00	\$750.78
11	708	9	15	\$1,332.00	\$1,004.32
12	1212	28	32	\$2,658.00	\$1,821.70
13	1401	24	34	\$2,821.50	\$2,025.95
14	766	17	16	\$1,659.00	\$1,076.03
15	660	8	12	\$1,230.00	\$894.20
Average	870	11	19.9	\$1,634.50	\$1,252.80

As the first scenario, the average prices of loads per day and per week were also calculated. Table 4.4 shows the total average prices per day of seventeen loads and the price per week. The left column is contractor loads and the right column is Bell Nursery drivers.

Table 4.4. Summary Table of Average Price of 17 Loads per Day and per Week for Scenario #2 (\$1.50 Contractor Price and \$22 Employee Wage).

Average price of 17 loads per day for a day	\$27,786.50	\$21,064.79
Average price of 17 loads per day for a week	\$138,932.50	\$105,323.97

In another situation, we will see how the prices will be influenced when both the price per mile for the contracting company and the employee wage for a Bell employee increases. Below, you can see that the Bell Nursery employed CDL driver is still the better option. In this case, the price per mile is \$3.50 and the employee wage for Bell Nursery was increased to \$30.

Table 4.5. Third Scenario Results of 15 Sample Loads - \$3.50 Contractor Price, \$30 Employee Wage.

Trip #	Miles	# Stores on Trip	Estimated Hours	Price of Load (Contractor)	Price of Load (Bell Employee)
1	1165	9	29	\$4,347.50	\$1,944.41
2	1188	10	30	\$4,458.00	\$1,994.95
3	615	5	11	\$2,302.50	\$921.32
4	957	5	24	\$3,499.50	\$1,614.20
5	670	7	13	\$2,555.00	\$1,029.91
6	930	6	23	\$3,435.00	\$1,560.32
7	748	9	17	\$2,888.00	\$1,220.41
8	705	10	15	\$2,767.50	\$1,121.82
9	776	9	17	\$2,986.00	\$1,243.74
10	544	9	10	\$2,174.00	\$830.78
11	708	9	15	\$2,748.00	\$1,124.32
12	1212	28	32	\$5,082.00	\$2,077.70
13	1401	24	34	\$5,623.50	\$2,297.95
14	766	17	16	\$3,191.00	\$1,204.03
15	660	8	12	\$2,550.00	\$990.20
Average	870	11	19.9	\$3,373.83	\$1,411.74

The average prices per day and per week are shown below in Table 4.5 for scenario three.

These average prices still showed that Bell Nursery drivers are still the cheapest option.

Table 4.6. Summary Table of Average Price of 17 Loads per Day and per Week for Scenario #3 (\$3.50 Contractor Price and \$30 Employee Wage).

Average price of 17 loads per day for a day	\$57,355.17	\$23,766.66
Average price of 17 loads per day for a week	\$286,775.83	\$118,833.31

In a rare find of a contractor trucking company that would only want to be paid \$1.50 per mile, this situation was also calculated. It would be a rarity that a contracting company would only want \$1.50 per mile as they must factor in their own costs for fuel, maintenance, etc. This is a price that is worth looking at in this scenario to show that even if you lower the contractor price per mile, Bell Nursery loads are still lower. The employee wage for a Bell Nursery driver remained at \$30 per hour, while decreasing the price per mile on the contractor loads. Everything else in factor remained constant.

Table 4.7. Fourth Scenario Results of 15 Sample Loads - \$1.50 Contractor Price, \$30 Employee Wage.

