DEVELOPMENT OF DECISION SUPPORT SOFTWARE TO ESTIMATE THE COST OF TRANSPORTING AND GINNING OF SEED COTTON

A Thesis

by

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ABSTRACT

The number of cotton gins in the state of Texas has declined from over 1,400 gins in 1960 to less than 232 gins in 2011. Texas has experienced an increase in cotton production since that time, and now remains relatively constant at 5.5 million bales ginned annually. A Decision Support Software package was produced and published for cotton ginners to determine the economic risks and benefits of transporting seed cotton modules from the field to the gin. Using gin data from U.S Department of Agriculture Agricultural Research Service and Texas Cotton Ginner's Association from 2005-2010, the software package has aided many in the cotton industry to determine the limits of economic viability of seed cotton transport in remote areas where long distance module hauling was imminent. The increasing production of seed cotton along with the decreasing number of cotton gins in Texas justifies the need for an updated software package with the goal of more efficient cotton handling and ginning systems. Specifically, fewer gins and increased production will likely result in transporting seed cotton longer distances. Using reported gin data from 2011 U.S Department of Agriculture Agricultural Research Service and data from cooperating gins, the previous transportation model produced in 2009 is being updated to reflect current economic conditions. This paper explains how non-conventional module types were incorporated into the transportation calculator to aid cotton ginners and producers in making sound management decisions relating to module transportation. It also details analysis that indicate factors that have the greatest impact on the cost of transportation as well as methods to determine the breakeven point of owning trucks compared to contracting trucks.

DEDICATION

This thesis is dedicated to my family, friends, and colleagues for their never-ending support. Without them this would not have been possible.

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I would first like to thank Cotton Incorporated and the Texas A&M Endowed Cotton Chair for providing funding to make this research and my education possible. A special thanks goes to the many cooperating gins that provided data and feedback to help with the development of a Transportation Decision Support Software.

I am grateful for my parents, loved ones, family, and friends unwavering and endless support during the past two years. Without them none of this would have been possible.

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Finally, I would like to thank the Parnell Crew (past and present) for all of the help, support, and knowledge they have given me throughout these past two years. Thank you for making this time such a memorable experience.

NOMENCLATURE

CNH	Case New Holland
JD	John Deere
MT	module truck
STT	semi-tractor trailer
RFID	radio frequency identification
%U	percent utilization
GR	Gin rated capacity
BG	Bales ginned
CB	Crystal Ball
DSS	Decision Support Software
D	Depreciation
P	Purchase Price
S	Salvage Value
L	Useful Life
R	One of a series of equal payments
i	Interest rate
q	Compound periods per year
n	Life of investment in years
AD	Average Distance
AFC	Average Fixed Cost
VC	Variable Cost
ATC	Average Total Cost
d	One-way distance
SWFC	Stripper with a field cleaner
SWOFC	Stripper without a field cleaner
TCMT	Cost of Transportation for a module truck
TCSTT	Cost of Transportation for a Semi-Tractor and Trailer
USDA ARS	U.S. Department of Agriculture Agricultural Research Service

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CHAPTER I

INTRODUCTION, LITERATURE REVIEW, AND OBJECTIVES

Texas has experienced a reduction in the total number of gins opening each season from over 1,400 in the 1960's to 232 in 2012. The production at the farm level has been relatively constant at 5 million bales annually. The trend in number of operating gins and farm level production is shown in Figure 1. Remaining gins have often faced the management decision to modify their ginning operation by transporting seed cotton longer distances, increasing processing capacity, and/or operate for a longer season to take advantage of any economies of scale or efficiencies that may exist. The trend within the ginning industry in Texas has been to increase processing capacity per gin per day as reported by Norman et al. (2006). Increased gin ratings are caused by advances in efficiency of modern ginning machinery. Many gins are also sending trucks further distances to pick up modules. Since cotton cannot be marketed until ginned and graded, the producer would often prefer their seed cotton to be ginned as quickly as possible. This could play a part in the management strategies taken by the gin. The ability to quickly calculate and evaluate what the impact of these management decisions have on the cost of ginning is needed.

Historically, cotton producers had a gin within close proximity that was able to gin their cotton. Transportation was accomplished by a farmer owned cotton trailer that was delivered to the gin by the farmer. Cotton trailers held two to four bales of seed cotton and were emptied in the order in which they were received at the gin. Often, long lines at the gin would prevent trailers from returning to the field quickly. This created a bottleneck in this harvest system.

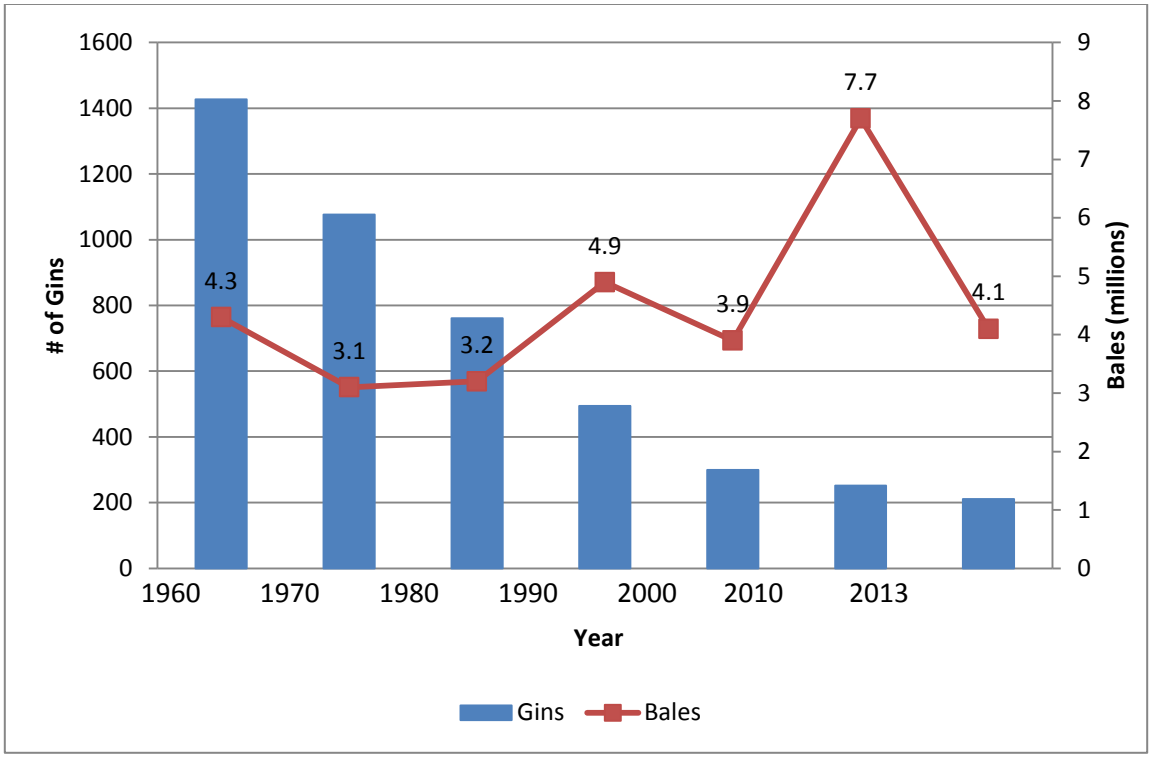

Figure 1. Bales produced and number of gins operated in the state of Texas from 1960-2012 (USDA, 2013)

The development and adoption of the module builder in the early 1970's allowed for the storage of seed cotton modules at the gin site. The need for the module builder was due partially to the harvest speed of improved mechanical harvesters. The compression of seed cotton into modules with densities ranging from 112- to 320-kg/m^3 (7-to 20-lb/ft^3) had no effect on fiber quality so long as seed moisture content levels remained below 10% wet-basis (Wilkes, 1978). Modules are built directly on the ground and covered with tarps to protect the top and sides from wind and rain damage during storage prior to ginning.

In the late 2000's both Case New Holland (CNH) and John Deere (JD) released cotton pickers that had the ability to build seed cotton modules on-board. The CNH Module Express builds a block type module that measures 4.88 meters by 2.44 meters by 2.44 meters (16 feet by 8 feet by 8 feet), and the John Deere 7760 builds a round module

that has a diameter and width of 2.29 meters by 2.44 meters (7.5 feet by 8 feet in width), respectively.

The number of bales contained in each module type depends upon the harvest method used in the field as reported by Hamann (2011). There are three primary cotton harvesting methods used: picker, stripper with a field cleaner (SWFC), and stripper without a field cleaner (SWOFC). The average number of bales contained in each module type is summarized in Table 1.

A traditional module is compressed to a density of 160-to -190-kg/m^3 (10-to 12-lbs/ft^3) and will contain between 10 - 18 bales depending on the harvester used. Currently CNH produces a picker harvester that is packed at a density of 144-kg/m^3 (9-lbs/ft^3) and will contain approximately 6.5 bales. John Deere's on-board module building machine is used to build a round module that is packed at a density of 190-kg/m^3 (12 lbs/ft^3) and will contain 3.5 bales of picked cotton. A stripper harvester is under development that will have the ability to build round modules on board and is assumed to contain approximately 2.5-3 bales per module packed at a density of 160-kg/m^3 (10 lbs/ft^3). Modules produced, regardless of type, are typically aligned on the turn row of the field ready to be loaded onto trucks. Trucks will be used to transport formed modules to the gin's storage yard where they will be stored until ginned.

Table 1. Average number of bales contained in module types based on harvester used (Hamann, 2011).

Harvester	Picker	SWFC[a]	SWOFC[b]
Traditional Module	15	12	10
CNH Module	6.5	N/A	N/A
JD Round	3.5	3	2

[a] Stripper harvester with a field cleaner
[b] Stripper harvester without a field cleaner

Since the introduction of the module builder, transporting modules has been of great concern to gin managers and primarily accomplished through a specialized live

bottom module truck (MT)**.** A module truck is a specialized vehicle that utilizes a series of roller chains in the tilting bed that are outfitted with cleats to convey the seed cotton module onto the bed of the truck. Shown in Figure 2, Figure 3, and Figure 4, a module truck has the capacity to transport a single traditional module, two CNH half-modules, and four John Deere round modules. Boyd and Hudson (1999) reported that eighty-five percent of the time Mississippi ginners would be responsible for transporting modules from the field to the gin; this is found to hold true in other parts of the cotton belt as well. The cost of transporting modules from the field is typically absorbed by the gin and not passed along to the producer directly (Harrison 2007).

A module truck loaded with a traditional module can weigh up to 26.7 tonnes (59,000-lbs) (Simpson, 2007).The weight of a loaded module truck exceeds the 15.4 tonne (34,000-lbs) weight limit of a standard commercial tandem axle truck travelling federally funded roadways (DOT, 2013). However, many states in the cotton belt have created exemptions or special permits that allow overweight module trucks to travel non-federal roadways. Regulations often cause module trucks to take longer routes from the field to the gin.

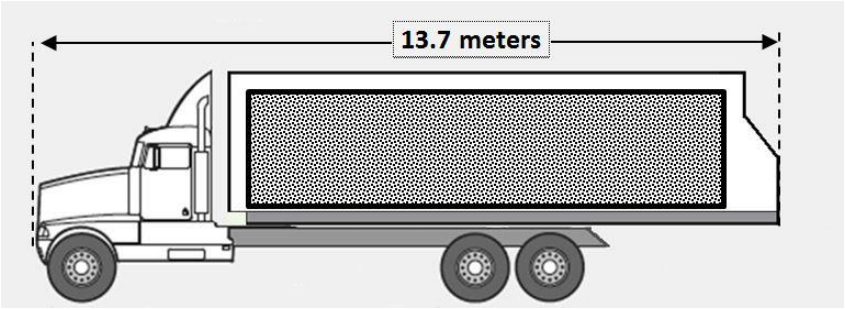

Figure 2. Schematic of a module truck loaded with a traditional module (Adapted from TXDOT, 2014).

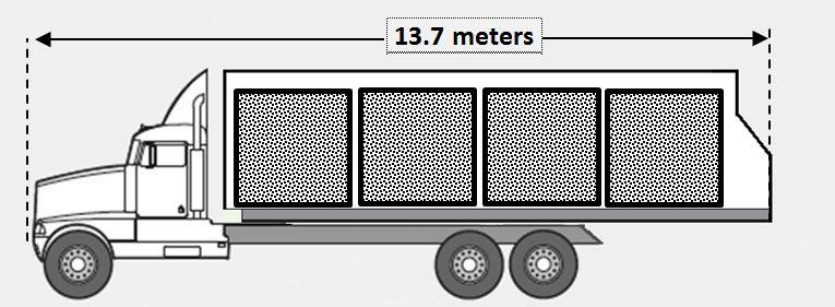

Figure 3.Schematic of a module truck loaded with 4 John Deere Round Modules (Adapted from TXDOT, 2014).

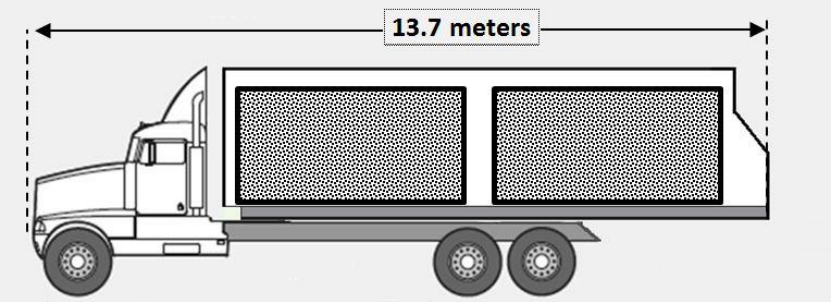

Figure 4. Schematic of a module truck loaded with 2 CNH Modules (Adapted from TXDOT, 2014).

Although not considered the best alternative when transporting traditional modules, the Semi-tractor and trailer (STT) is a worthwhile option when evaluating transportation systems for John Deere's round modules. According to the legal size and limits of Texas Motor Vehicle Law, a truck and trailer combination cannot exceed a trailer length of 18 meters (59 feet), height of 4.27 meters (14 feet), and weigh more than 36.3 tonnes (80,000 lbs) if the combination has a total of 5 axles (TXDOT, 2013). The use of a semi-tractor trailer to transport seed cotton from the field allows for a more direct route from the field to the gin. A common semi-trailer with a flat deck measures 16.2 meter (53 feet), can transport up to 6 round modules and could travel on the federal interstate system as shown in Figure 5. Considering the dimensions of the module, and assuming a single row on the trailer deck, this arrangement would not violate any load restrictions. A semi-trailer with a step deck can be used that measures 18.0 meters (59

feet) in length can be used to transport up to 8 round modules. The step decks allow for modules to be stacked, shown in Figure 6, without exceeding the maximum load height of 4.27 meters (14 feet).

This system could also be beneficial due to fact that a semi-truck can be used for multiple purposes. This could open up additional revenue streams for the gin, further reducing the cost of transporting modules.

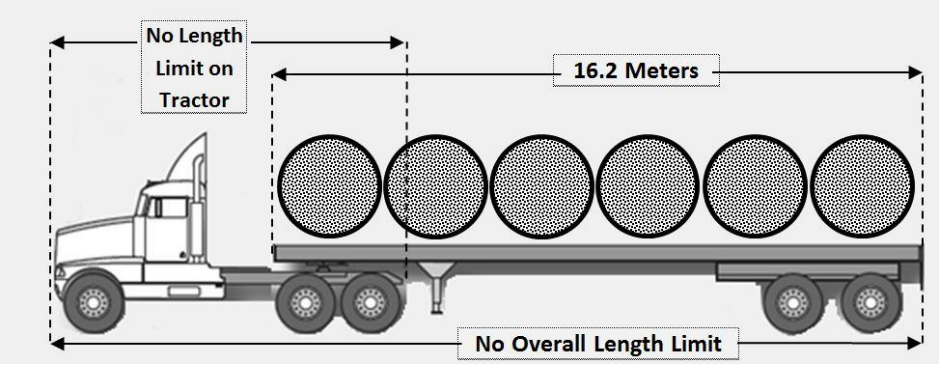

Figure 5. Schematic of a Semi-Tractor Trailer loaded with 6 John Deere round modules (Adapted from TXDOT, 2014).

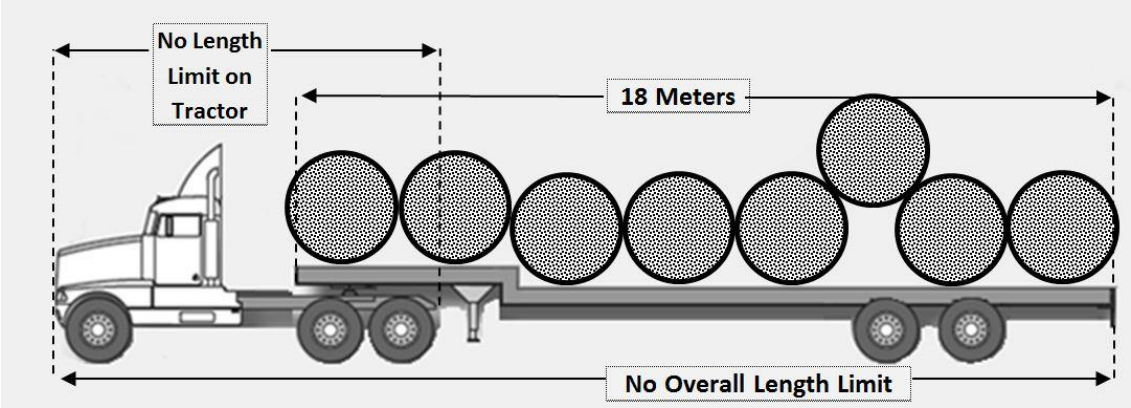

Figure 6. Schematic of a Step Deck Semi-Tractor Trailer loaded with 8 John Deere round modules (Adapted from TXDOT, 2014).

To be loaded and unloaded from semi-trailers, round modules require an additional piece of equipment in the field and at the gin. These loading systems are typically a farm tractor or articulated construction loader with three-point or front-end loader attachment as shown in Figure 7. These units can be equipped with radio frequency identification (RFID) readers that will assist operators at the gin yard with keeping track of the modules and positioning modules to cut the wrap at the designated location. The type and options selected greatly influence the cost of the attachment which range from 10 to 70 thousand dollars. The operation of loading equipment, if provided by the gin, will be considered in the cost of transporting modules from the field to the gin.

Figure 7. Round module loading and handling systems (KBH Equipment, 2014) and (Paladin Construction Group, 2014).

Changes in module shapes and dimensions have given cotton ginners the ability to use means other than a traditional live bottom module truck to transport modules from the field to the gin. A better understanding of the cost and logistical constraints associated with each method is critically needed by gin managers when making

management decisions regarding module transportation. Parnell et al. (2005) introduced the concept of developing decision support software (DSS) using variable and fixed costs versus "percent utilization" (%U) and reported that the total cost per bale increased significantly as the percent utilization dropped below 100%U.

Simpson et al. (2007) reported equations 1 and 2 to estimate the cost associated with transporting seed cotton modules by both a module truck (TC_{MT}) and a semi-tractor trailer (TC_{STT}) with a live bottom floor. This model included assumptions for cost of ownership and variable cost. Results of the study suggested that picker cotton transport costs per bale were lower than the cost per bale to transport stripper cotton. The study also demonstrated that transporting seed cotton modules with semi-tractor trailers showed potential to reduce the cost per bale over that of a module truck. Equations resulting from the study are as follows:

$$TC_{MT} = 60 + 2.10(d - 24.1) \quad (1)$$

$$TC_{STT} = 90 + 2.80(d - 24.1) \quad (2)$$

Where:

d = one-way distance (kilometers)
TC_{MT} = Cost to transport module using a contract module truck
TC_{STT} = Cost to transport module using a contract Semi-Tractor Trailer

Past research concluded that there is a relationship between fixed cost per bale and the percent utilization at which the gin was operating (Parnell et al. 2005). Emsoff et al. (2007) published researched findings that included models and algorithms for determining optimal season lengths in terms of percent utilization (%U) and minimal ginning cost for four different ginning rate categories as shown in Table 2. The cost curves for each gin category that describe the fixed costs per bale and total ginning cost are shown in Figure 8 and Figure 9. The notion that ginning cost would have a quadratic effect, rather than an exponential, is a consequence of equipment wearing out and needing increased maintenance as well as policies that allow cotton gins a 14 week exemption from paying overtime.

The concept of %U, as defined by Fuller et al. (1993), is that a gin operating at 100 %U would on average process seed cotton at 80% of the rated capacity (GR) for 1000 hours per season. For modeling purposes, %U allows for comparing economic and engineering data for cotton gins with different processing rates. Percent utilization is calculated using equation 3.

$$\%U = \frac{BG}{GR*0.8*1000} \quad (3)$$

Where:

%U = allows for comparing economic and engineering data for cotton gins with different processing rates
BG = Bales ginned during a given season;
GR = Rated ginning rate in bales per hour (bph);
0.8 = fraction corresponding to the equipment efficiency; and
1000 = hours of operation without downtime correspond to 100%U.

For example, if a gin rated at 30 bales per hour is operated at 100 %U, it would gin 24,000 bales (30*0.8*1000). If a gin is operated at 50 %U, then the gin is processing cotton for 500 hours regardless of the size of gin (Parnell et al. 2005a and 2006a).

Table 2. Optimal season lengths in terms of %U for gin rating categories reported by Emsoff et al (2007).

Category	Rating (bph)	Opt. %U
I	<15	130%
I	15-25	280%
III	25-40	200%
IV	>40	240%

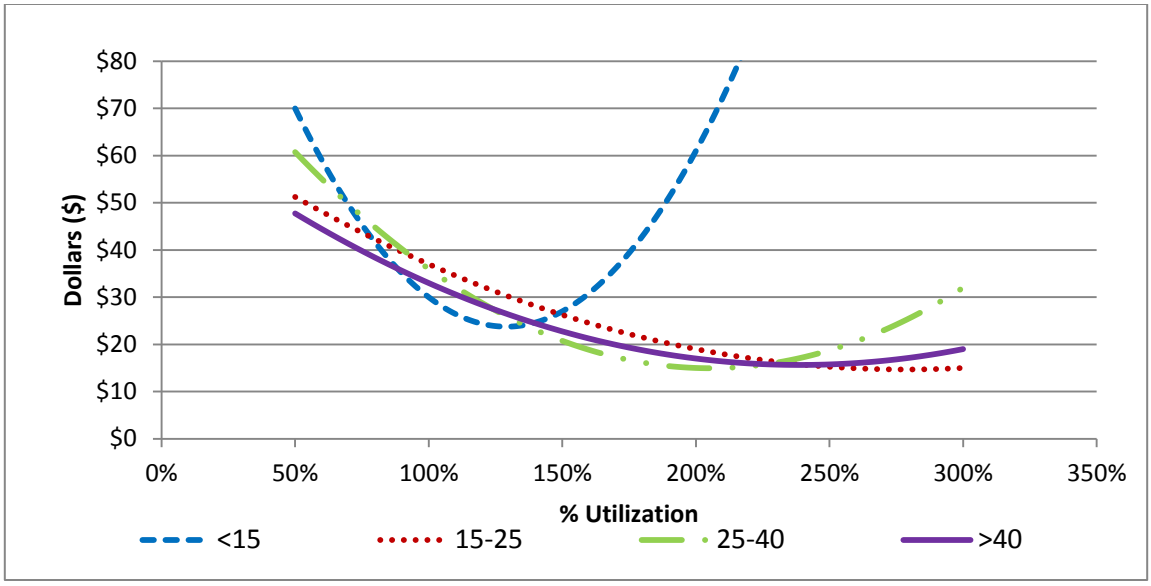

Figure 8. Predicted Fixed Cost/Bale vs. % Utilization for four categories of gin rated capacities (Emsoff, 2007).