Trip #	Miles	# Stores on Trip	Estimated Hours	Price of Load (Contractor)	Price of Load (Bell Employee)
1	1165	9	29	\$2,017.50	\$1,944.41
2	1188	10	30	\$2,082.00	\$1,994.95
3	615	5	11	\$1,072.50	\$921.32
4	957	5	24	\$1,585.50	\$1,614.20
5	670	7	13	\$1,215.00	\$1,029.91
6	930	6	23	\$1,575.00	\$1,560.32
7	748	9	17	\$1,392.00	\$1,220.41
8	705	10	15	\$1,357.50	\$1,121.82
9	776	9	17	\$1,434.00	\$1,243.74
10	544	9	10	\$1,086.00	\$830.78
11	708	9	15	\$1,332.00	\$1,124.32
12	1212	28	32	\$2,658.00	\$2,077.70
13	1401	24	34	\$2,821.50	\$2,297.95
14	766	17	16	\$1,659.00	\$1,204.03
15	660	8	12	\$1,230.00	\$990.20
Average	870	11	19.9	\$1,634.50	\$1,411.74

Table 4.8 shows the average prices for the 4th scenario. Still, the Bell Nursery employed driver loads are the best option even breaking down by day.

Table 4.8. Summary Table of Average Prices of 17 Loads per Day and per Week for Scenario #4 (\$1.50 Contractor Price and \$30 Employee Wage).

Average price of 17 loads per day for a day	\$27,786.50	\$23,766.66
Average price of 17 loads per day for a week	\$138,932.50	\$118,833.31

In the last scenario, Microsoft Excel’s Goal Seek feature was used to find the Bell Nursery employee wage that would generate the average of both the contractor loads and the Bell Nursery employed driver to be equal. From previous scenarios, it was assumed that the employee wage would drastically increase. Goal Seek found that for the averages of all fifteen loads from both the contractor company and Bell Nursery employed loads to be equal, the employee wage would be \$85. This is a drastic change from the employee wage of \$22. The \$85 employee wage could show an increase in hourly wage, but also could reflect fringe benefits that the company could be paying to employ a driver. Fringe benefits are a form of

pay for the performance of services such as health insurance, retirement plans, workers' compensation, or medical leave. In this case, a fringe benefit of 33% was calculated while using the \$22 per hour employee wage. When the averages of both contractor and employed driver loads both equaled \$2,504.17, some load prices were increased for Bell Nursery drivers as the wage raised to \$85. The below table shows how the load prices fluctuated for Bell Nursery employee driver loads, and the equal averages.

Table 4.6. Fifth Scenario Results of 15 Sample Loads - \$2.50 Contractor Price, \$85 Employee Wage.

Trip #	Miles	# Stores on Trip	Estimated Hours	Price of Load (Contractor)	Price of Load (Bell Employee)
1	1165	9	29	\$3,182.50	\$3,539.07
2	1188	10	30	\$3,270.00	\$3,644.59
3	615	5	11	\$1,687.50	\$1,526.19
4	957	5	24	\$2,542.50	\$2,933.92
5	670	7	13	\$1,885.00	\$1,744.75
6	930	6	23	\$2,505.00	\$2,825.05
7	748	9	17	\$2,140.00	\$2,155.21
8	705	10	15	\$2,062.50	\$1,946.65
9	776	9	17	\$2,210.00	\$2,178.54
10	544	9	10	\$1,630.00	\$1,380.66
11	708	9	15	\$2,040.00	\$1,949.15
12	1212	28	32	\$3,870.00	\$3,837.32
13	1401	24	34	\$4,222.50	\$4,167.55
14	766	17	16	\$2,425.00	\$2,083.84
15	660	8	12	\$1,890.00	\$1,650.06
Average	870	11	19.9	\$2,504.17	\$2,504.17

Employing more drivers would require more trucks and trailers. The cost of renting a semi-truck is equated to the expenses of a local driver, which turns out to be around \$33 a day from Penske Rentals. Bell Nursery has many trailers that are not used in the Spring so depending on the number of drivers they hired, the number of trailers needed would vary. Year round, they use a refer semi-trailer that is climate controlled. When transporting in the winter, the trailer must stay at 55 degrees minimum to prevent plants from dying of freezing temperatures. According to TruckertoTrucker.com, the cost of a 2013 Wabash National

Refer semi-trailer is \$29,000 (2013 *Wabash National Reefer Carrier 2500*). This cost could vary depending on how old or new a trailer the company would be willing to purchase. The costs of having a diesel mechanic could be costly depending on the issue needing to be fixed, but this would only be for the trailers. Maintenance costs for trailers are estimated to be \$5,000 annually. This typically includes tires, brakes, lift gate repairs, and refer repairs. The refer part of the trailer keeps the trailer temperature controlled. If the trucks are rented through Penske, all repairs are covered through Penske Rentals. Even when calculating the cost of new rental trucks and the potential of buying new refer trailers, it is still wise to employ more Bell Nursery semi drivers.

CHAPTER V: CONCLUSION

Bell Nursery spends thousands of dollars ensuring there are drivers to deliver products to Home Depot stores by utilizing an outside company, not its own employees. Using scenario analysis, this method showed how Bell Nursery should transition from contractor drivers to employed CDL drivers in multiple scenarios. It was proven through fifteen loads that it is the best solution. Throughout this project, multiple recommendations could be made to management. The management team often has conversations about how to save money in different sections of the operation. Transportation is often overlooked within the firm.

Limitations detail flaws within a study. Within my study, several limitations exist. The company is seasonally based due to the nature of its products. In the winter months, there would be no work for 15-17 CDL drivers. The only product that ships out of the dock is tropical houseplants that are grown out of house. This only entails one or two loads a week when garden centers are shut down. In this study, I focused on peak season during the spring. This is a limitation as it is looking at only the months that the greenhouse is running full force. It was most important in this study to show how much money the company could save by analyzing the busy spring season. Another limitation is this research only shows around 1% of total loads during a given year. While this seems like a small percentage, only looking at 1% of the annual loads still shows the company could save thousands of dollars.

A solution for hiring more CDL drivers would be to network with the local economy and resources. Within Ohio, there are several career technical centers and colleges that provide CDL licenses. It would be crucial for the company to start interacting with these training centers with the potential of new employees. A local community

college, Clark State, offers CDL training that would be a wonderful opportunity to recruit drivers. If the company could provide funds they are saving to transition to employee CDL drivers, a manager could become a recruiter for drivers.

Another solution would be to hire seasonal or full-time drivers. Seasonal drivers could come to work for the busy time of year which is typically April through October. This time of year, the drivers would be full-time working 40+ hours per week. At the end of the season, they are not working as they are considered seasonal. Drivers could also be hired full-time and work throughout the greenhouse during the off season. These full-time employees could work as drivers during the busy season, then work in the maintenance department or the greenhouse so they are still getting hours the entire year. Either of these are feasible if they are working to recruit drivers within the local economy.

On the other hand, the last scenario showed the opposite suggestion to management. This scenario shows that once you include fringe benefits into the equation, then the cheaper option is to continue contracting loads to an outside company. The first four scenarios did not include fringe benefits, which in turn would have a large effect on the overall costs that the company would have to pay. In scenarios where fringe benefits were not included in the costs, it was the cheaper option to hire Bell Nursery drivers. The scenario where fringe benefits are included in costs, it is more expensive to hire Bell Nursery drivers.

It is quite easy to put a load of product together and send it to the contractors to ship, then move on to the next load. The logistics team does not have to coordinate with a driver on load times, figuring out a driver within the contractor company that can pick up

the load, etc. If Bell Nursery were to focus on increasing hourly wages, more people would more than likely apply to work at this facility as a driver.

Currently, they only have one semi driver that is full time, and the hourly wage is \$22 an hour. According to SalaryExpert, the average-based salary of a semi-truck driver is \$56,554 (Institute, E. R. I. E. R.). This is an average hourly rate of \$27.19. Bell Nursery's wage is \$5 less than the average hourly rate. The management of Bell Nursery could increase the hourly wage to \$28-\$30 an hour, which would directly increase the chance to hire more company drivers rather than contracting loads to another trucking company. While hiring more employees would put more work on the logistics manager coordinating with more drivers, the farm could save hundreds of thousands of dollars to put into different sectors to maintain a clean, profitable, and safe working environment.

In conclusion, transportation at Bell Nursery is the most important sector of the company. Without box trucks and semi-truck drivers, our products would not reach the stores. The roles of these drivers are important to the success of our company. If they are not getting the treatment and a competitive wage, the company will overall lose revenue by not providing it to our drivers. Increasing hourly wages for our drivers will help ensure those employees continue working for Bell and increase the chances of hiring new drivers.