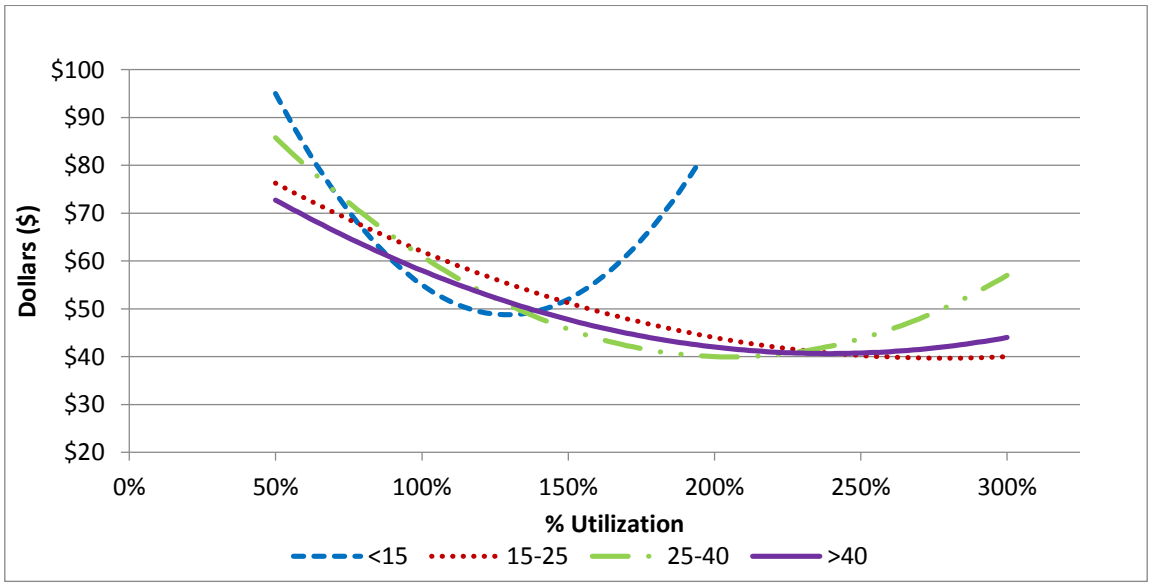

Figure 9. Predicted Total Cost/Bale vs. % Utilization for four categories of gin rated capacities (Emsoff, 2007).

U.S Department of Agriculture Agricultural Research Service (USDA ARS) in conjunction with several regional ginning associations surveyed gins and reported the average variable ginning cost for the cotton belt (Valco et al. 2012). Variable costs are described as the cost that will increase or decrease with the number of bales ginned during the season. Table 3 shows the average variable cost per bale for each gin category during the 2010 ginning season. The variable cost reported include: 1) Bagging and Ties, 2) repairs, 3) Electricity, 4) Dryer Fuel, 5) Seasonal Labor.

Table 3. 2010 Variable Ginning Costs for the Southwest Region as reported by Valco et al. (2012).

Rating Category	Bag/Ties	Repairs	Electricity	Dryer Fuel	Seasonal Labor	Total Variable
I	$5.13	$3.95	$3.41	$2.10	$9.89	$24.47
II	$4.80	$3.97	$3.83	$1.08	$8.79	$22.47
III	$4.34	$5.91	$3.69	$0.85	$7.07	$21.85
IV	$4.38	$3.69	$3.20	$0.75	$5.76	$17.77

*All values reported as average cost per bale

Objectives

The ability to quickly make informed decisions is important in any management role. Compiling management science tools and historical data in an easy to use decision support software can be a valuable asset to cotton ginners when making plans for upcoming ginning seasons. Plans can include: what % utilization can the gin expect to operate, how far should trucks be sent to pick up additional modules, how many trucks are needed, how many hours per day should trucks operate, and how many hours per day should the gin operate.

The planning and cost of transporting seed cotton from the field to the gin can be modeled mathematically and evaluated using simulation approaches as shown by examples in other industries. The ability for the cotton ginning industry to forecast and

make decisions easily using a Decision Support Software that is readily available is valuable when evaluating the overall cost of ginning. The objectives of this research are as follows:

1. Update an existing Decision Support Software tool developed in 2008 to reflect changes in the types of modules received at the gin.
2. Use Monte Carlo simulation to provide estimates of the cost for both a module truck and Semi-Tractor Trailer that is owned and contracted.
3. Use Monte Carlo simulation to provide estimates of the ginning cost per bale.

CHAPTER II

MATERIAL AND METHODS

Simulation is defined as the "process of designing a model of a real system and conducting experiments with this model for the purpose of either understanding the behavior of the system or of evaluating various strategies for the operation of the system" (Shannon, 1975). Using simulation the transportation system utilized by a cotton gin can be evaluated to estimate the cost and logistical constraints that might be associated with transporting seed cotton modules from the field to the gin's storage yard. Computer based simulation models allow for an inexpensive tool for rapidly generating data that can be used evaluate the cost of transporting modules from the field to the gin.

A mathematical model was developed using Microsoft Excel to calculate the cost of owning and operating a module truck and semi-tractor trailer used to transport modules. The spreadsheets being used can be found in Table 4 and Table 5. The data generated using simulation was incorporated into a simplified Decision Support Software. The Decision Support Software will be a useful tool for managers to quickly analyze the economic impact of management decisions on the total cost of ginning.

The Microsoft platform has been selected because of its ease of use, accessibility, and ability to be used in conjunction with Oracle Crystal Ball (CB) software. Unlike other forecasting, simulation, and risk analysis programs, Crystal Ball does not require the user to be familiar with special modeling languages to use its tools. The tools built into Crystal Ball allow for the user to analyze changes with a real world system due to risk caused within the physical system using a computer based spreadsheet model.

Table 4. Example of Spreadsheet developed to simulate the cost of owning and operating a module truck.

Cost of Owning & Operating a Module Truck			
Purchase Price [a]	$205,000.00	Fuel ($/gal) [a]	$3.50
Interest Rate [a]	6.42%	Fuel (Miles/gal)	5
Years Financed	5	Annual Repair/Maintenance	$28,140.00
Periods per Year	12	Service Cost	$750.00
Total Interest Paid	$31,665.43	Service Interval	15000
Useful Life (years)	10	Service Events	7
Salvage	10%		
Contribution to Ginning	100.00%	Labor ($/hr) [a]	$12.00
		Speed (MPH) [a]	42
Gin Rating (bph) [b]	25		
% Utilization [b]	335%	Loading/unloading/weigh time (Min)	17
Bales per Season	67000	Loading/unloading/weigh time (Hrs)	0.29
% Transported by Module Truck [a]	84%	Driving Time per module (hrs)	1.68
Anticipated Module Equivalents	5628	Total Time per load(hrs)	2.00
Average Mileage/load [b]	35		
Annual Mileage	93800	Hours per Day Ginning [b]	20
Trucks Needed [c]	4.2	Ginning Season (days)	168
		Hours per Day Transporting [b]	20
Primary Harvester Type [b]	SWOFC	Transport Days Available	134
Bales per Traditional Module [a]	10.0	Total Time per Season (hrs)	2680
Bales per CNH half-length Module	4	Total Time per Season (days) [c]	134
Bales per Round Module	7.5		
Modules Equivalents per Load	1		
Bales per Load	10.0		
Modules Equivalents Transported	1340		
Loads [c]	1340		

Fixed Cost		Variable Cost	
Depreciation	$18,450	Service ($/mile)	$0.05
Interest	$6,333	Repair/Maintenance	$0.30
Tax	$615	Labor Driving	$0.29
License	$500	Labor Loading/Unloading	$0.00
Insurance	$2,000	Fuel ($/mile)	$0.70
Overhead	$554		
Fixed Cost per Truck	$28,451.59	Variable Costs ($/mile) [c]	$1.34
Fixed cost per Module	$21.23		
Fixed cost per Bale	$2.12		
Fixed cost per Load [c]	$21.23		
Fixed Cost Per Mile	$0.30		

Total Cost	
Total Cost per Truck	$153,995.65
Total Cost per Module	$114.92
Total Cost per Bale [c]	$11.49
Total Cost per Load [c]	$114.92
Total Cost per Mile	$1.64

[a] Assumption Variable
[b] Decision Variable
[c] Forecast variable

Table 5. Example of Spreadsheet developed to simulate the cost of owning and operating a Semi-Tractor Trailer.

Semi-Tractor Trailer			
Truck Purchase Price [a]	$130,000.00	Fuel ($/gal) [a]	$3.50
Trailer Purchase Price [a]	$30,000.00	Fuel (Miles/gal)	8
Contribution to Ginning	100.00%	Annual Repair/Maintenance Costs	$9,166.50
Interest Rate [a]	6.42%	Service Cost	$750.00
Years Financed	5	Service Interval (miles)	15000
Periods per Year	12	Service Events	3
Total Interest Paid	$27,460.53		
Useful Life (years) [a]	10	Labor ($/hr) [a]	$12.00
Salvage	10%	Speed (MPH) [a]	42
Trailer length (feet)	53		
Round Modules per Load	8	Loading/unloading/weigh time (Min) [a]	33
		Loading/unloading/weigh time (Hrs)	0.56
Gin Rating (bph) [b]	40	Driving Time per module (Hrs)	1.68
% Utilization [b]	240%	Total Time per load (Hrs)	2.20
Bales per Season	76800		
% Transported by STT [a]	23%		
Bales per Season STT	17920		
Anticipated Module Equivalents	2240	Hours per Day Ginning [b]	20
Average Mileage per load [b]	35	Ginning Season (days)	120
Annual Mileage	30555	Hours per Day Transporting [b]	20
Trucks Needed [c]	1.30	Transport Days Available	96
Primary Harvester Type	Picker	Total Time per Season (hrs)	1921
Bales per Traditional Module	15.3	Total Time per Season (days) [c]	96
Bales per Round Module [a]	2.00		
Bales per CNH half-length Module	7.5		
Modules Equivalents per Load	2		
Bales per Load	16.0		
Module Equivalents Transported	1746		
Loads [c]	873		
Bales per Season [c]	13968		
Fixed Cost		Variable Cost	
Annual Depreciation	$14,400	Service ($/mile)	$0.05
Interest	$5,492	Repair/Maintenance	$0.30
Tax	$390	Labor Driving	$0.29
License	$500	Labor Loading/Unloading	$0.19
Insurance	$1,000	Fuel ($/mile)	$0.44
Overhead (Management)	$432		
Fixed Cost per Truck [c]	$22,214	Variable Costs ($/mile) [c]	$1.3
Fixed Cost per Load [c]	$25		
Fixed Cost per Module	$13	Total Cost per Truck	$60,898
Fixed Cost per Bale	$1.59	Total Cost per Load [c]	$70
		Total Cost per Module Equivalent [c]	$34.9
		Total Cost per Bale [c]	$4.36

Table 5 Continued.

Loading Cost			
Loader Purchase Price [a]	$50,000.00	Fuel ($/gal)	$3.50
Percent Contribution to Loading	100.00%	Fuel (hrs/gal)	0.4
Attachment Purchase Price [a]	$20,000.00	Annual Repair/Maintenance Costs	
Interest Rate	6.42%	Service Cost	
Years Financed	5	Service Interval (hours)	
Periods per Year	12	Service Events	
Useful Life (years)	10		
Total Interest Paid	$12,013.98	Labor ($/hr)	$12.00
Salvage	10%		
License	0	Loading/unloading/weigh time (Min)	33
Insurance	500	Loading/unloading/weigh time (Hrs)	0.56
Monthly Rental Cost (Wheel Loader)	6000		
Rental Time (months) [a]	4		
Hours per day	12		
Owned Loaders Available	1		
Leased Loaders Available	1		
Loads	1135		
Module Equivalents Transported	2270		
Bales Transported	17920		
Fixed Cost		Variable Cost	
Rental Cost	$24,000	Service	
Annual Depreciation	$1,800	Repair/Maintenance	$0.30
Interest	$2,403	Labor Loading/Unloading	$6.67
Tax	$60	Fuel	$0.78
License	$0		
Insurance	$500		
Overhead (Management)	$54		
Fixed Cost of Loading	$28,817	Variable Costs ($/load) [c]	$7.7
Fixed cost per Load (loading) [c]	$25.39		
Fixed cost per Module Equivalent	$13	Total Cost of Loading	$37,606
Fixed cost per Bale	$2	Total Cost per Load (loading) [c]	$33.14
		Total Cost per Module Equivalent	$16.57
		Total Cost per Bale (Loading) [c]	$2.10

Truck + Loading Cost			
Fixed Cost per Truck (T+L) [c]	$51,031	Total Variable Costs ($/mile) [c]	$1.3
Fixed cost per Load (T+L)	$51	Total Variable Costs ($/load) [c]	$7.7
Fixed cost per Module (T+L)	$25		
Fixed cost per Bale (T+L)	$3.20		
		Total Cost (T+L)	$116,774
		Total Cost per Load (T+L) [c]	$103
		Total Cost per Module (T+L) [c]	$51
		Total Cost per Bale (T+L) [c]	$6.46

[a] Assumption Variable
[b] Decision Variable
[c] Forecast variable

A conceptual transportation system is shown in Figure 10 that gin management would use to organize the transport of modules from the field to the gin's storage yard. This organizational structure will assist with the organization of simulations performed.

It can be assumed that both traditional modules and Case-New Holland half-modules are transported using a module truck. John Deere round modules are transported by either using a module truck or semi-tractor trailer. A loader is required both in the field and at the gin site to load and unload modules transported by semi-tractor trailer.

The time required to load and transport each mode of transportation was considered in this analysis to analyze the amount of time required to transport during the season. It was estimated to take 20 minutes on average to load, weigh, and unload a module with a MT. Variability was applied to the time required to load a module truck by a triangular distribution with a minimum, mode, and maximum of 10, 20, and 22 minutes, respectively. It was estimated to take 30 minutes on average to load, weigh, and unload a module with a STT. A STT takes longer to load due to it not being a self-loading unit and modules needing to be secured to the deck of the trailer. Variability was applied by a triangular distribution with a minimum, mode, and maximum of 25, 30, and 45 minutes, respectively

The average travel speed was estimated to be 72.5 km/h (45 mph) for a MT and 80.5 km/h (50 mph) for a STT. Each mode of transportation was described by a triangular distribution with a minimum, mode, and maximum average travel speed. A MT used 35, 40, and 50 mph, respectively. A STT used 40, 45, and 55 mph, respectively.

When estimating the number of trucks needed during the season, an estimate of 80% of the ginning season length was considered to account for any weather conditions that may prevent module trucks or Semi-tractor trailers from entering fields to transport modules.

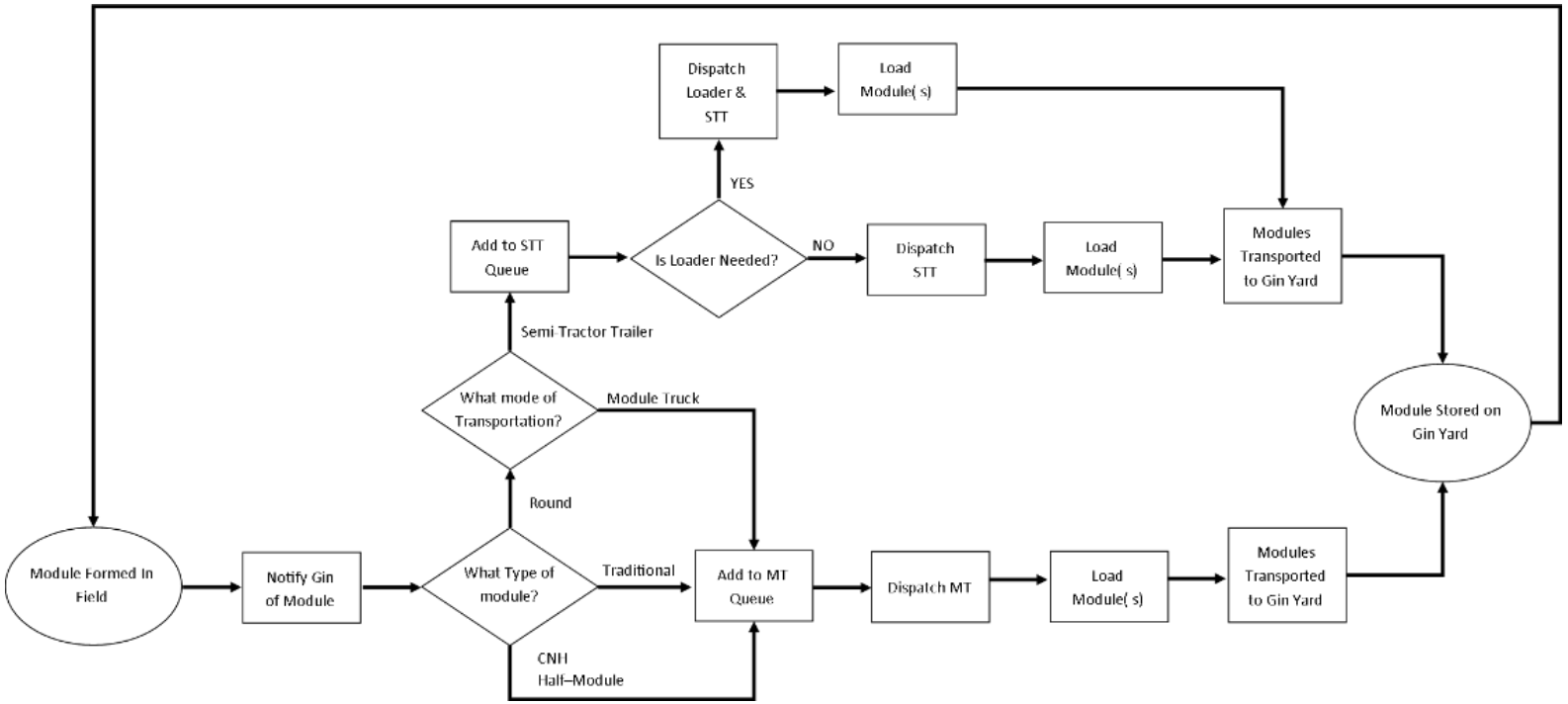

Figure 10. Conceptual flow diagram for the transportation system utilized by a gin.

The actual number of bales contained in each module is known to vary. The number of bales contained in each module was described by a triangular distribution outlined in Table 6(Hamann, 2007).

Table 6. Bales contained in module types based on harvester used (Hamann, 2011).

Harvester	Picker	SWFC	SWOFC
Traditional Module	15 ± 3	12 ± 3	10 ± 3
CNH Module	6.5 ± 3	N/A	N/A
JD Round	3.5 ± 1	2.5 ± 1	2 ± 1

The cost associated with owning and operating a module truck can be described as either a fixed or variable cost. Fixed costs are paid on an annual basis independent of the amount of use. In this analysis, fixed costs evaluated are: 1) depreciation, 2) taxes, 3) license and registration, 4) insurance, and 5) management. Variable costs vary directly with the amount of use and are not owed if the equipment is not operated. Variable costs considered are: 1) service, 2) maintenance and repair, 3) labor, 4) fuel. Annual fixed costs were divided by the number of loads expected for the equipment.

Fixed Costs

It is estimated that a new module truck will cost $205,000 ± 10% based on the options selected (Nunnely, 2014). A uniform distribution with a minimum of $180,000 and a maximum of $230,000 was used to account for any variations due to variations in options selected. A used Semi truck and new trailer were estimated to cost $130,000 and $30,000 respectively. A normal distribution with a mean of $130,000 and standard deviation of $5000 was used for a used semi-tractor. A normal distribution with a mean of $30,000 and standard deviation of $1000 was used for a trailer.

A wheel loader specified to use for attachments was quoted for both rental and purchase. Rental cost were estimated at $6000 per month and purchased used at a cost

of $50,000 (Wilson, 2014). Each was fit with a normal distribution to describe the variation in purchase or rental price. Used loaders were given a mean of $50,000 and a standard deviation of $5,000 based on information from an equipment dealer. The rental of a loader was estimated with a mean of $6000 per month and a standard deviation of $540 based on estimates received. Several different attachments are commercially available ranging from simple to more complex that accomplishes other tasks as well such as data collection and wrap removal of round bales. The simple attachment was estimated to cost $10,000 (Cauthen, 2013). The more complex attachment outfitted with power rollers, and RFID reader was estimated to cost $70,000 (Crook, 2013).

Depreciation (D) of equipment was calculated using the straight-line depreciation method shown in equation 4. The depreciation amount calculated was included in the annual fixed cost of assets. A module truck is assumed to have a useful life of approximately 7 to 10 years described by a uniform distribution.

$$D = \frac{(P-S)}{L} \tag{4}$$

Where:
P = purchase price of equipment;
S = salvage value of equipment at the end of useful life;
L = Useful life of equipment in years.

Interest paid on an annuity was calculated using equation 5, found in the standards of the American Society of Biological and Agricultural Engineers (ASABE, 2013). The minimum interest rate used was the current prime interest rate, 3.25%, as reported by the Federal Reserve System (FRS, 2014). Current commercial loans were found to range between 6.25% and 10%. Loan rates were described by a triangular distribution with a minimum, mode, and maximum of 3.25%, 6.25%, and 10%, respectively.

$$R = (P - S)\left[\frac{\frac{i}{q}}{1-\left(1+\frac{i}{q}\right)^{-nq}}\right] + S\left(\frac{i}{q}\right) \quad (5)$$

Where:

R = one of a series of equal payments due at the end of each compounding period, q times per year;
P = purchase price of equipment;
i = annual interest rate in decimal;
q = compounding periods per year;
n = life of the investment in years; and
S = salvage value.

Cooperating gins provided data that helped to prepare histograms that were useful when performing simulations. Shown in Figure 11 is a histogram describing the number of modules picked up within ranges 0 to 25.7 km (0 to 15 miles), 25.8 to 49.8 km (16 to 48.3 km), 49.9 to 73.9km (31 to 45 miles), 74.0 to 96.6 km (46 to 60), and greater than 96.7 (60 miles). The average one-way distance to modules of the gins surveyed is 41.8 km (26 miles) with a standard deviation of 5.8 km (3.6 miles). The average distance (AD) to all modules was used in simulations rather than simulating distances to individual modules. This is due to insufficient data being available to simulate individual distances with any confidence.

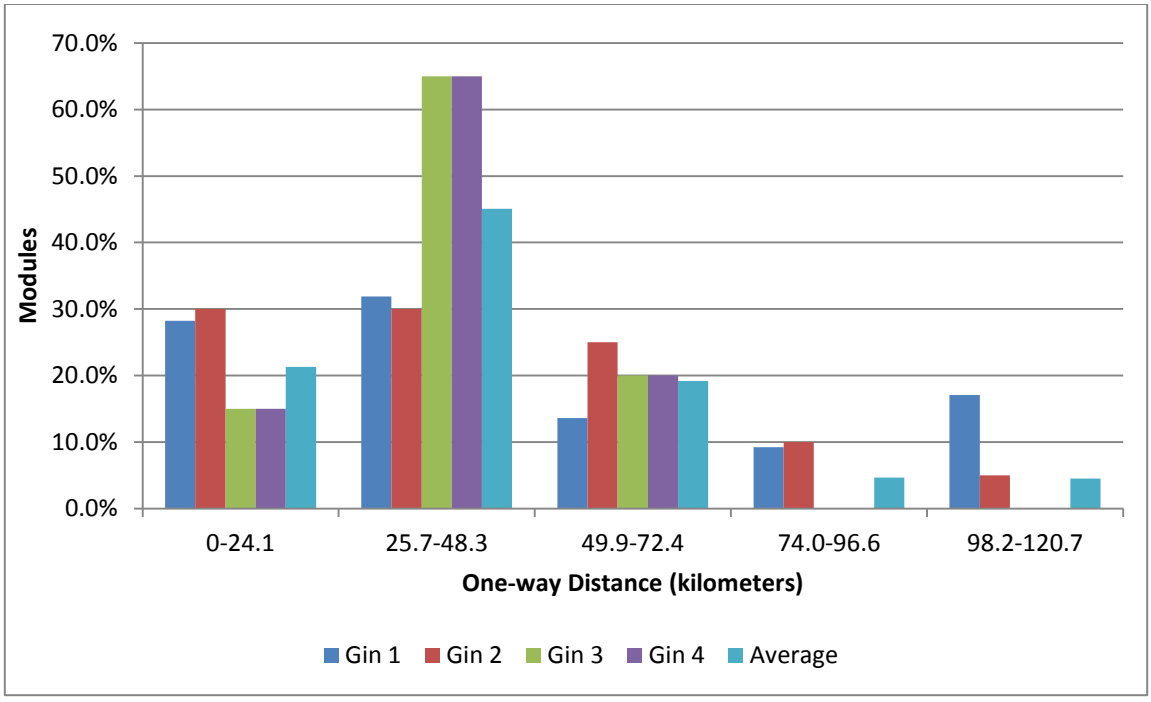

Figure 11. Histogram of one-way distances to modules from cooperating gins surveyed.

Variable Costs

The three-year average price paid for No. 2 diesel in the southwest region of the United States was described by a normal distribution with a mean of $3.70 per gallon with a standard deviation of 0.41 (EIA, 2014).

A service interval of 24,000 km (15,000 miles) was used for routine service. This includes: engine oil, engine oil filter, air filter, etc. This is lower than the intervals recommended by PACCAR Inc. a global leader in heavy duty trucks. This service interval was selected due to the dusty operating conditions that a module truck or semi-truck would experience in the field. Based on data from cooperating gins a routine service costs $750.

Annual maintenance and repair of module truck or semi-tractor was expected each season to keep the truck operational and safe to operate. This can include overhaul,

tires, live bed chains, or hydraulic repairs. Data from cooperating gins suggested that the average maintenance and repair cost would be $5,000.

Dependable labor is a vital component needed to operate module trucks and loaders in the field. Data from cooperating gins suggested that drivers are paid on average $12.00 per hour with a standard deviation of 1.63 and can be described by a normal distribution. This did not include benefits, workers compensation insurance, or employment taxes. A factor of 1.25 was used to adjust the paid hourly wage to a value that reflects the actual cost associated with holding an employee (Hadzima, 2005).

Conclusion

An approach was developed for simulation of estimating the cost of transporting seed cotton modules from the field to the gin. Assumption, decision, and forecast variables were selected to analyze the cost of transportation. The selected assumption variables have historical variability that can alter the estimated cost of transporting modules from the field. The following assumption variables were selected:

1) Purchase price of equipment;
2) Interest rate on annuity;
3) Life of Equipment;
4) Number of modules transported (loads);
5) Average transportation distance;
6) Cost of Energy; and
7) Cost of Labor.

For each criterion outlined above, variability was applied using distribution tools included in the Crystal Ball simulation package that will fit industry data to a continuous probability function. The variability applied helped to analyze and account for any associated risk.

Decision variables are subject to the choice of the manager and once decided upon do not contain variability. Decisions variables selected for these simulation are:

1) Gin processing rate;
2) Average distance to modules;
3) % Utilization
4) Hours per day available to transport modules; and
5) Hours per day available to gin.
6) Primary harvester type used.

Decision variables were the factors used to formulate an experimental design to test at different levels. Testing at different levels was needed to construct algorithms for inclusion in the Decision Support Software.

Forecast values are the result of the assumption and decision variables. The resulting data from the forecast variables can be incorporated in Decision Support Software to give cotton gin managers and producers an estimate about the cost of transporting seed cotton from the field, truck requirements to transport modules, and the resulting impact on the total cost of ginning. Forecast values selected to analyze and report are:

1) Cost per load;
2) Variable costs ($/mile);
3) Average total cost per load;
4) Average total Cost per bale;
5) Time per season transporting modules; and
6) Trucks needed.

A series of simulations for module trucks and semi-tractor trailers were performed for each gin rating category by altering the decision variables outlined. Selected decision variables and corresponding levels are outlined in Table 7. Each scenario outlined was iterated 1000 times using Oracle's Crystal Ball. The mean and standard deviation will be reported from data generated for each scenario. Data outside of three standard deviations of the mean was considered an outlier and removed from the dataset.

Table 7. Selected decision factor and levels to use for simulation trials.

Factor	Level 1	Level 2	Level 3	Level 4	Level 5
Gin Rating (bph)	0-15	15-25	25-40	>40	
Average Distance (Km)	32.2 (20)[1]	40.2 (25)[1]	48.3 (30)[1]	56.3 (35)[1]	
% Utilization	- 20%	- 10%	Optimal	+ 10%	+ 20%
Gin Time Available (hrs)	20	22			
Transport Time Available (hrs)	10	20			
Harvester Type	Picker	SWFC	SWOFC		

[1] ()Distance in miles

The resulting data helped generate a best fit equation, similar to the equations presented by Simpson et al., which will aid gin managers estimate the cost of transporting individual modules from the field to the gin. Equation 6 represents a general equation that was followed. Average fixed cost per load (AFC) is the amount that is allocated to picking up a load no matter how far the truck travels. The variable cost (VC) is the operating cost of the truck that depends on the distance travelled (d) to pick up modules. This type of cost equation will be useful to managers who may adopt a policy where only a portion of transporting expenses are covered in the cost of ginning.

$$\mathrm{ATC} = \mathrm{AFC} + (2 \times \mathrm{VC}) \times d \tag{6}$$

Where:
AFC = Fixed Cost per load
VC = Variable Cost per mile
d = One-way distance travelled

CHAPTER III

UPDATING DECISION SUPPORT SOFTWARE

In 2009, a Decision Support Software was developed at Texas A&M and released by Cotton Incorporated (2012). The intent of this DSS was to give gin managers a decision aid when determining whether or not to open the gin doors that season based on cotton acres grown within the region, crop yield, or factors that would drive up the cost of ginning. The DSS was developed in Microsoft Excel making it very practical for gin managers to use with a personal computer without needing to purchase or learn new software. Graphics of the inputs and summary tables are shown in Figure 12 and Figure 13.

The results given by the DSS showed only the fixed cost per bale and the transportation cost per bale. Variable costs per bale were not considered.

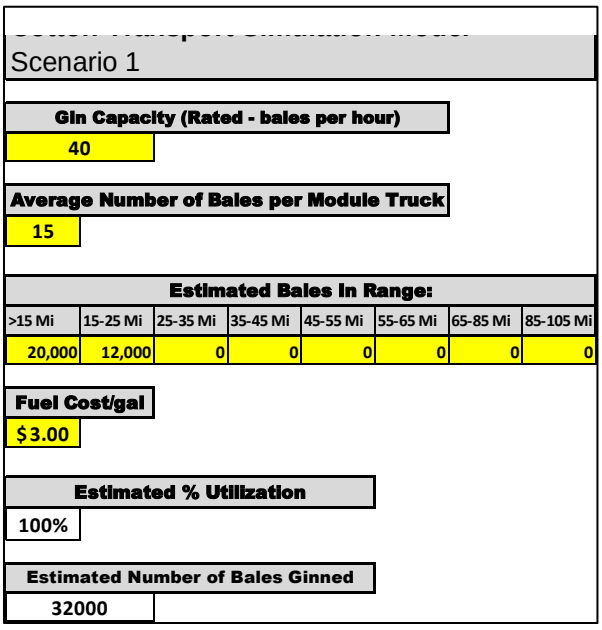

Figure 12. Scenario page from 2009 Decision Support Software (Cotton Incorporated, 2012).

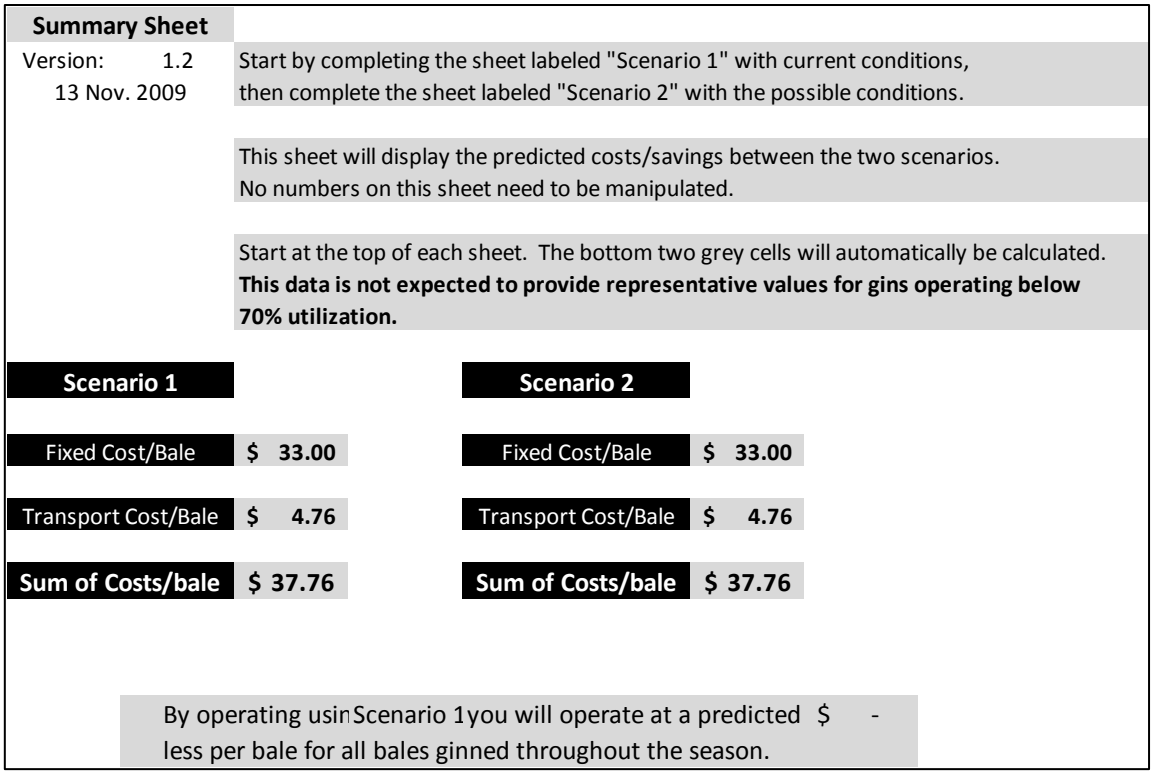

Figure 13. Summary page of the 2009 Decision Support Software (Cotton Incorporated, 2012).

The 2009 model was very simplistic and easy to use, however additional information was desired by gin managers and producers. The changes made to the DSS are outlined in the following sections of this chapter.

Since the time of the initial development of the DSS, the cotton industry has seen changes that have the potential to impact the cost of operating a cotton gin; specifically related to the transportation of modules from the field to the gin. Different module shapes and sizes are being built and alternative modes of transportation can be used to transport them. The primary objective of the updates was to include the different modes of transportation becoming available.

Changes were made in the DSS to give gin managers additional information which might be relevant when making business decisions. Often, producers will communicate planted acres to the gin who record this information for planning purposes. As the growing season progresses the gin can update its information based on projected

yields to calculate the number of bales expected during the season. For this reason, the ability to enter the acres and yield into the DSS was deemed to be beneficial.

The initial version of the DSS did not allow the user to distinguish between contracted trucks and gin owned trucks transporting modules from the field when evaluating cost. The ability to distinguish what percentage of module equivalents would be transported by each mode was added. Spreadsheet models were developed and included in the DSS to estimate the cost of transporting modules for each mode from the field to the gin based on the inputs of the user. The same models, found in Table 4 and Table 5, are used in subsequent chapters to estimate the cost of transporting modules using simulation techniques. Within the model is also the ability to account for the amount of time required for each alternative method to load and transport modules from the field to the gin. These calculations are useful to the gin manager who is trying to size the fleet of trucks required based upon changes within the system.

Within Figure 14, you will notice cells that are shaded yellow and blue. The yellow cells represent values which can be changed by the user based on the operation being evaluated. The blue cells represent values which may be useful when making decisions.

Cotton Transport Model

Scenario 1

Mileage Lower	Mileage Upper	Contract Acres	Bales / Acre	Modules Recvd	Bales Recvd	% modules w/in Ring	Percent of module equivalents to each transport method: Contract Module Truck	Owned Module Truck	Contract Semi-Tractor Trailer	Owned Semi-Tractor Trailer	Total
0	15		2.00	0	0		0%	80%	0%	20%	
15	30		2.00	0	0		0%	80%	0%	20%	
30	45		2.00	0	0		0%	80%	0%	20%	
45	60		2.00	0	0		0%	80%	0%	20%	
60	75		2.00	0	0		0%	80%	0%	20%	
75	90		2.00	0	0		0%	0%	0%	0%	
90	105		2.00	0	0		0%	0%	0%	0%	
105	120		2.00	0	0		0%	0%	0%	0%	
120	135		2.00	0	0		0%	0%	0%	0%	
			Total	0	0	100%					

***Must Total 100%

Gin Capacity (Rated)	
40	bales/hour

Transport Days			
0	Days	12	Hours/Day

Primary Harvester
Picker

Bales per Module	
	Bales per Module
Traditional	19
Round Modules	4
Half Modules	7

	Trucks Available	Bales/Load	Loads/Truck
2	Contracted Module Truck	19	0
5	Owned Module Truck	19	0
1	Contracted Semi-Tractor Trailer	22	0
1	Owned Semi-Tractor Trailer	22	0

Days Ginning			
0	Days	22	Hours/Day

Loaders Available	
1	Owned loader
2	Leased Loader

Estimated Bales in Range

	1	2	3	4	5	6	7	8	9				
	Miles from Gin									Total	%	Avg Distance	Days
	>15 Mi	15-30	30-45	45-60	60-75	75-90	90-105	105-120	120-135				
Contracted Module Truck	0	0	0	0	0	0	0	0	0	0	0.0%	0	
Owned Module Truck	0	0	0	0	0	0	0	0	0	0	0.0%	0	
Contracted Semi-Tractor Trailer	0	0	0	0	0	0	0	0	0	0	0.0%	0	
Owned Semi-Tractor Trailer	0	0	0	0	0	0	0	0	0	0	0.0%	0	
Total	0	0	0	0	0	0	0	0	0	0			
Percent within Region													

% Utilization	
0%	% U

Bales Ginned	
0	Bales

Average Distance	
	Miles

Module Equivalents	
0	Modules

Variable Cost of Ginning		
Bagging and Ties	$5.00	$/bale
Repairs	$6.50	$/bale
Seasonal Labor	$7.75	$/bale
Electric	$5.60	$/bale
Dryer Fuel	$0.15	$/bale
Total Variable Costs	$25.00	$/bale

Energy Cost		
Electric	0.09	$/kWh
Dryer Fuel	5.99	$/MCF

Energy Use		
Electric	48.75	kWh/bale
Dryer Fuel	0.02	MCF/Bale

Figure 14. Scenario page of updated Decision Support Software.

An additional summary page was added to aid the user in determining the cost associated with transporting modules within each mileage range. This type of analysis is useful when evaluating how loads could be distributed between each mode of transportation to potentially reduce cost. Figure 15, Figure 16, and Figure 17 depict information that is displayed in the transportation summary page of the DSS. Shown in Figure 18 is the summary output that gives estimates on the cost to transport and gin cotton. This summary can be used by the gin manager to quickly realize the economic impact of altering the operation of the gin and transportation system.

Transportation Method	Base Charge	Cost per Mile	Miles Included	
Contracted Module Truck	$65.00	$2.65	0	
Owned Module Truck	$63.00	$1.90	0	
Contracted Semi-Truck Trailer	$0.00	$4.00	0	
Owned Semi-Tractor Trailer	$72.00	$3.20	0	

Total Transportation Cost =	$386,437

Average Transportation Cost per Module	
Contracted Module Truck	$111
Owned Module Truck	$125
Contracted Semi-Tractor Trailer	$89
Owned Semi-Tractor Trailer	$235
Average Transportation Cost per Module	$101

Average Transportation Cost per Bale	
Contracted Module Truck	$5.90
Owned Module Truck	$6.70
Contracted Semi-Tractor Trailer	$4.70
Owned Semi-Tractor Trailer	$12.50
Average Transportation Cost per Bale	$6.80

Figure 15. Transportation summary within DSS that provides estimates for the transportation cost per module and bale for each mode of transportation.

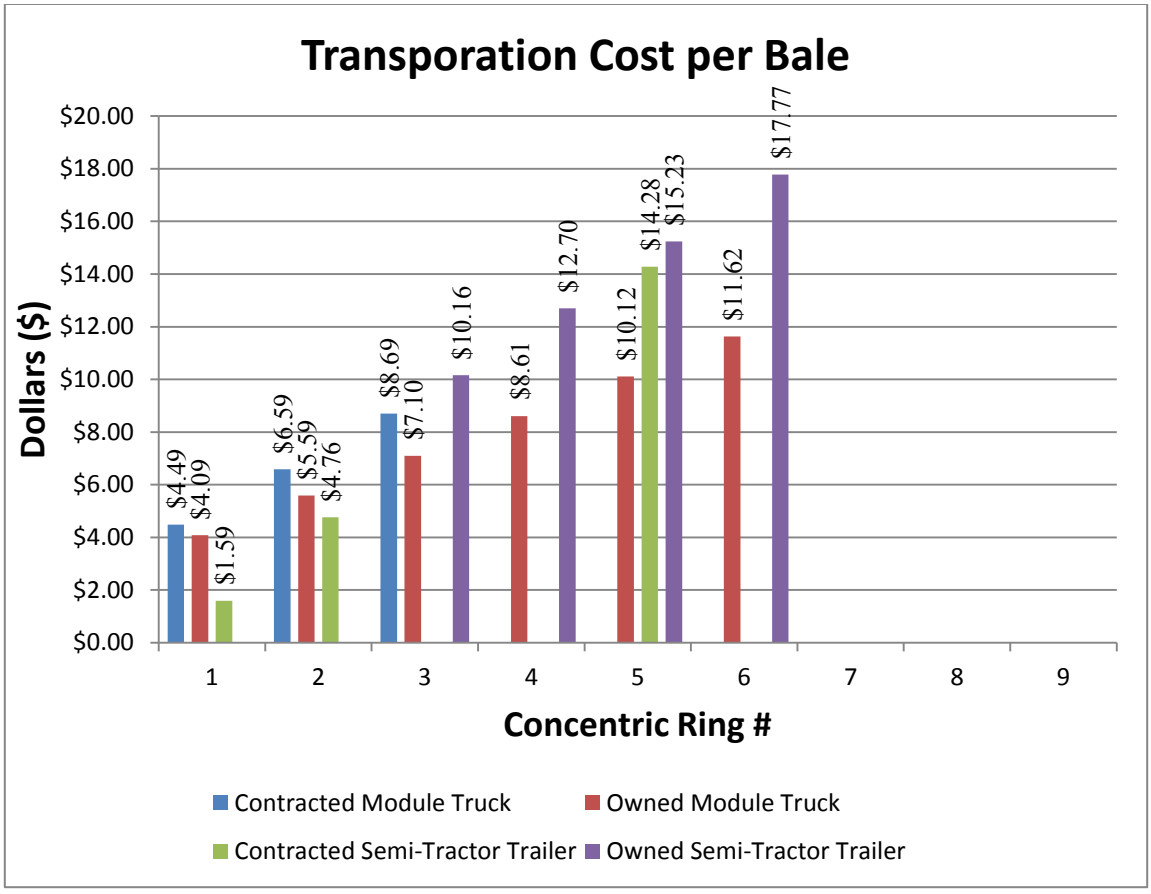

Figure 16. Bar chart showing an example of cost per bale for each distance range and type of truck.