The economic impact of this decision not only affects the greenhouse but affects stakeholders within the company. Being owned by Central Garden and Pet, the stakeholders are a large part. When Bell Nursery is minimizing costs, this increases the profitability of the company and stakeholders. In the end, if we are not safely using our funds, this can affect the overall quality of our plants. Where money is spent on transportation, this could be spent on soil, plastic poly for the covers of greenhouses, safety

concerns around the houses, and other areas. Bell Nursery can continue improving sectors of the company, starting with transportation.

WORKS CITED

- Agriculture, United States Department of. 2020. *U.S. Horticulture Operations Report \$13.8 Billion in Sales*. December 8. Accessed February 10, 2024. www.nass.usda.gov/Newsroom/archive/2020/12-08-2020.php.
- Associations, American Trucking. 2024. *Economics and Industry Data*. Accessed April 3, 2024. <https://www.trucking.org/economics-and-industry-data>.
- Benton, Tim. 2019. "Using Scenario Analyses to Address the Future of Food." *European Food Safety Authority*. July 8. Accessed January 26, 2024. efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2019.e170703.
- Foundation, Wikipedia. 2022. *International Fuel Tax Agreement*. September 26. Accessed February 10, 2024. en.wikipedia.org/wiki/International_Fuel_Tax_Agreement.
- Institute, E.R.I.E.R. 2024. *Semi-Truck Driver Salary*. January 17. Accessed February 18, 2024. <https://www.salaryexpert.com/salary/job/semi-truck-driver/united-states/ohio/cleveland#:~:text=Compensation%20Data%20Based%20on%20Experience%20The%20average%20semi,semi%20truck%20driver%20salary%20in%20the%20United%20States>.
- Intelligence, Mordor. 2023. *United States Freight and Logistics Market Size*. Accessed March 1, 2024. [www.mordorintelligence.com/industry-reports/united-states-freight-logistics-market-market-size#:~:text=United%20States%20Freight%20and%20Logistics%20Market%20Analysis,period%20\(2024%2D2029\)](https://www.mordorintelligence.com/industry-reports/united-states-freight-logistics-market-market-size#:~:text=United%20States%20Freight%20and%20Logistics%20Market%20Analysis,period%20(2024%2D2029)).
- Khan, Ahmad Saghir. 1968. "Role of road transportation in economic development of underdeveloped countries." Kansas State University.
- Maleki, Mohammed. 2023. *Resource management in transportation networks: addressing challenges and optimizing efficiency*. Kansas State University.
- Ray, Dusty. 2017. *Rural occupational transitions: Transportation, identity, and new geographies*. Kansas State University.
- ReefertoReefer.com. 2024. *2013 Wabash National Reefer Carrier*. January. Accessed January 20, 2024. <https://truckertotrucker.com/used-2013-wabash-national-reefer-carrier-2500-reefer-trailer-sioux-city-iowa-843139/>.
- Reilly, Michael. n.d. Accessed March 1, 2024. royalsocietypublishing.org/doi/full-xml/10.1098/rstb.2017.0192.

Service, United States Department of Agriculture Economic Research. 2023. *Farms and Farm Households During the Covid-19 Pandemic*. November 30. Accessed March 1, 2024. www.ers.usda.gov/covid-19/farms-and-farm-households/#:~:text=Farm%20businesses%20experienced%20disruptions%20to,commodities%20in%20certain%20market%20segments.

Swenseth, Scott, and Michael Godfrey. 2002. "Incorporating transportation costs into inventory replenishment decisions."

U.S. Department of Transportation, Federal Highway Administration and Federal Transit. 2021. *Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance Report to Congress, 24th Edition*. Accessed January 15, 2024. www.fhwa.dot.gov/policy/23cpr/chap11.cfm#:~:text=The%20freight%20transportation%20system%20in,1.6%20million%20miles%20of%20pipelines.

USCIS. 2023. *H-2A Temporary Agricultural Workers*. November 8. Accessed February 12, 2024. www.uscis.gov/working-in-the-united-states/temporary-workers/h-2a-temporary-agricultural-workers.