Contracted Module Truck

Concentric Ring #	Average Distances	# of Bales	# of Modules	Cost per Module	Cost per Bale	TOTAL
1	7.5	4,800	320	$84.88	$4.49	$21,550.29
2	22.5	4,800	320	$124.63	$6.59	$31,643.07
3	37.5	1,200	80	$164.38	$8.69	$10,433.96
4	52.5	-	0			
5	67.5	-	0			
6	82.5	-	0			
7	97.5	-	0			
8	112.5	-	0			
9	127.5	-	0			
Totals:		10,800	720			$63,627

Owned Module Truck

Concentric Ring #	Average Distances	# of Bales	# of Modules	Cost per Module	Cost per Bale	TOTAL
1	7.5	8,000	533	$77.25	$4.09	$32,690.43
2	22.5	14,400	960	$105.75	$5.59	$80,551.76
3	37.5	8,400	560	$134.25	$7.10	$59,652.10
4	52.5	8,000	533	$162.75	$8.61	$68,872.07
5	67.5	2,000	133	$191.25	$10.12	$20,233.15
6	82.5	1,600	107	$219.75	$11.62	$18,598.63
7	97.5	-	0			
8	112.5	-	0			
9	127.5	-	0			
Totals:		42,400	2,827			$280,598

Contracted Semi-Tractor Trailer

Concentric Ring #	Average Distances	# of Bales	# of Modules	Cost per Module	Cost per Bale	TOTAL
1	7.5	3,200	213	$30.00	$1.59	$5,078.13
2	22.5	4,800	320	$90.00	$4.76	$22,851.56
3	37.5	-	0			
4	52.5	-	0			
5	67.5	1,000	67	$270.00	$14.28	$14,282.23
6	82.5	-	0			
7	97.5	-	0			
8	112.5	-	0			
9	127.5	-	0			
Totals:		9,000	600			$42,212

Owned Semi-Tractor Trailer

Concentric Ring #	Average Distances	# of Bales	# of Modules	Cost per Module	Cost per Bale	TOTAL
1	7.5	-	0			
2	22.5	-	0			
3	37.5	2,400	160	$192.00	$10.16	$24,375.00
4	52.5	2,000	133	$240.00	$12.70	$25,390.63
5	67.5	1,000	67	$288.00	$15.23	$15,234.38
6	82.5	400	27	$336.00	$17.77	$7,109.38
7	97.5	-	0			
8	112.5	-	0			
9	127.5	-	0			
Totals:		5,800	387			$72,109

Figure 17. Example Table within DSS given details on bales, modules, and totals for each distance range for a given scenario.

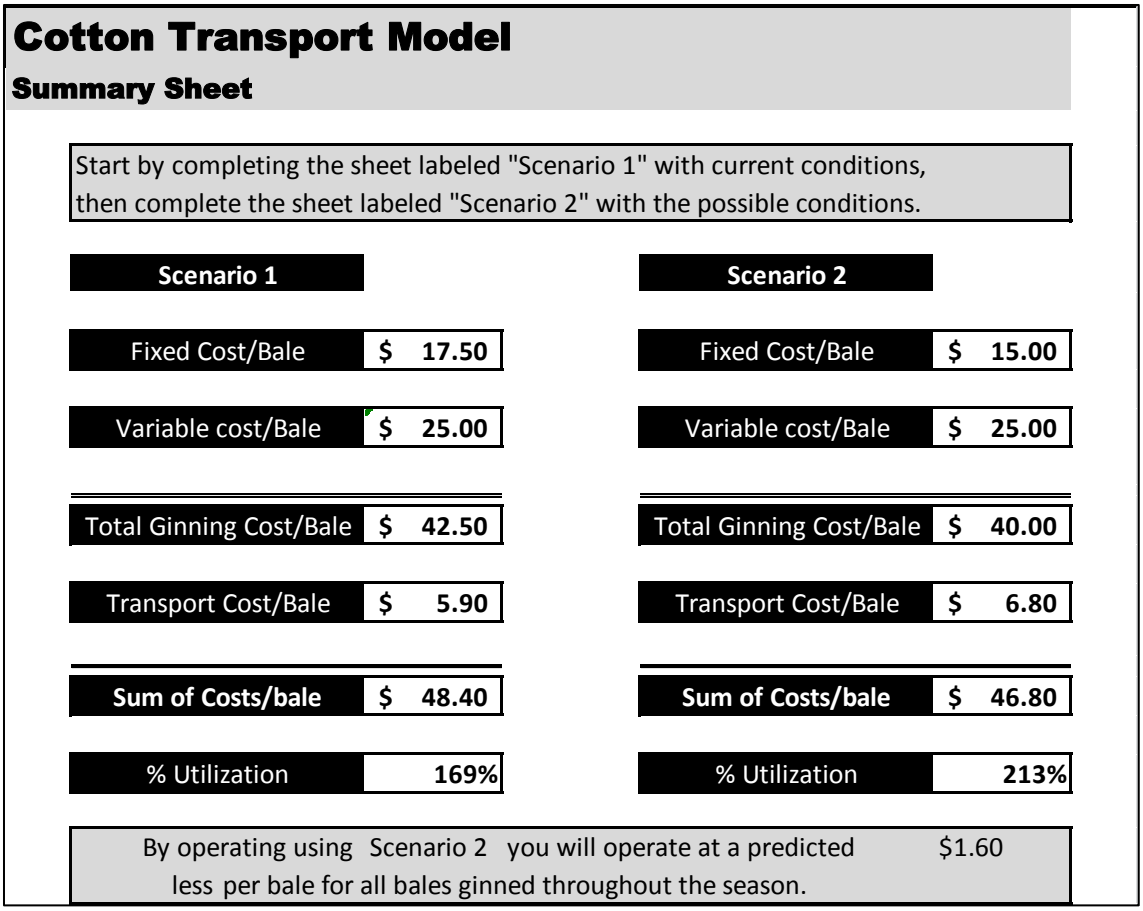

Figure 18. Summary page of the 2014 Decision Support Software.

The updated DSS has been updated to include alternative modes of transportation, variable ginning costs, time spent transporting modules, and additional summary information to aid gin in making more efficient business decisions. These changes are beneficial to gins that are evaluating changes in ginning rate, average distance to modules, and transporting modules using alternative modes. Changes made in the operation are striving to reduce cost, improve efficiency, and ultimately increase profit.

CHAPTER IV

ESTIMATING THE COST OF TRANSPORTING MODULES AND SIZE OF FLEET

Using the background data and equations found in literature, a spreadsheet model was developed to simulate conditions outlined in Table 7 for both a module truck and semi-tractor trailer. For further details on the spreadsheet used, refer to Table 4 and Table 5 in materials and methods. This section of the report documents the results of the analysis on the cost of transporting modules from the field to the gin for a 40 bph gin through iterations of simulations conducted using Crystal Ball software. Models and algorithms developed in this analysis could then be incorporated into a DSS to aid gin managers when evaluating the economic impact of different modes of transportation within the ginning operation. A sensitivity analysis of the cost to transport cotton modules from the field to the gin was also performed to show which factors selected have the most potential to affect the outcome. Data and analysis for additional gin ratings can be found in Appendix A.

Cost of Owning and Operating a Module Truck

Cotton gin managers must continually analyze the cost of owning and operating module trucks because transportation costs are typically absorbed by the gin through the fee schedule charged to producers for ginning cotton. An analysis was performed using iterations of a simulation model for module trucks that contained risk and variability in both fixed and variable cost components. This analysis was performed to generate data which could be used to develop models to estimate the cost incurred by the gin to transport cotton modules from the field to the gin.

Fixed Cost of Operating a Module Truck

The annual fixed cost of owning a module truck was found to be $28,500 with a standard deviation of $3,000 through iterations of the spreadsheet model. The annual fixed cost is based on assumptions that contain variability and risk; the mean values and standard deviations are reported in Table 8. The annual fixed cost is disbursed equally to the number of loads transported each season by the module truck.

Table 8. Risk and uncertainty variables associated with owning a module truck.

Category	Mean	Std Dev
Purchase Price	$204,200	$14,400
Interest Rate	6.46%	1.37%
Useful Life (years)	10.00	0.97

Cost per load data associated with the fixed cost of owning a module truck was sorted by gin rating, primary harvester type, and average distance. These data were then plotted with respect to percent utilization. These plots describe the cost function that a gin would expect if the average distance to transport modules were to remain steady percent utilization were to vary. As percent utilization increases, trucks are used to transport more loads during the gin season. Increased number of loads per truck distributes the fixed costs associated with transportation over a larger number of units. Alternatively, as the average distance to modules increases, fewer loads are completed during the ginning season due to the increased travel time from the field to the gin.

The resulting cost per load for each harvester type simulated was in close proximity and may not be significantly different. A paired t-test was performed to detect whether there was a difference in the means for fixed cost per load between harvester types. The null hypothesis was that there was a detectable difference in the means at an alpha level of 0.05. Shown in Figure 19 is the resulting box plot generated using the data for each harvester type. The calculated mean of fixed cost per load for each harvester

type and the connecting letter analysis is shown in Table 9. The results of the paired t-test indicated that the null hypothesis could be rejected. There was not a significant difference in the means in fixed cost per load for each harvester type and a single model could be used to estimate fixed cost per load.

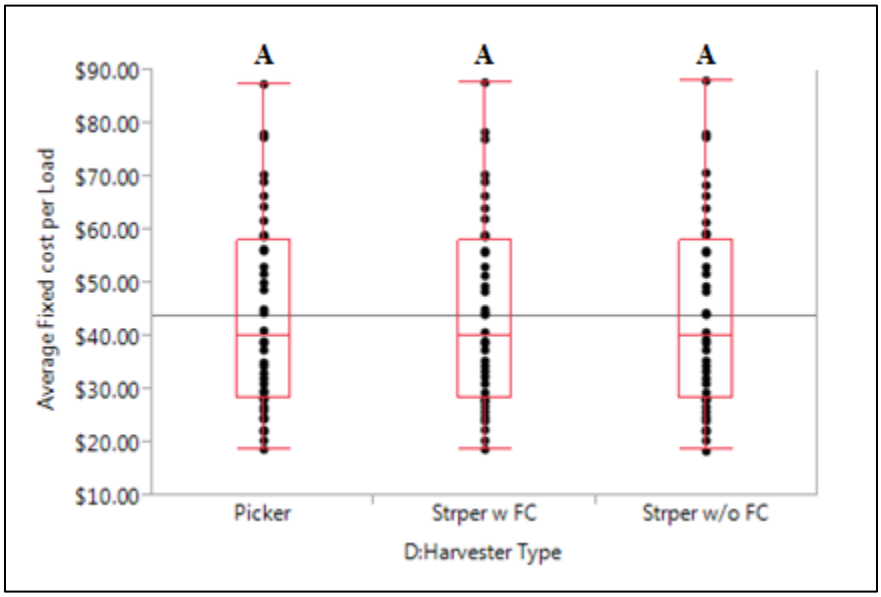

Figure 19. Box plot of means from iterations of simulations for a module truck transporting modules from three harvester types.

Table 9. Connecting letter Table with mean and standard deviation for fixed cost per load for harvester types.

Level	Connecting Letter	Mean	Std Dev
Picker	A	44.05	18.11
SWFC	A	44.00	18.13
SWOFC	A	43.99	18.16

The resulting average fixed cost per load data is compiled into Figure 20. Equations for best fit lines are summarized in Table 10 for each corresponding average distance. These equations are used in the average total cost equations based on the average distance to modules of the gin being evaluated.

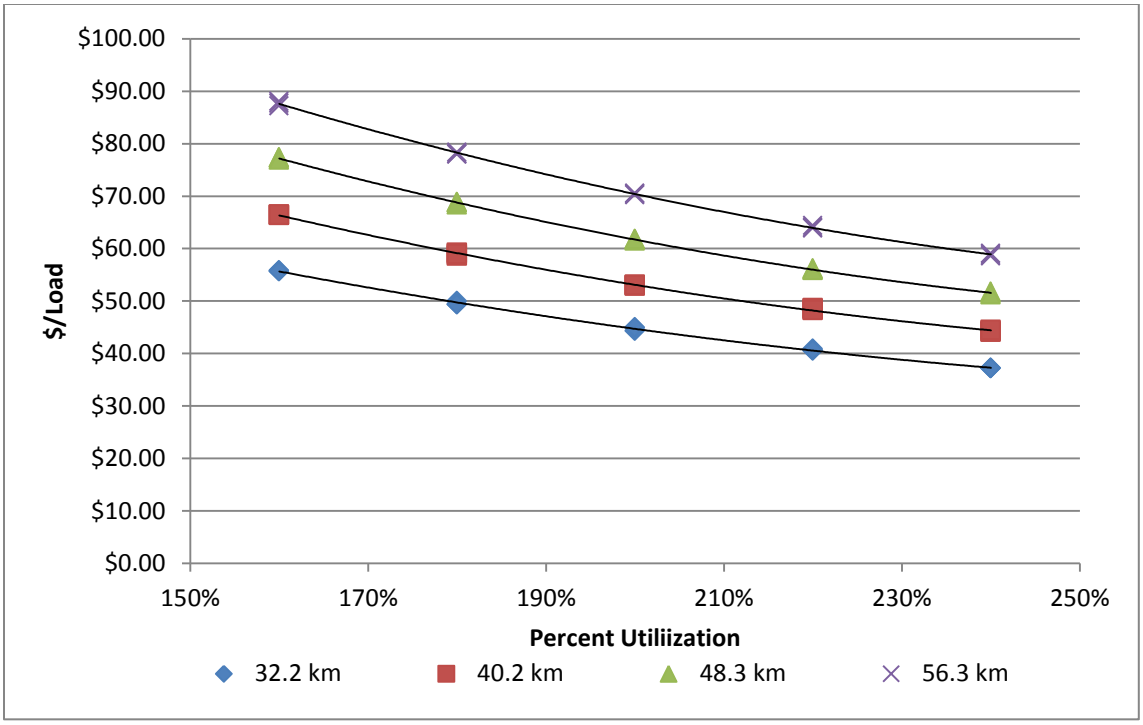

Figure 20. Plotted MT data for average fixed cost per load for a 40 bph gin for all three harvester types at four average distance of 32.2, 40.2, 48.3, and 56.3 km, respectively..

Table 10. Average fixed cost per load best fit equation for a module truck corresponding to the average distance to modules (AD).

Distance	Equation	R2
32.2 km	$11.1(\%U)^2 - 67.2(\%U) + 135$	0.999
40.2 km	$14.3(\%U)^2 - 84.5(\%U) + 165$	0.999
48.3 km	$16.7(\%U)^2 - 98.7(\%U) + 192$	0.999
56.3 km	$17.8(\%U)^2 - 107(\%U) + 213$	0.999

Variable Cost of Operating a Module Truck

The variable costs of operating a module truck were simulated and an analysis of variance (ANOVA) was performed to determine whether average distance or %U had an effect on the cost per mile. The null hypothesis was that the variable cost per mile would change as a result of average distance and %U. The results of the ANOVA, shown in Table 11, indicated that the model was not significant at the 95% confidence interval. The null hypothesis was rejected and it was concluded that variable cost per mile were not affected by the one-way distance or %U.

Average variable cost per mile (VC), shown in Figure 21 was found to be independent of both percent utilization and harvester type. Iterations of the simulation returned $0.84 as the average variable cost per kilometer ($1.35 $/mile) with a standard deviation of $0.15 per km.

Table 11. Results of ANOVA showing that average distance and %U did not result in a statistically significant change in variable costs per mile at a 95% confidence interval for a module truck.

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	2.78E-04	7	3.97E-05	2.00	0.115	not significant
A-Average Distance	5.38E-05	3	1.79E-05	0.902	0.460	
B-% Utilization	2.21E-04	4	5.53E-05	2.78	0.060	
Residual	3.38E-04	17	1.99E-05			
Lack of Fit	3.38E-04	12	2.82E-05			
Pure Error	0.00E+00	5	0.00E+00			
Cor Total	6.16E-04	24				

The total variable cost per load was found to be dependent on the distance travelled. As the average distance increased the total variable cost per load increased and was estimated using equation 7. To calculate the cost per load the VC per km

needed to be multiplied by a factor of 2. This resulted in a cost of $1.68 per km when using the one-way distance to modules.

$$VC_{MT} = 1.68 \times d \quad (7)$$

Where:
VC_{MT}=Variable Cost per load of operating a module truck
d = one-way distance in km.

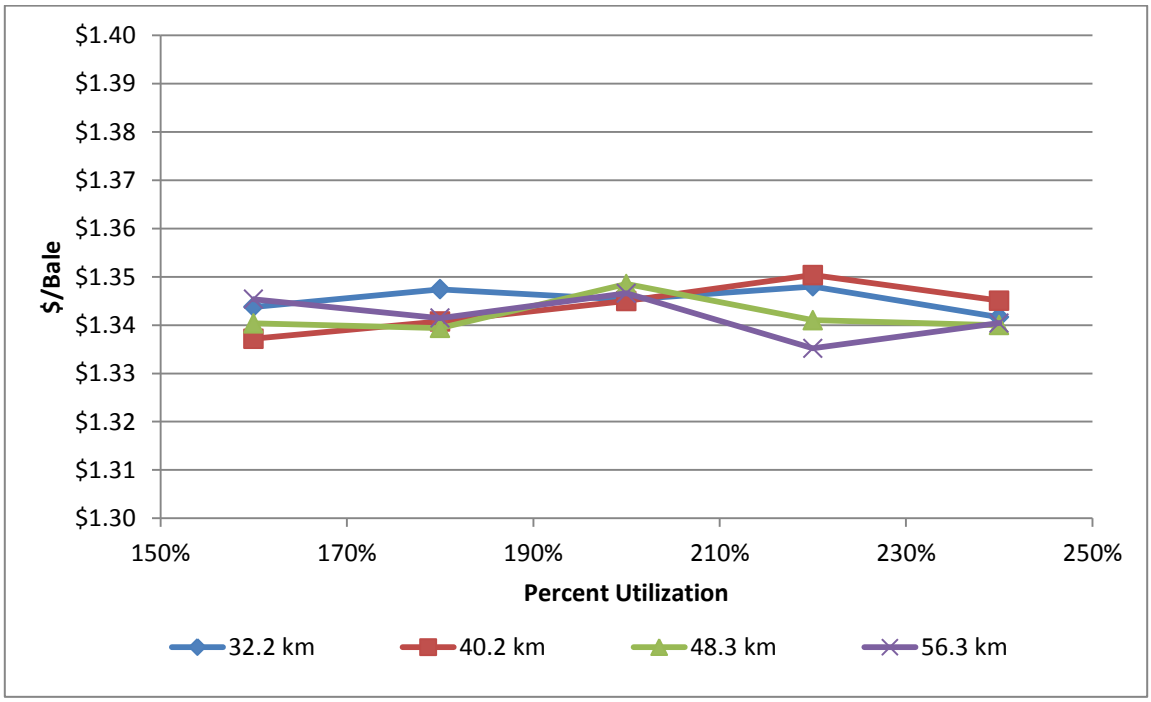

Figure 21. Average Variable Cost per mile v. %U for a MT at four average distance of 32.2, 40.2, 48.3, and 56.3 km, respectively.

Total Cost of Operating a Module Truck

Gin managers are often interested in evaluating what the total cost to transport cotton modules from the field to the gin would be. Transportation cost information may useful when determining a pricing strategy for ginning seed cotton, distance to send trucks to transport modules, or should a portion of transportation be contracted. Equation 8 represents the calculation used to estimate the total cost per load the gin would encumber per load. The term AFC in Equation 8 refers to the best fit equation found in Table 10 describing the fixed cost per load for a module truck. The best fit equation selected will correspond to the average distance to modules for the gin being evaluated. Variable cost per load is represented by the second half of Equation 8. Shown in Figure 22 are the results for average total cost per load for a module truck transporting modules at average distances of 32.2, 40.2, 48.3, and 56.3 kilometer (20,25,30,35 miles)

$$\text{ATC per Load}_{MT} = \text{AFC}_{MT} + 1.68 \times d \quad (8)$$

Where:

ATC per Load_{MT} = Total Cost per load for a MT corresponding to AD;
AFC_{MT} = Fixed Cost per load equation for a MT corresponding to AD;
AD = Average distance to modules;
d = One-way distance (km).

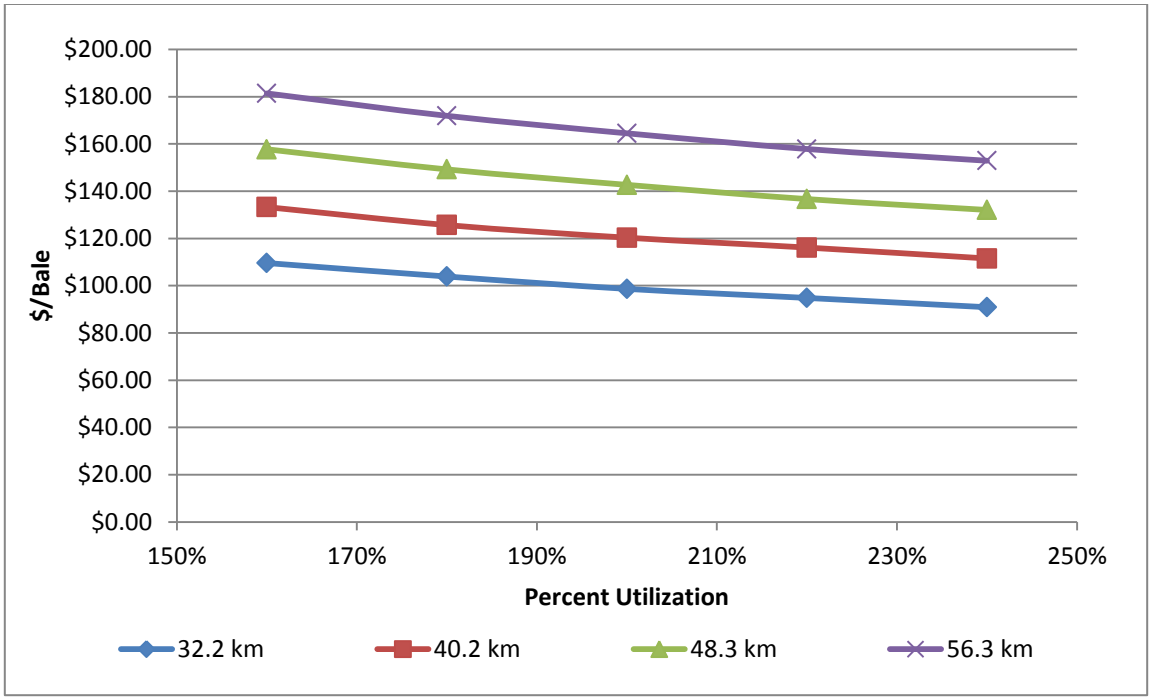

Figure 22. Module Truck cost per load v. percent utilization for a 40 bph gin at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively.

The total cost per bale for a module truck was calculated for each harvester type and is presented in Figure 23, Figure 24, and Figure 25. Unlike total cost per load, the type of harvester used directly affected the total cost per bale. This is attributed to the number of bales of lint that are stored in each module. As expected the cost per bale associated with transporting picker harvested cotton was least, followed by SWFC, and lastly SWOFC. The cost per bale for a module truck is estimated using equation 9.

$$\text{ATC per bale}_{MT} = \frac{\text{AFC}_{MT} + 1.68 \times d}{10 \times b} \quad (9)$$

Where:

ATC per Bale$_{MT}$ = Total Cost per Bale for a MT corresponding to AD;
AFC = Fixed Cost per load equation corresponding to AD;
AD = Average distance to modules;
d = One-way distance (km);
b = Coefficient for the number of bales in a load: Picker b=1.50,
SWFC b=1.25;
SWOFC b=1.00.

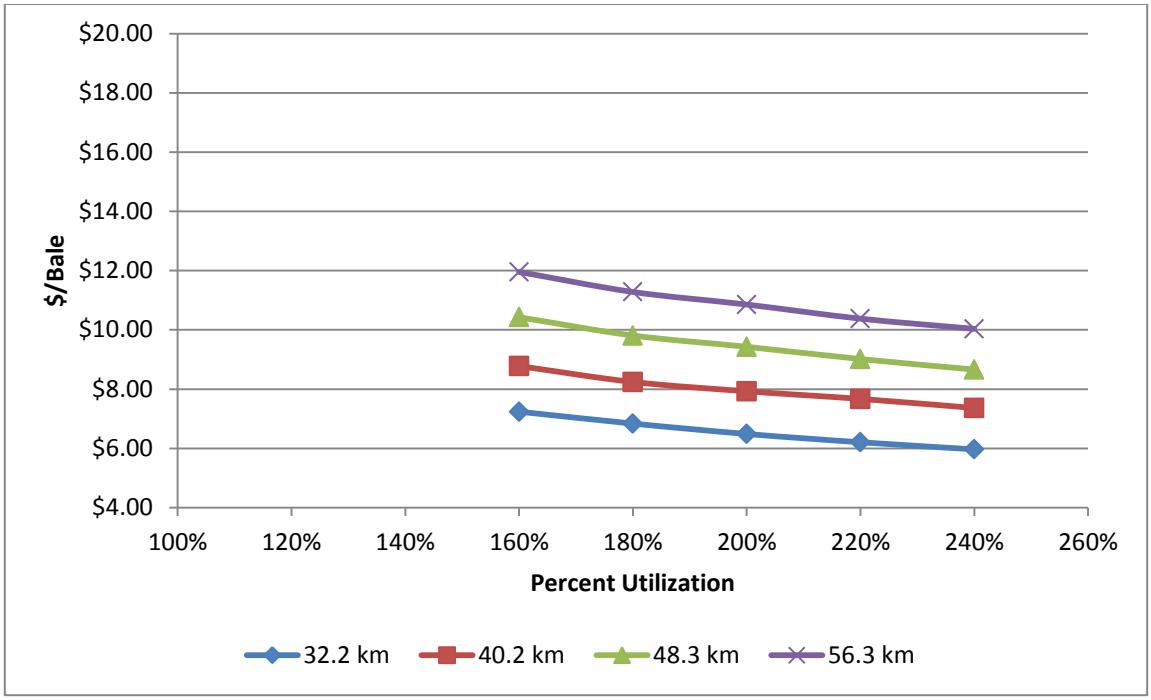

Figure 23. Module Truck cost per bale v. percent utilization for a 40 bph gin processing picker harvested cotton at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively.

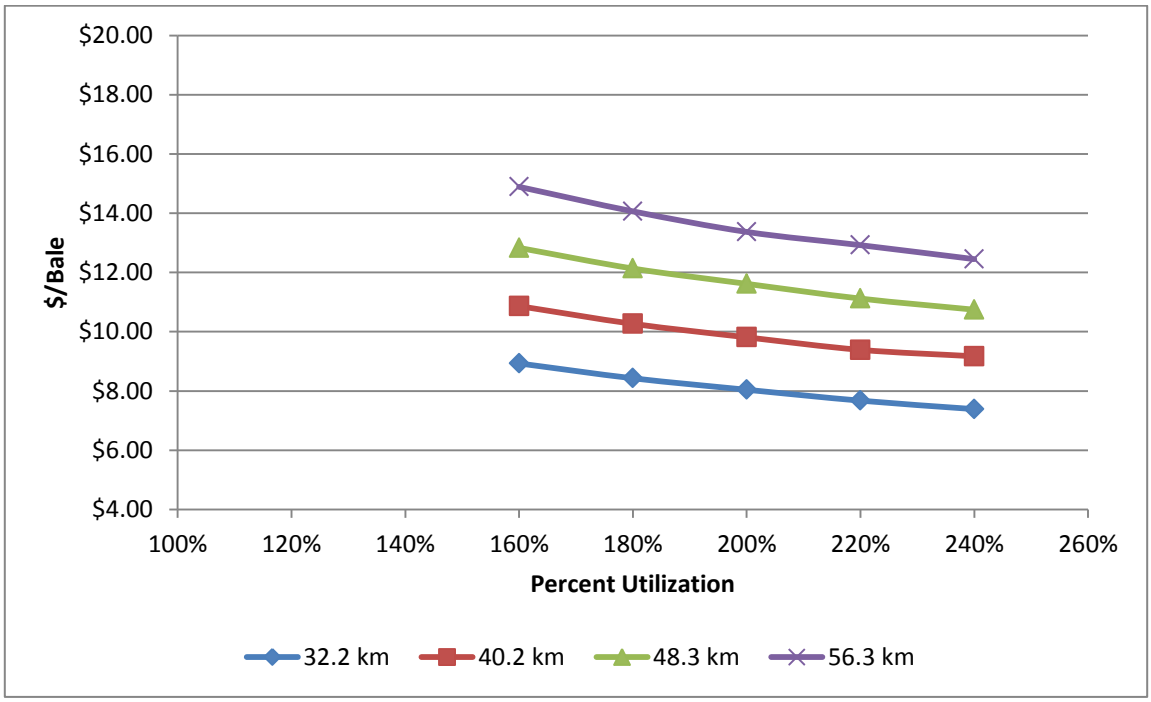

Figure 24. Module Truck cost per bale v. percent utilization for a 40 bph gin processing SWFC at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively..

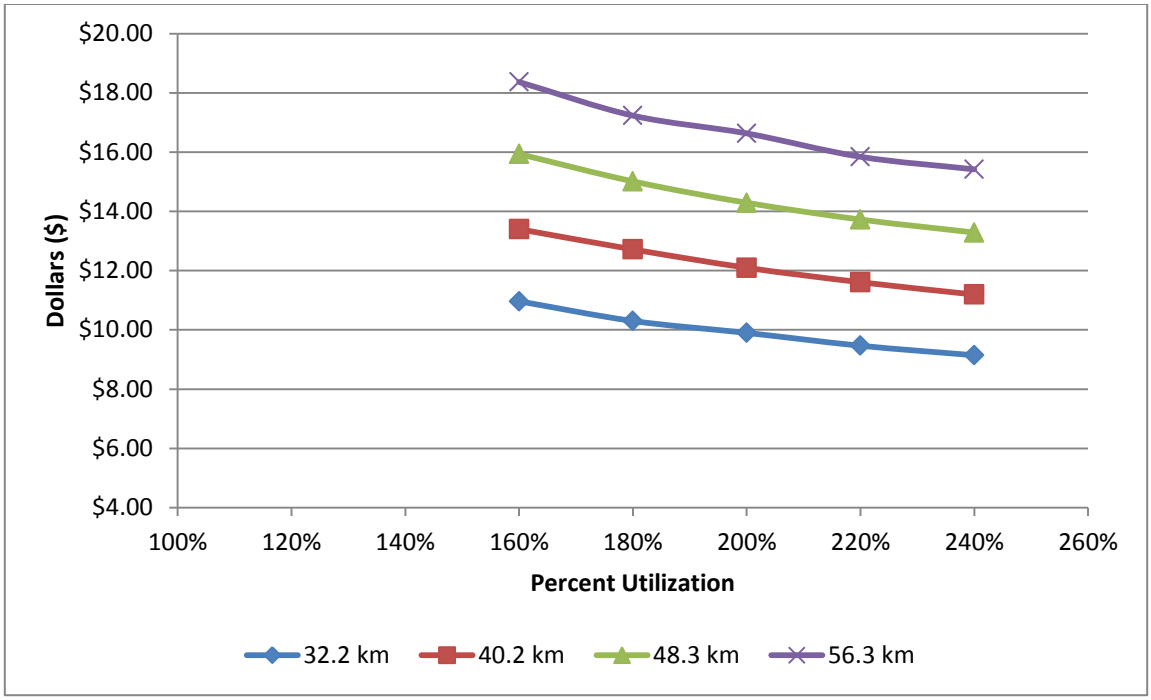

Figure 25. Module Truck cost per bale v. percent utilization for a 40 bph gin processing SWOFC harvested cotton at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively.

Cost of Owning and Operating a Semi-Tractor and Trailer

Since the introduction of alternative module shapes and dimensions, the ability to utilize alternative modes of transportation, such as a semi-tractor and trailer, has become very attractive to gin managers and producers. The initial capital investment of a STT is less than that of a module truck and the ability to transport more bales per load is very appealing. Conversely, a STT requires additional resources in the field and at the gin to load and unload modules. This adds to the cost of operation and increased logistical planning involved with transporting round modules by STT. The costs of using a wheel loader in the field and at the gin to load and unload modules from the trailer were also included in this model. An analysis was performed using iterations of a simulation model for STTs that contained risk and variability in both fixed and variable cost components. This analysis was performed to generate data that could be used to develop

models to estimate the cost incurred by the gin to transport cotton modules from the field to the gin.

Fixed Cost of Operating a Semi-Tractor and Trailer

The fixed cost of owning a STT includes the semi-trailer, trailer, loaders, and attachments. The annual fixed cost of a STT was found to be $47,000 with a standard deviation of $2,800 through iterations of the spreadsheet model. The annual fixed cost is based on assumptions that contain variability and risk; the mean values and standard deviations are reported in Table 12. The annual fixed cost is disbursed equally to the number of loads transported each season by the STT.

Table 12. Risk and uncertainty associated with a Semi-Tractor Trailer

Category	Mean	Std. Dev
Truck Purchase Price	$130,000	$5,200
Trailer Purchase Price	$30,000	$1,000
Loader Purchase Price	$50,100	$5,100
Loader Rental Cost	$6,000	$540
Attachment Purchase Price	$20,100	$1,050
Interest Rate	6.46%	1.43%
Useful Life (years)	10.0	0.96

Cost per load data associated with the fixed cost of owning a STT was sorted by gin, rating, primary harvester type, and average distance then plotted with respect to percent utilization.

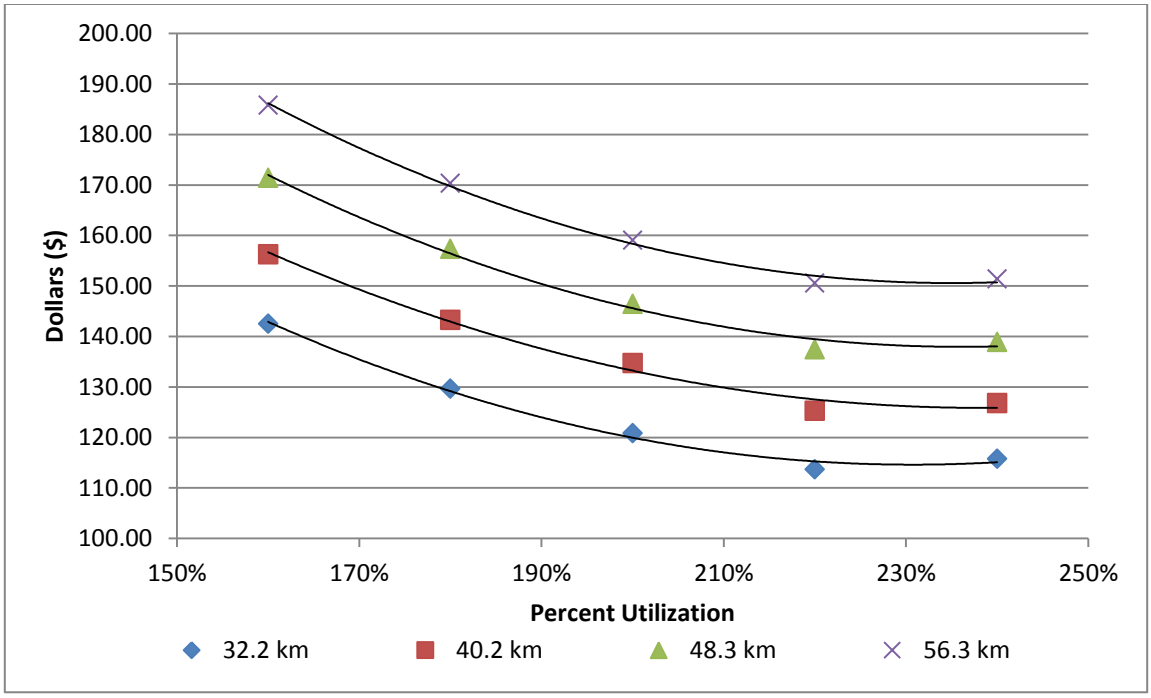

Figure 26. Plotted STT data for average fixed cost per load for a 40 bph gin at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively.

Table 13. Average fixed cost per load best fit equation for a STT corresponding to the average distance to modules (D).

Distance	Equation	R^2
32.2 km	$56.5(\%U)^2 - 260.8(\%U) + 415.5$	0.993
40.2 km	$50.3(\%U)^2 - 239.8(\%U) + 411.5$	0.988
48.3 km	$58.9(\%U)^2 - 278.1(\%U) + 466.1$	0.992
56.3 km	$63.3(\%U)^2 - 297.5(\%U) + 500.2$	0.996

Variable Cost of Operating a Semi-Tractor and Trailer

The variable costs of operating a module truck were simulated and an analysis of variance (ANOVA) was performed to determine whether average distance or %U had an effect on the cost per mile. The null hypothesis was that the variable cost per mile

would change as a result of average distance and %U. The results of the ANOVA, shown in Table 14, indicated that the model was not significant at the 95% confidence interval. The null hypothesis was rejected and it was concluded that variable cost per mile were not affected by the one-way distance or %U.

Table 14. Results of ANOVA showing that average distance and %U did not result in a statistically significant change in variable costs per mile at a 95% confidence interval for a semi-tractor trailer.

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	1.90E-04	7	2.71E-05	1.55	0.240	not significant
A-Average Distance	4.00E-05	3	1.33E-05	0.762	0.537	
B-% Utilization	1.50E-04	4	3.75E-05	2.14	0.138	
Residual	2.10E-04	12	1.75E-05			
Cor Total	4.00E-04	19				

The variable cost of operating a module truck included two variable cost components: variable cost per mile associated with operating the truck and trailer, and variable cost per load associated with operating the loaders in the field and at the gin. The average variable cost per mile was calculated to be \$0.77 per km (\$1.25 /mile) with a standard deviation of \$0.10. The average variable cost per load was found to be \$11.50 per load with a standard deviation of \$1.40 per load. The variable cost per load for a STT can be estimated using equation 10.

$$VC_{STT} = 1.54\ x\ d + 11.50 \quad (10)$$

Where:
d = One-way distance (km).

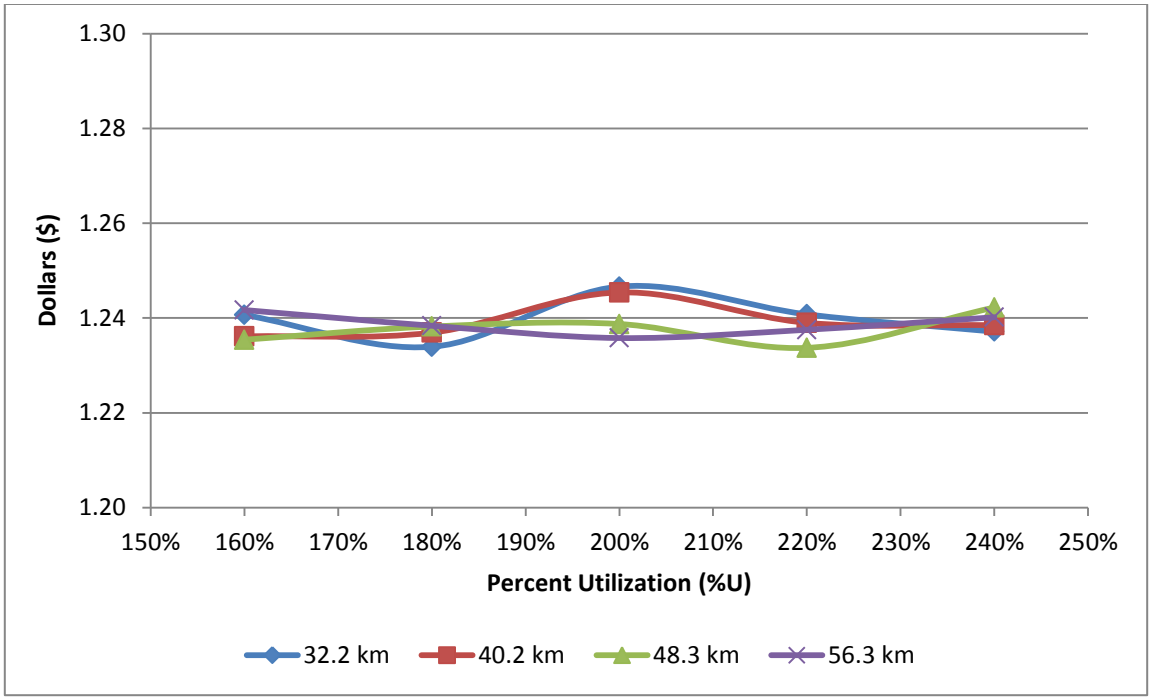

Figure 27. Average Variable Cos per mile v. %U for a STT at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively.

Total Cost of Operating a Semi-Tractor and Trailer

Combing the equations for average fixed cost per load and variable cost per load the total cost per load can be calculated giving gin managers an estimate when comparing alternative modes of transportation. The total cost per load when using a Semi-Tractor Trailer can be estimated using equation 11. The term AFC in this equation refers to the best fit equations found in Table 13. The equation corresponding the average distance (AD) to modules will be selected and inserted into Equation 11. The second half of the equation refers to the variable cost of operating a semi-tractor trailer and loading modules onto the STT.

$$\text{ATC per Load}_{STT} = \text{AFC}_{STT} + 1.54 \times d + 11.50 \qquad (11)$$

Where:

AFC_{STT} = Fixed Cost per load;

d = One-way distance (km).

The total cost per bale for a STT was calculated for each harvester type and is presented in Figure 28, Figure 29, and Figure 30. Similar to a module truck, the type harvester used directly affected the total cost per bale. Again this is attributed to the number of bales of lint contained in each module type. Total cost per bale when using a Semi-Tractor Trailer can be estimated using equation 12.

$$\text{ATC per bale}_{STT} = \frac{\text{AFC}_{STT} + 1.54 \times d + 11.50}{15 \times b} \qquad (12)$$

Where:

AFC_{STT} = Fixed Cost per load equation corresponding to D;

d = One-way distance (km);

b= Coefficient to the number of bales in a load: Picker b=1.50, SWFC b=1.25; SWOFC b=1.00.

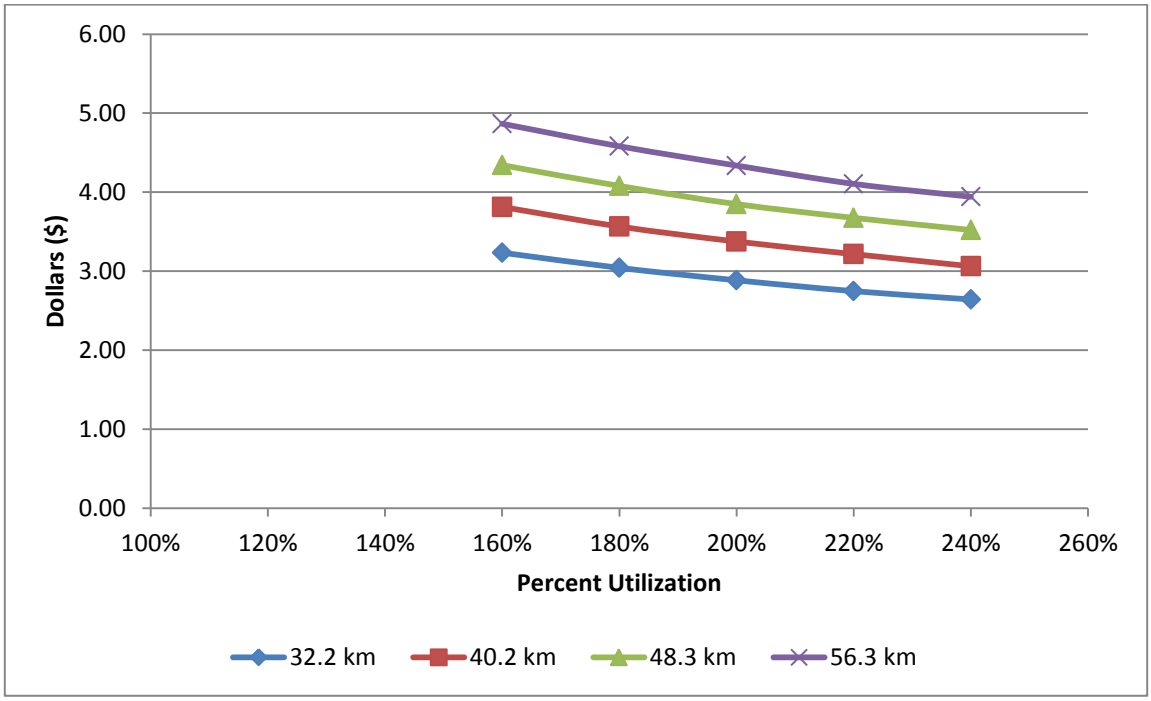

Figure 28. Semi-Tractor Trailer Cost per bale v. percent utilization for a 40 bph gin processing picker harvested cotton at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively..

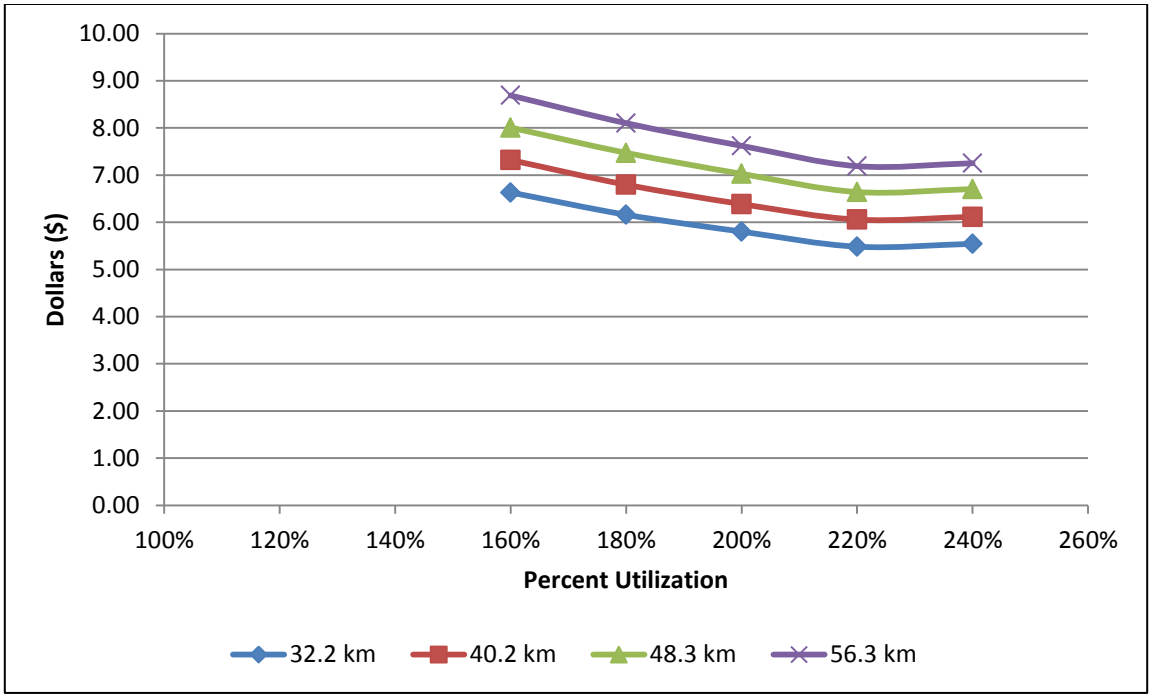

Figure 29.Semi-Tractor Trailer Cost per bale v. percent utilization for a 40 bph gin processing SWFC cotton at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively..

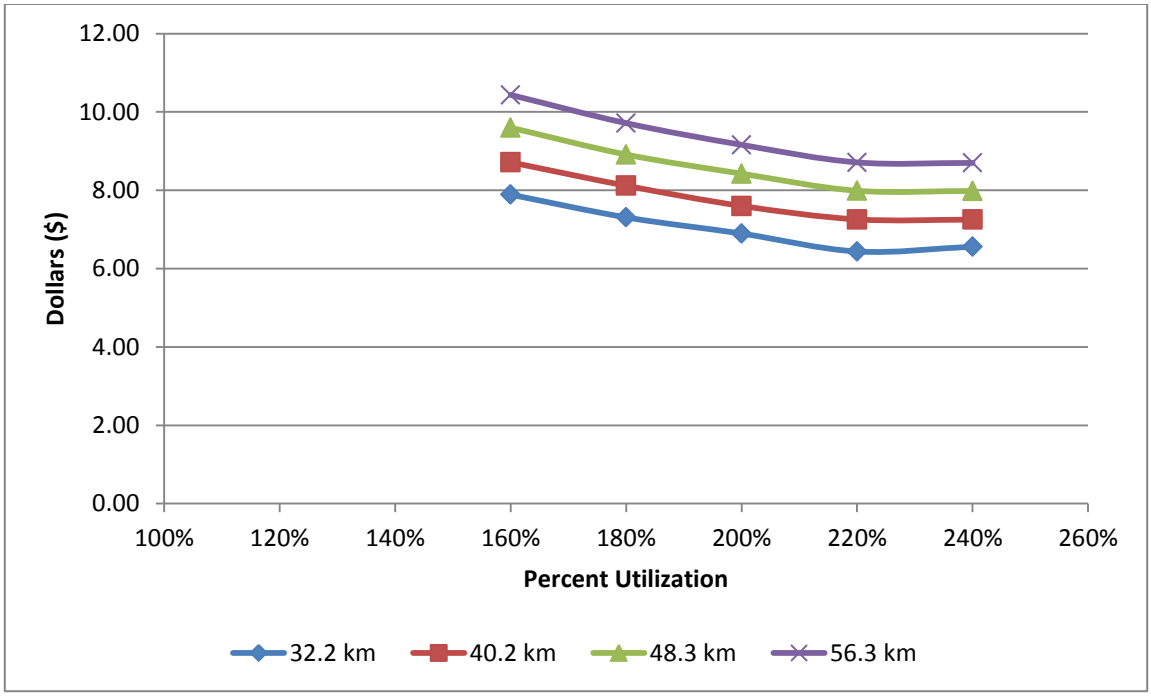

Figure 30. Semi-Tractor Trailer Cost per bale v. percent utilization for a 40 bph gin processing SWOFC cleaner harvested cotton at four average distances of 32.2, 40.2, 48.3, and 56.3 km, respectively..

Sensitivity Analysis

A sensitivity analysis was performed to determine which factors have the greatest influence on the cost per bale to transport modules. This analysis was performed using the Tornado analysis tool in Crystal Ball. The tornado analysis tool analyzes the sensitivity of the specified forecast and illustrates the range in cost per bale between the maximum and minimum forecast values for each variable. The variables towards the top of the chart have the highest relative importance to change the cost per bale, and the variables at the bottom have the least. The lower values from the decision or assumption variables are indicated in red, and the upper values are indicated in blue. The average values in cost per bale are indicated by the center line, or where the blue and red bars divide. Values to the left of the divide result in a lower cost per bale and values to the right result in higher costs per bale. The values of decision or assumption variables that result in the lowest or highest forecast are listed next to each bar.

The tornado analysis performed for a module truck is shown in Figure 31. The top 3 values found to have the greatest effect on cost per bale when transporting with a module truck were decision variables. Decision variables allow management to choose at what values these factors will be. This allows the ability to choose levels that will meet the cost needs of the operation. Assumption variables outlined in this analysis showed to have a lesser effect on the cost. The largest swing in cost per bale due to an assumption variable was $2.00; this was caused by the number of bales per module.

The tornado analysis performed for a semi-tractor and trailer is shown in Figure 32. This analysis also indicated that decision variables had the largest impact on the cost per bale when using a STT. The number of bales contained in each module attributed to the largest change in cost per bale from an assumption variable. This change was just over $1.00 per bale.

The results of the sensitivity studies performed showed that management factors for both modes of transportation are driving factors in controlling cost. If the upside factors do not negatively impact other operations of ginning, management has the ability choose levels of decision variables that can result in lower cost of transportation.

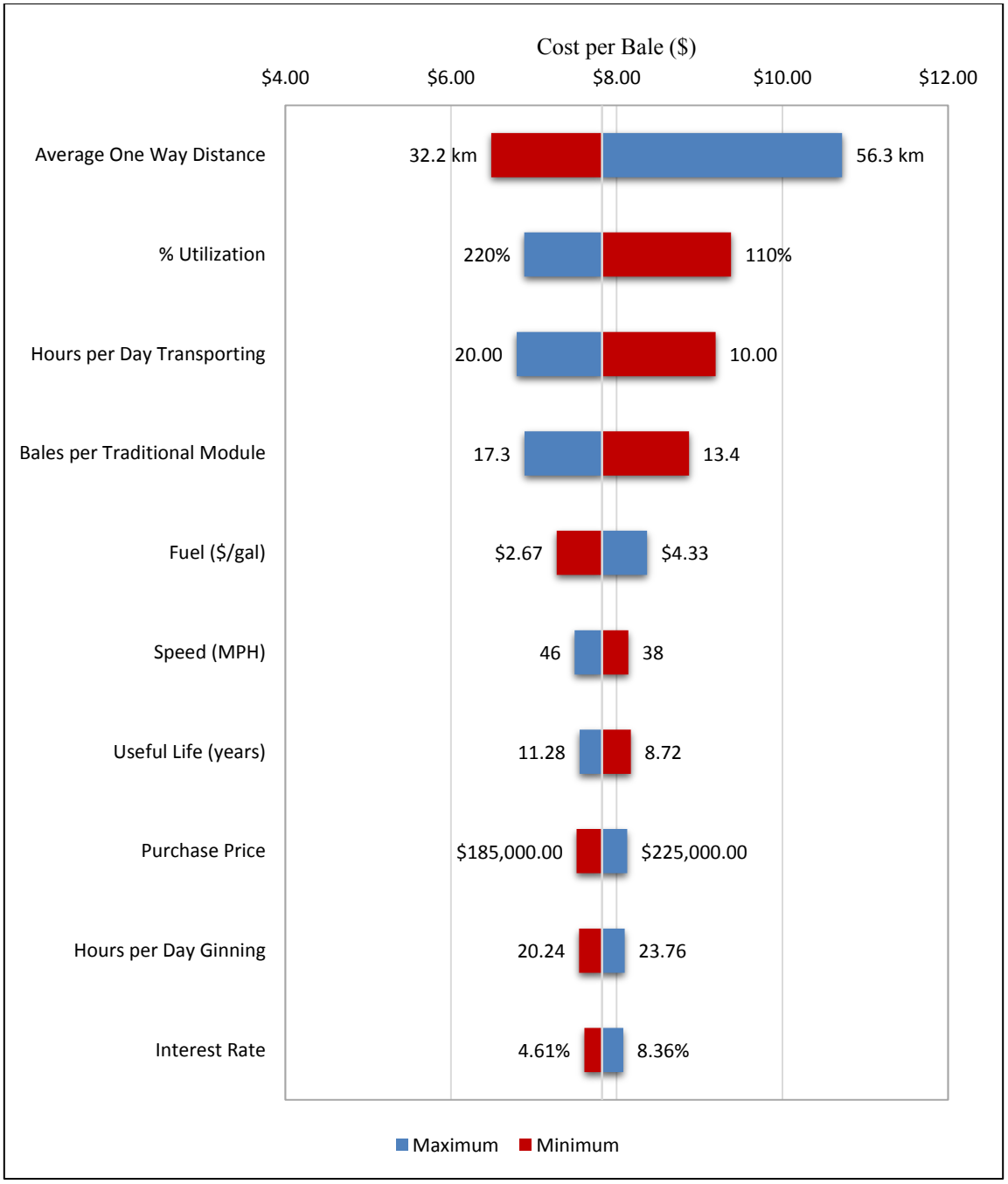

Figure 31. Module Truck Sensitivity Analysis on Cost per Bale

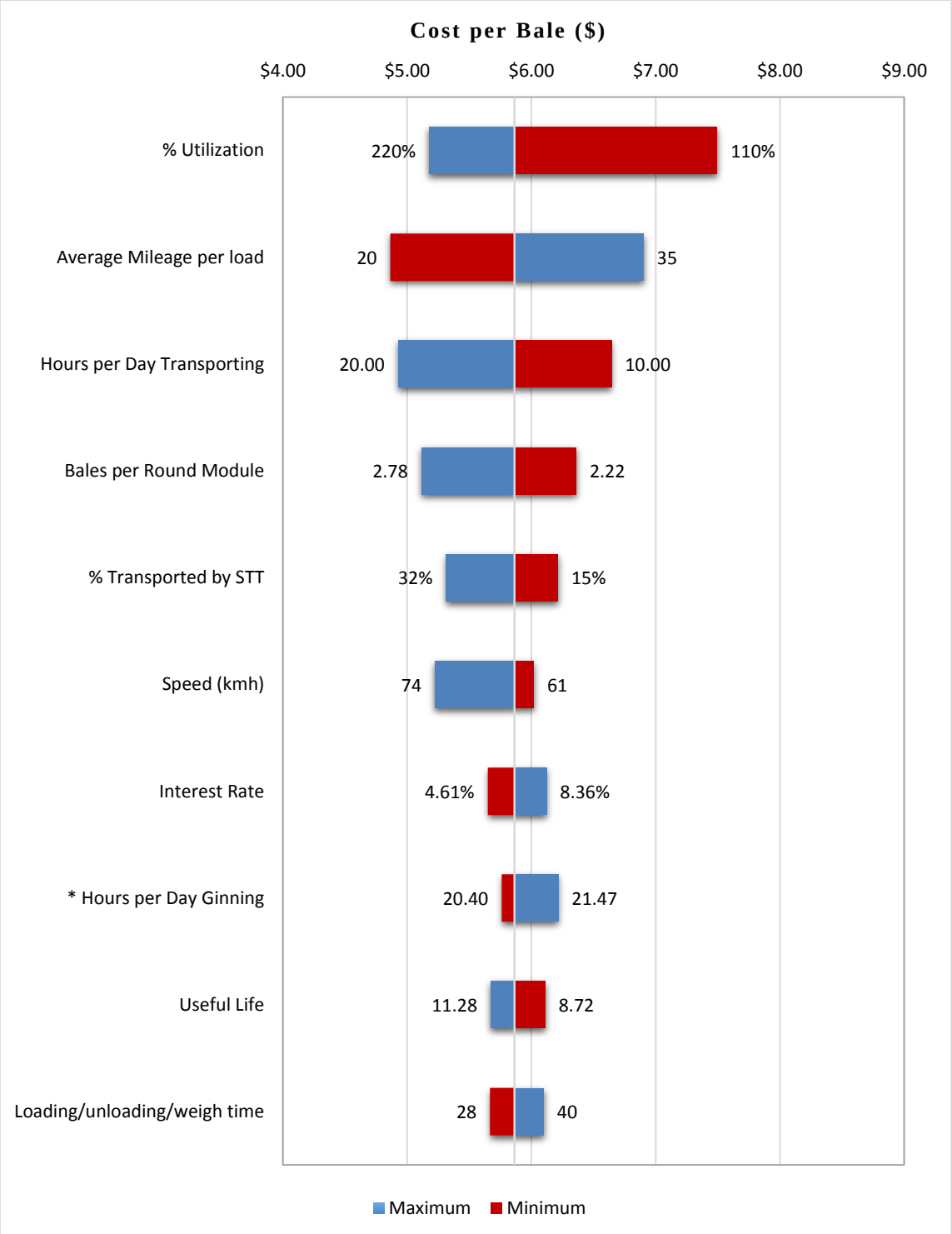

Figure 32. Semi-Tractor and Trailer Sensitivity Analysis on Cost per Bale

Fleet Sizing

In order for the gin to operate efficiently, gin managers must size the fleet of trucks to adequately supply the gin with modules. If an insufficient number of trucks are transporting modules from the field to the gin yard, the possibility of downtime within the ginning system is of great concern. For instance, a 40 bph gin will need a supply of 70 modules per day to maintain continual operation if processing stripper harvested cotton. The management of the transportation system must be arranged in such a way that enough modules are available on the gin's storage yard to sustain continual ginning during peak periods of the season.

Analysis tools within Crystal Ball allow for decision aids to be created that would give an indication of the number trucks needed based on the variability of the transportation system. Variability is a result in loading time, travel speed, and distance to modules. For this analysis it was assumed that the gin would prefer to receive all modules within 80% of the projected time ginning. Therefore if a gin is operating at 200 percent utilization, or 2000 hours of ginning time, all modules should be received within 1600 hours of ginning time, or 72 days. This assumption is based on times when module trucks are not able to enter fields to retrieve modules due to poor field or weather conditions.

Module Trucks Needed

The number of module trucks needed was found to be dependent on the average distance trucks are sent to retrieve modules and amount of time trucks are operational per day, as shown in Figure 33. As the distance travelled increased, the number of trucks required increased. As the hours per day trucks are operational increased, the number of trucks required decreased.

For instance, if module trucks are transporting modules for 10 hours per day at an average distance of 32.2 kilometers (25 miles), the gin will need to use at least 7 trucks to maintain the needed supply of modules to keep the gin operating. If the average

distance were to increase to 40.2 kilometers (30 miles) an additional truck would be needed to maintain the steady supply of modules.

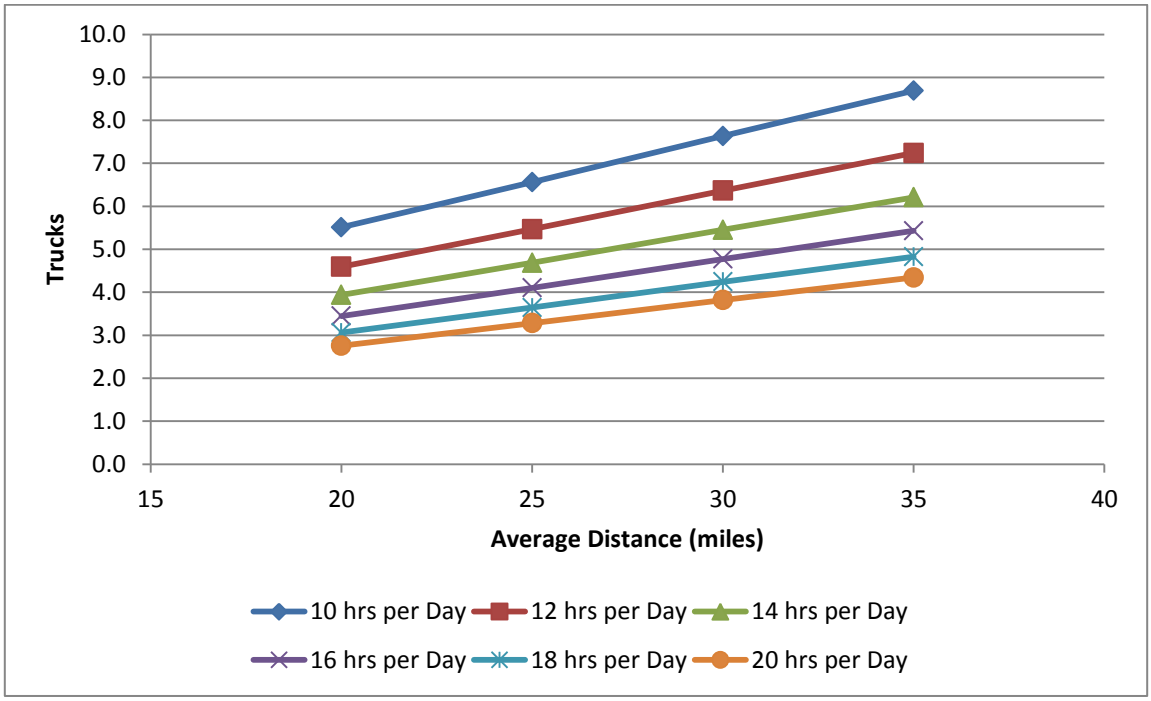

Figure 33. The number of module trucks needed based on the average distance travelled and amount of time trucks are operational for a 40 bph gin.

Semi-Tractor and Trailers Needed

An analysis was performed to estimate the number of trucks required to transport JD round modules from the field using a semi-tractor and trailer. Since these modules have not been adopted by all, it was assumed that approximately 20% of all bales ginned would be stored in the form of a round module and transported by a STT. If gins begin to experience larger volumes of round modules, additional analysis is needed to determine how many trucks or loaders are needed to efficiently supply the gin. Much like module trucks, as the hours per day trucks are operational increased, the number of

trucks required decreased. The number of STTs needed during the season ranges from one to two trucks depending on the average distance to modules and is shown in Figure 34.

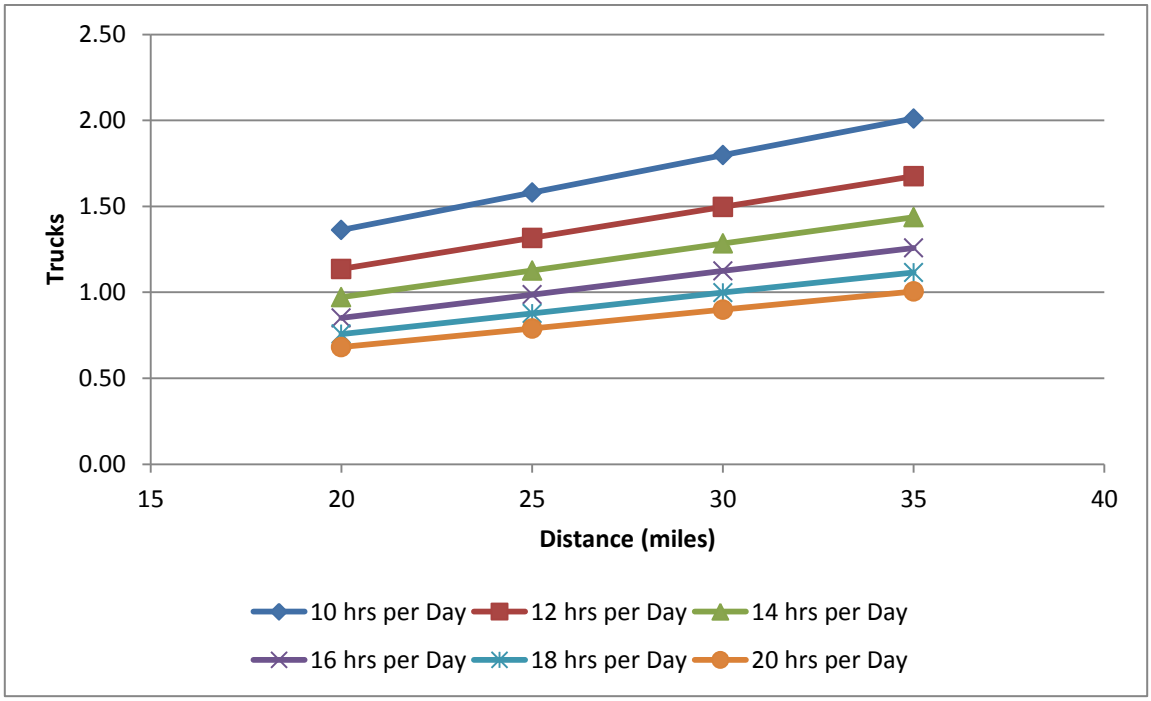

Figure 34. The number of STTs needed based on the average distance travelled and amount of time trucks are operational for a 40 bph gin.

Breakeven Analysis

Gins managers are often interested in breakeven points when making decisions regarding the addition of trucks, transporting modules further distances, or using alternative modes of transportations. In this section breakeven points are presented for each transportation mode based on the optimal fleet size determined previously for a 40 bph gin at varying average distances. An owned module truck is compared to a module truck that can be contracted to a gin to transport modules from the field. The cost to retrieve each module regardless of distance was found to be $60, this is referred to as the pick-up fee. The variable cost was found to be $1.78 per mile and is calculated based on the one way distance to modules, or d. Based on data provided by cooperating gins the cost of contract transporters is presented in equation 13:

$$ATC_{CMT} = 60 + 1.78 \times d \quad (13)$$

Where:
ATC_{CMT} = Average total cost per load for a contract module truck
d = one-way distance (km)

The breakeven analysis performed is reported in terms of the average distance gins should consider for each %U level tested. A gin operating at 160 %U, 180 %U, 200 %U, 220 %U, and 240 %U should have average distances of 38.6, 45.1, 51.0, 58.4, 64.8 km (24, 28, 31.9, 36.5, and 40.5 miles) or less respectively to rely solely on owned module trucks.

To approximate the number of loads each module truck must transport to breakeven, the annual fixed cost of owning a module truck is divided by the pickup fee, $60 in this case, charged by the contract transporter regardless of distance. Each owned module truck will need to transport at least 475 loads to justify owning a truck rather than contracting.

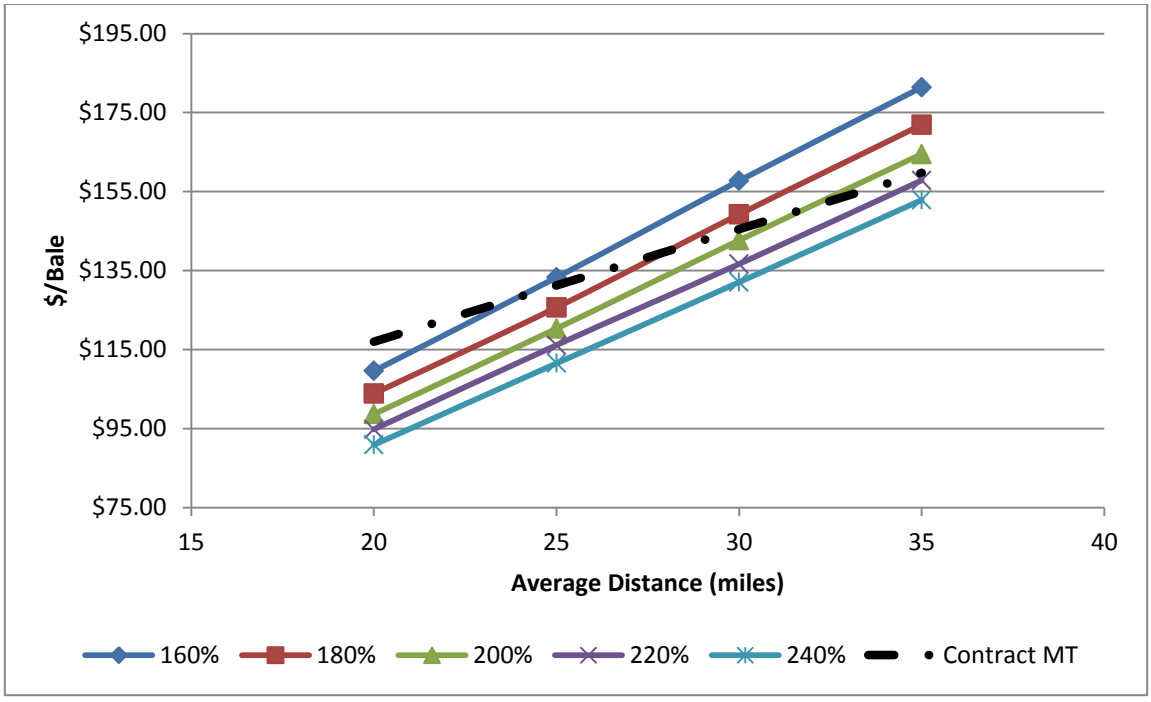

Figure 35. Module truck cost per load v. average distance, 40 bph break even analysis.

Similarly, a contract STT can be hired to transport modules from the field. The cost to retrieve modules using an STT regardless of distance was found to be $90. The variable cost was found to be per mile and is calculated based on the one way distance to modules, or d. Data was made available from cooperating gins to represent the cost of contract STTs, and is represented in equation 14:

$$ATC_{CSTT} = 90 + 2.81 \times d$$

Where:
ATC_{STT} = Average total cost per load for a contract semi-tractor trailer
d = one-way distance (km)

A gin operating at 160 %U, 180 %U, 200 %U, 220 %U, and 240 %U will need average distances of 60.4, 48.1, 40.7, 37.7, 35.3 kilometers (37.5, 29.9 , 25.3 , 23.4 , and 21.9 miles) or greater respectively to rely solely on owned semi-tractor trailers.

To approximate the number of loads each STT must transport to breakeven, the annual fixed cost of owning a module truck is divided by the pickup fee, $90 in this case, charged by the contract transporter regardless of distance. Each owned semi-tractor trailer will need to transport at least 525 loads to justify owning a truck rather than contracting.

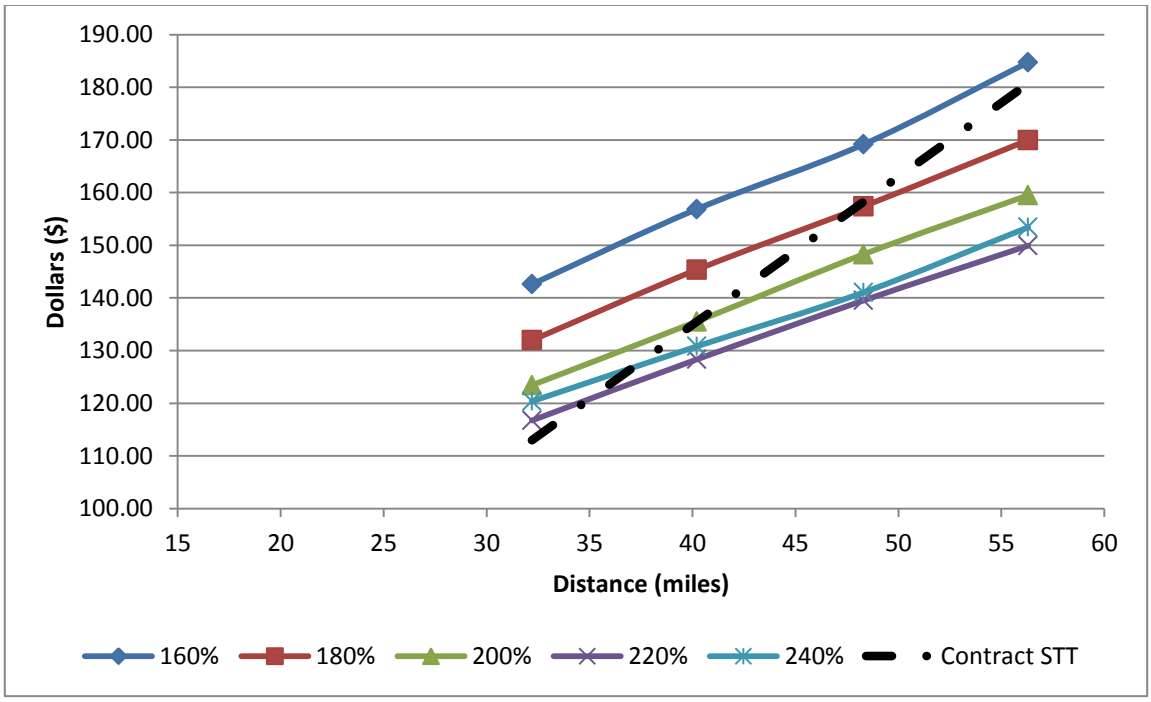

Figure 36. Semi-Tractor Trailer cost per load v. average distance, 40 bph break even analysis.

CHAPTER V

SUMMARY AND CONCLUSIONS

As cotton ginning machinery and harvesting equipment becomes more advanced or the number of gins becomes fewer, more emphasis will be placed on improving and evaluating the cost and logistical constraints of transporting seed cotton modules from the field to the gin. Gins may be transporting seed cotton modules in excess of 160 kilometers (100 miles) from the turn row to the gin. Tools that can aid gin managers, board members, and producers in making informed decisions will help increase the efficiency and meet the cost objectives of the enterprise and producers. Decision Support Software was developed to achieve this task. Variability was introduced into spreadsheet models to analyze the associated risk gins might expect when evaluating changes regarding the transportation system.

Best fit equations were developed to estimate the fixed costs of owning and variable costs of operating module trucks and semi-tractor trailers with risk and uncertainty being considered for varying levels of operating during the season. Best fit equations were also developed to estimate the transportation cost per bale for each harvester type used; cotton harvested with a SWOFC had the highest cost. SWFC and picker harvested cotton showed a 20% and 33% reduction in cost per bale over SWOFC, respectively for a 40 bph gin.

A sensitivity analysis found that factors that can be decided upon by the management have the greatest impact on the cost of transporting modules from the field to the gin. This makes a reliable DSS all the more valuable when making decisions and evaluating those analytically. Demonstrated in this report and included in the DSS are techniques to evaluate break even points for owning versus contracting trucks to transport modules from the field to the gin. It may be more beneficial for gins to rely on contract trucks to haul modules from further distances away, while relying on owned

trucks to haul modules closer to the gin. This decision would depend on the fee structure imposed by the contractor.

Within the DSS is the ability to evaluate different modes of transportation that may now be more advantageous due to new module shapes and sizes. Added features also allow the user to evaluate contract versus owned trucks, cost of individual hauls, truck fleet sizing, and estimated days needed to transport modules. Having a DSS available with these types of tools included is a valuable asset to gin managers, gin boards, and producers to evaluate ginning operation and make management decisions in an effort to reduce the costs of ginning.

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APPENDIX A

Contained within this appendix are the summary data tables from simulations conducted.

Module Truck Data Tables

15 bph

Table A- 1. Data table for a 15 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost	Trucks Needed
1	15	100%	20	Picker	10	9.31	142.31	88.62	40	1.34	2
2	15	100%	20	Picker	20	6.47	98.45	44.72	40	1.34	1
3	15	100%	25	Picker	10	11.44	173.45	106.42	40	1.34	2.5
4	15	100%	25	Picker	20	7.94	120.07	53.1	40	1.34	1.2
5	15	100%	30	Picker	10	13.44	204.16	123.67	40	1.34	2.9
6	15	100%	30	Picker	20	9.37	142.25	61.81	40	1.34	1.4
7	15	100%	35	Picker	10	15.45	234.82	141.14	40	1.34	3.3
8	15	100%	35	Picker	20	10.88	164.57	70.34	40	1.35	1.6
9	15	115%	20	Picker	10	8.66	131.61	77.69	46	1.35	2.1
10	15	115%	20	Picker	20	6.09	92.13	38.79	46	1.33	1
11	15	115%	25	Picker	10	10.5	160.08	92.85	46	1.34	2.5
12	15	115%	25	Picker	20	7.49	113.22	46.14	46	1.34	1.2
13	15	115%	30	Picker	10	12.35	188.02	107.71	46	1.34	2.9
14	15	115%	30	Picker	20	8.83	134.58	53.94	46	1.34	1.4
15	15	115%	35	Picker	10	14.26	216.1	122.24	46	1.34	3.2
16	15	115%	35	Picker	20	10.27	155.25	61.23	46	1.34	1.6
17	15	130%	20	Picker	10	8.03	122.28	68.42	52	1.35	2.1
18	15	130%	20	Picker	20	5.76	87.52	34.25	52	1.33	1
19	15	130%	25	Picker	10	9.91	150.35	82.61	52	1.35	2.5
20	15	130%	25	Picker	20	7.09	107.28	40.79	52	1.33	1.2
21	15	130%	30	Picker	10	11.51	175.44	94.94	52	1.34	2.9
22	15	130%	30	Picker	20	8.43	128.15	47.7	52	1.34	1.4
23	15	130%	35	Picker	10	13.26	201.83	107.79	52	1.34	3.3
24	15	130%	35	Picker	20	9.81	148.4	54.42	52	1.34	1.6
25	15	145%	20	Picker	10	7.59	115.13	61.24	58	1.35	2.1
26	15	145%	20	Picker	20	5.55	84.3	30.73	58	1.34	1
27	15	145%	25	Picker	10	9.2	139.93	73.12	58	1.34	2.5
28	15	145%	25	Picker	20	6.79	103.25	36.65	58	1.33	1.2
29	15	145%	30	Picker	10	10.87	165.23	85.3	58	1.33	2.9
30	15	145%	30	Picker	20	8.12	122.7	42.31	58	1.34	1.4
31	15	145%	35	Picker	10	12.57	191.51	97.3	58	1.35	3.3
32	15	145%	35	Picker	20	9.33	142.38	48.45	58	1.5	1.6
33	15	160%	20	Picker	10	7.23	109.72	56.05	64	1.34	2.1
34	15	160%	20	Picker	20	5.36	81.54	27.92	64	1.34	1
35	15	160%	25	Picker	10	8.86	134.24	66.78	64	1.35	2.5
36	15	160%	25	Picker	20	6.67	101.08	33.43	64	1.35	1.3
37	15	160%	30	Picker	10	10.38	157.7	77.09	64	1.34	2.9
38	15	160%	30	Picker	20	7.84	118.95	38.58	64	1.34	1.4
39	15	160%	35	Picker	10	11.95	182.36	88.25	64	1.34	3.3
40	15	160%	35	Picker	20	9.06	137.87	43.87	64	1.34	1.6

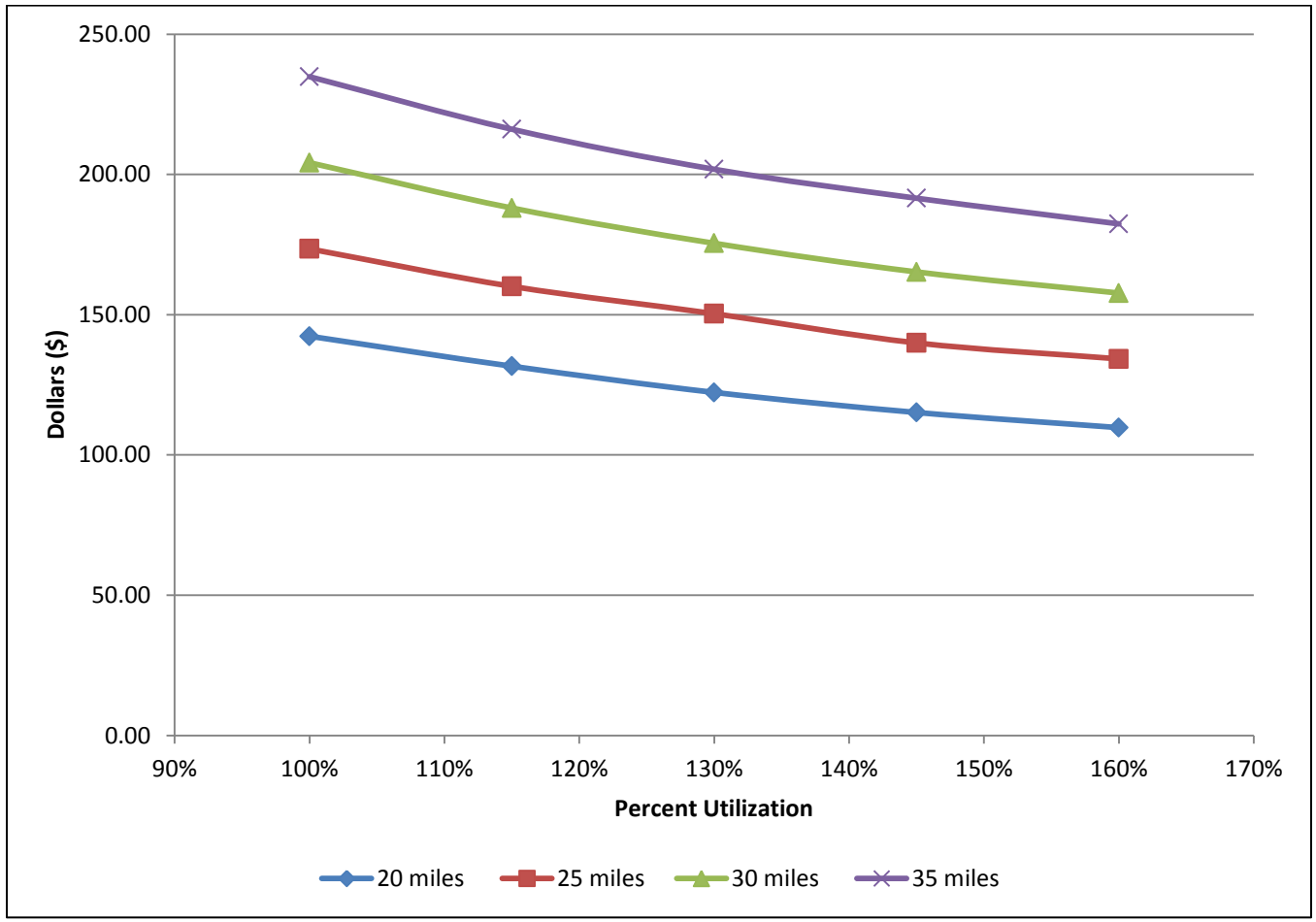

Figure A- 1. Module Truck cost per load v. percent utilization for a 15 bph gin processing picker harvested cotton transporting for 10 hours per day.

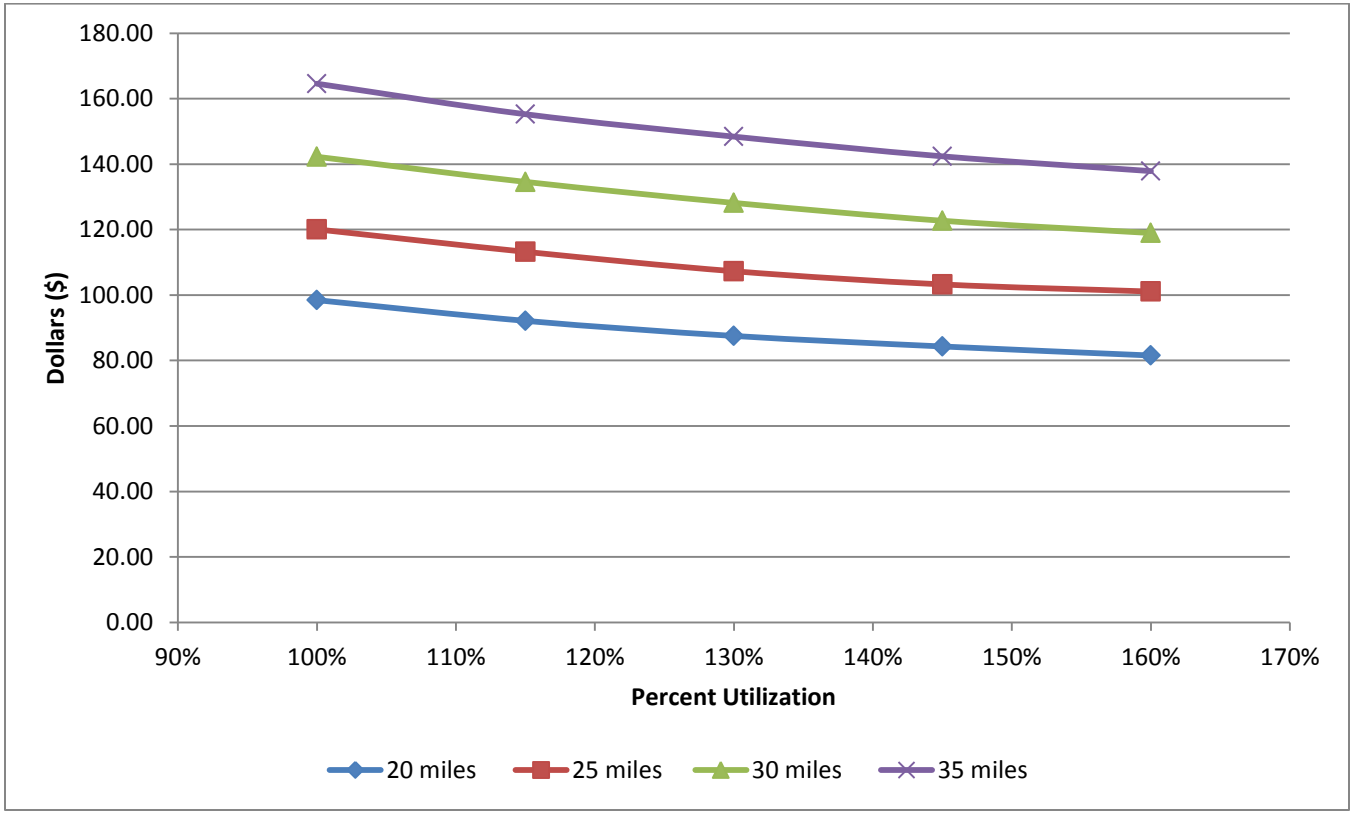

Figure A- 2. Module Truck cost per load v. percent utilization for a 15 bph gin processing picker harvested cotton transporting for 20 hours per day.

Table A- 2. Data table for a 15 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
41	15	100%	20	SWFC	10	11.71	143.25	89.67	40	1.34	2.6
42	15	100%	20	SWFC	20	$7.99	$98.15	$44.60	40	$1.34	1.3
43	15	100%	25	SWFC	10	$14.11	$173.47	$106.33	40	$1.34	3.1
44	15	100%	25	SWFC	20	$9.83	$119.77	$53.18	40	$1.33	1.5
45	15	100%	30	SWFC	10	$16.48	$202.76	$122.66	40	$1.33	3.6
46	15	100%	30	SWFC	20	$11.58	$141.71	$61.54	40	$1.34	1.8
47	15	100%	35	SWFC	10	$19.12	$234.40	$140.29	40	$1.34	4.1
48	15	100%	35	SWFC	20	$13.44	$164.06	$70.46	40	$1.34	2.0
49	15	115%	20	SWFC	10	$10.67	$130.85	$77.27	46	$1.34	2.6
50	15	115%	20	SWFC	20	$7.54	$92.48	$38.86	46	$1.34	1.3
51	15	115%	25	SWFC	10	$13.07	$159.89	$92.68	46	$1.34	3.1
52	15	115%	25	SWFC	20	$9.21	$112.84	$46.09	46	$1.34	1.5
53	15	115%	30	SWFC	10	$15.40	$188.41	$107.76	46	$1.34	3.6
54	15	115%	30	SWFC	20	$11.01	$134.61	$53.70	46	$1.35	1.8
55	15	115%	35	SWFC	10	$17.71	$216.41	$122.54	46	$1.34	4.1
56	15	115%	35	SWFC	20	$12.59	$155.16	$61.21	46	$1.34	2.0
57	15	130%	20	SWFC	10	$12.59	$155.16	$61.21	46	$1.34	2.0
58	15	130%	20	SWFC	20	$7.18	$87.92	$34.30	52	$1.34	1.3
59	15	130%	25	SWFC	10	$12.11	$148.54	$81.70	52	$1.34	3.1
60	15	130%	25	SWFC	20	$12.17	$148.64	$81.86	52	$1.34	3.1
61	15	130%	30	SWFC	10	$12.17	$148.64	$81.86	52	$1.34	3.1
62	15	130%	30	SWFC	20	$10.46	$127.98	$47.42	52	$1.34	1.8
63	15	130%	35	SWFC	10	$16.50	$202.35	$108.40	52	$1.34	4.1
64	15	130%	35	SWFC	20	$12.05	$147.20	$53.92	52	$1.33	2.0
65	15	145%	20	SWFC	10	$9.35	$114.68	$61.31	58	$1.33	2.6
66	15	145%	20	SWFC	20	$6.88	$84.32	$30.76	58	$1.34	1.3
67	15	145%	25	SWFC	10	$11.54	$140.99	$74.02	58	$1.34	3.1
68	15	145%	25	SWFC	20	$8.46	$103.80	$36.76	58	$1.34	1.5
69	15	145%	30	SWFC	10	$13.58	$165.42	$84.85	58	$1.34	3.6
70	15	145%	30	SWFC	20	$10.06	$122.92	$42.66	58	$1.34	1.8
71	15	145%	35	SWFC	10	$15.54	$190.99	$97.19	58	$1.34	4.1
72	15	145%	35	SWFC	20	$11.63	$142.34	$48.46	58	$1.34	2.0
73	15	160%	20	SWFC	10	$8.92	$109.62	$55.75	64	$1.35	2.6
74	15	160%	20	SWFC	20	$6.71	$82.13	$28.04	64	$1.35	1.3
75	15	160%	25	SWFC	10	$10.89	$133.72	$66.71	64	$1.34	3.1
76	15	160%	25	SWFC	20	$8.15	$100.17	$33.31	64	$1.34	1.5
77	15	160%	30	SWFC	10	$12.99	$158.67	$77.78	64	$1.35	3.6
78	15	160%	30	SWFC	20	$9.70	$118.83	$38.63	64	$1.34	1.8
79	15	160%	35	SWFC	10	$14.75	$181.18	$87.39	64	$1.34	4.1
80	15	160%	35	SWFC	20	$11.30	$137.82	$44.06	64	$1.34	2.1

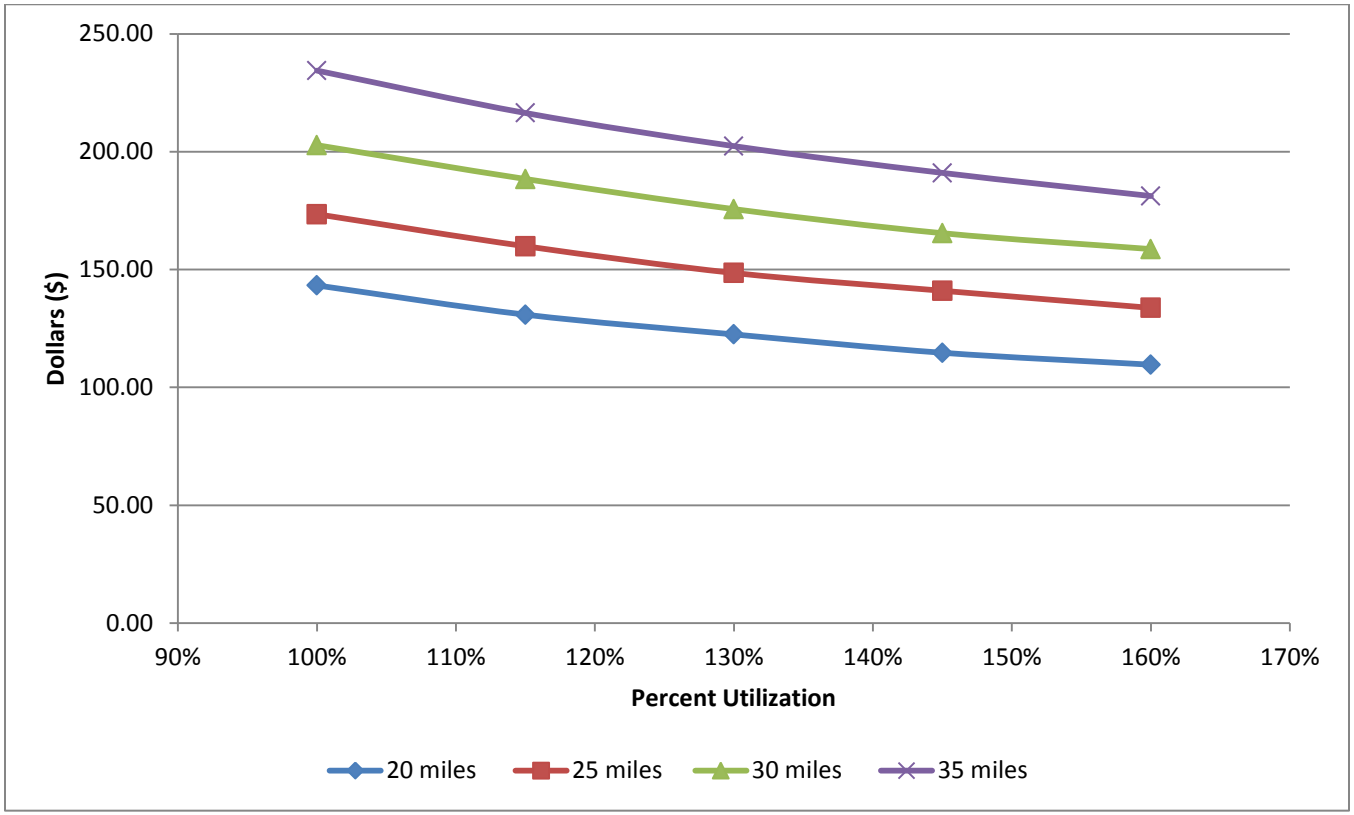

Figure A- 3. Module Truck cost per load v. percent utilization for a 15 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

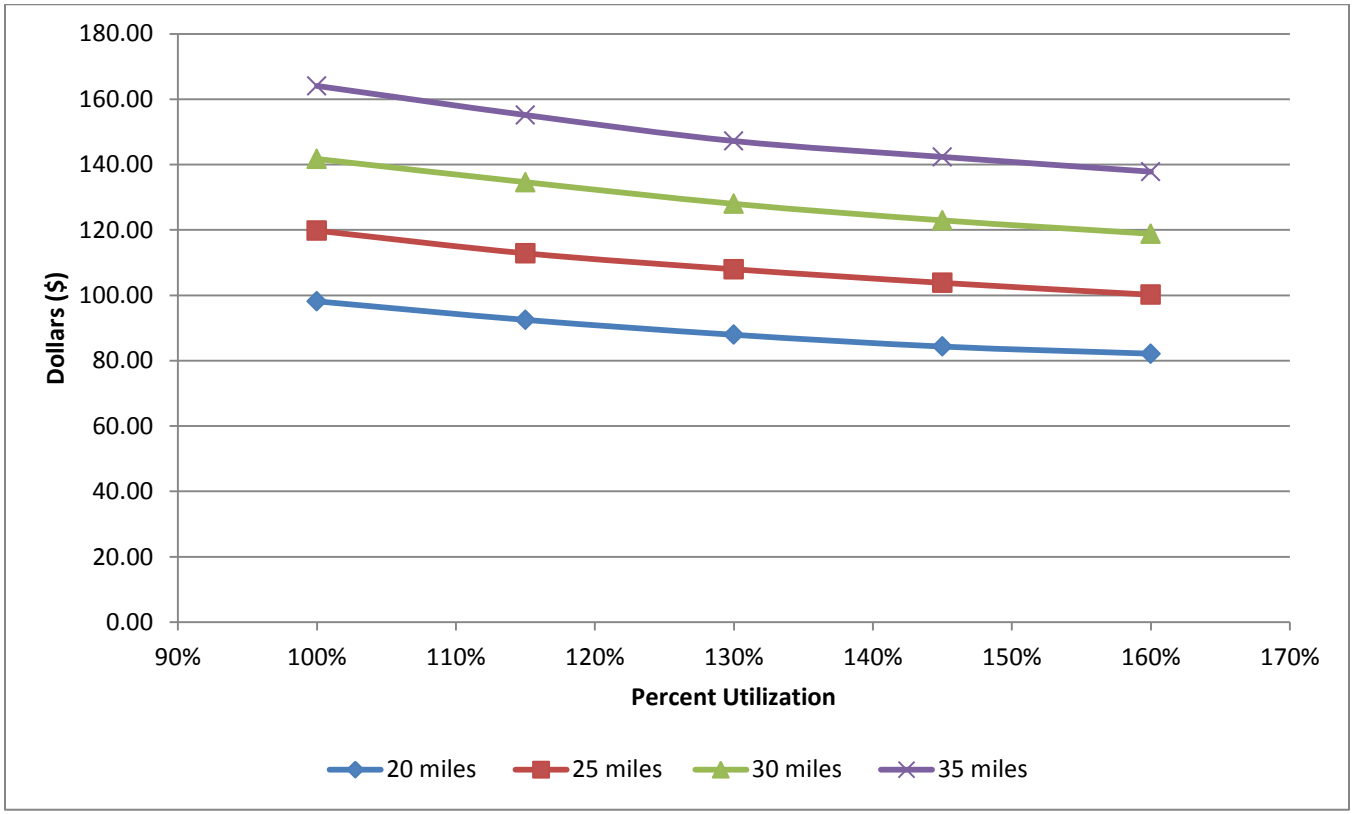

Figure A- 4. Module Truck cost per load v. percent utilization for a 15 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

Table A- 3. Data table for a 15 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
81	15	100%	20	SWOFC	10	$14.35	$142.62	$89.06	40	$1.34	3.2
82	15	100%	20	SWOFC	20	$9.97	$98.85	$45.00	40	$1.35	1.6
83	15	100%	25	SWOFC	10	$17.60	$173.95	$106.67	40	$1.35	3.8
84	15	100%	25	SWOFC	20	$12.13	$120.26	$53.12	40	$1.34	1.9
85	15	100%	30	SWOFC	10	$20.42	$203.89	$123.12	40	$1.35	4.4
86	15	100%	30	SWOFC	20	$14.34	$142.29	$61.87	40	$1.34	2.2
87	15	100%	35	SWOFC	10	$23.72	$235.50	$141.38	40	$1.34	5.0
88	15	100%	35	SWOFC	20	$16.59	$164.46	$70.61	40	$1.34	2.5
89	15	115%	20	SWOFC	10	$13.28	$131.97	$78.03	46	$1.35	3.2
90	15	115%	20	SWOFC	20	$9.27	$92.25	$38.74	46	$1.34	1.6
91	15	115%	25	SWOFC	10	$15.99	$159.52	$92.39	46	$1.34	3.8
92	15	115%	25	SWOFC	20	$11.40	$113.15	$46.33	46	$1.34	1.9
93	15	115%	30	SWOFC	10	$18.98	$188.53	$107.66	46	$1.35	4.4
94	15	115%	30	SWOFC	20	$13.51	$134.39	$53.58	46	$1.35	2.2
95	15	115%	35	SWOFC	10	$21.74	$216.19	$122.65	46	$1.34	5.0
96	15	115%	35	SWOFC	20	$15.64	$155.26	$61.26	46	$1.34	2.5
97	15	130%	20	SWOFC	10	$12.35	$122.78	$68.99	52	$1.34	3.2
98	15	130%	20	SWOFC	20	$8.82	$87.83	$34.26	52	$1.34	1.6
99	15	130%	25	SWOFC	10	$15.03	$148.78	$81.52	52	$1.35	3.8
100	15	130%	25	SWOFC	20	$10.85	$108.23	$41.13	52	$1.34	1.9
101	15	130%	30	SWOFC	10	$17.63	$175.67	$95.33	52	$1.34	4.4
102	15	130%	30	SWOFC	20	$12.83	$127.92	$47.75	52	$1.34	2.2
103	15	130%	35	SWOFC	10	$20.27	$201.68	$108.14	52	$1.34	5.0
104	15	130%	35	SWOFC	20	$14.96	$148.35	$54.26	52	$1.34	2.5
105	15	145%	20	SWOFC	10	$11.48	$114.37	$60.99	58	$1.33	3.2
106	15	145%	20	SWOFC	20	$8.47	$84.19	$30.83	58	$1.33	1.6
107	15	145%	25	SWOFC	10	$14.21	$140.49	$73.39	58	$1.34	3.8
108	15	145%	25	SWOFC	20	$14.21	$140.49	$73.39	58	$1.34	3.8
109	15	145%	30	SWOFC	10	$16.78	$166.02	$85.49	58	$1.34	4.4
110	15	145%	30	SWOFC	20	$12.45	$123.13	$42.80	58	$1.34	2.2
111	15	145%	35	SWOFC	10	$19.22	$191.51	$97.26	58	$1.35	5.0
112	15	145%	35	SWOFC	20	$14.31	$142.13	$48.51	58	$1.34	2.5
113	15	160%	20	SWOFC	10	$10.99	$109.37	$55.86	64	$1.34	3.2
114	15	160%	20	SWOFC	20	$8.24	$81.52	$27.97	64	$1.34	1.6
115	15	160%	25	SWOFC	10	$13.42	$133.59	$66.31	64	$1.35	3.8
116	15	160%	25	SWOFC	20	$10.15	$100.67	$33.09	64	$1.35	1.9
117	15	160%	30	SWOFC	10	$15.92	$157.57	$77.12	64	$1.34	4.4
118	15	160%	30	SWOFC	20	$11.95	$118.93	$38.65	64	$1.34	2.2
119	15	160%	35	SWOFC	10	$18.26	$181.45	$87.90	64	$1.34	5.0
120	15	160%	35	SWOFC	20	$13.88	$137.10	$43.85	64	$1.33	2.5

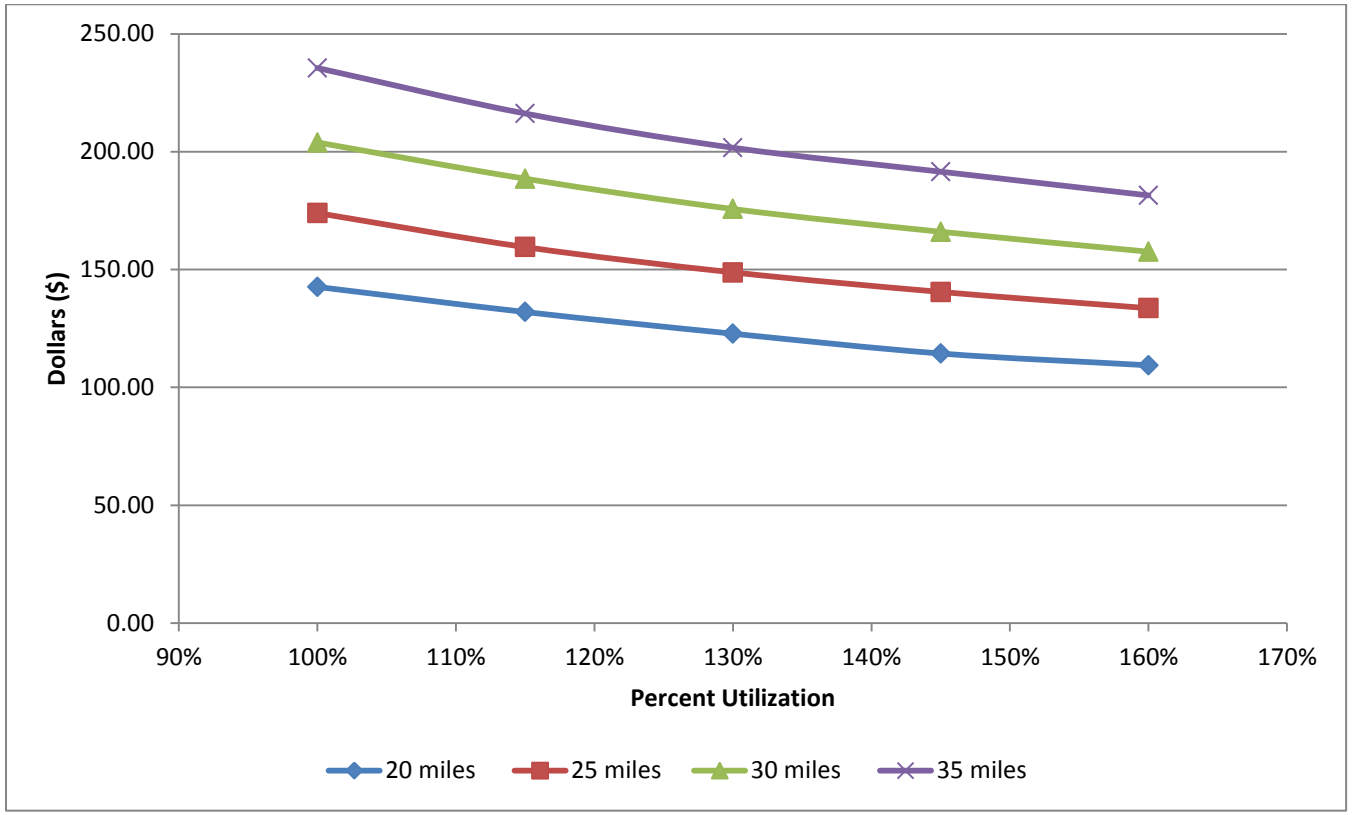

Figure A- 5. Module Truck cost per load v. percent utilization for a 15 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

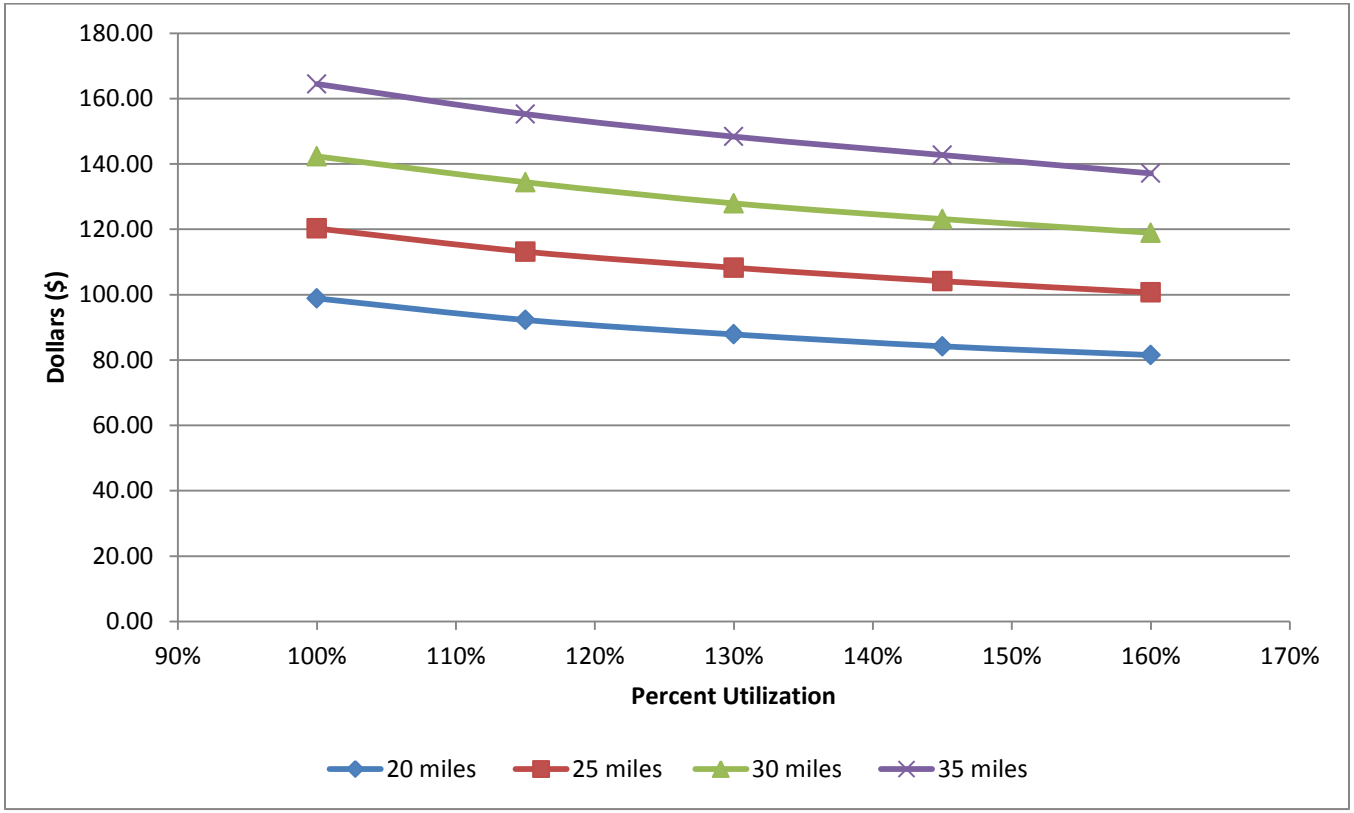

Figure A- 6. Module Truck cost per load v. percent utilization for a 15 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

25 bph

Table A- 4. Data table for a 25 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
121	25	224%	20	Picker	10	$6.17	$94.13	$40.06	89.60	$1.35	3.46
122	25	224%	20	Picker	20	$4.83	$73.25	$19.83	89.60	$1.34	1.74
123	25	224%	25	Picker	10	$7.59	$114.67	$47.64	89.60	$1.34	4.16
124	25	224%	25	Picker	20	$6.00	$90.97	$23.77	89.60	$1.34	2.07
125	25	224%	30	Picker	10	$6.00	$90.97	$23.77	89.60	$1.34	2.07
126	25	224%	30	Picker	20	$7.12	$108.07	$27.53	89.60	$1.34	2.40
127	25	224%	35	Picker	10	$10.34	$156.56	$62.83	89.60	$1.34	5.48
128	25	224%	35	Picker	20	$8.25	$125.20	$31.35	89.60	$1.34	2.75
129	25	250%	20	Picker	10	$5.89	$89.69	$35.80	100.00	$1.35	3.46
130	25	250%	20	Picker	20	$4.67	$71.34	$17.87	100.00	$1.34	1.72
131	25	250%	25	Picker	10	$7.26	$109.86	$42.73	100.00	$1.34	4.15
132	25	250%	25	Picker	20	$5.82	$88.30	$21.30	100.00	$1.34	2.07
133	25	250%	30	Picker	10	$8.58	$130.30	$49.58	100.00	$1.35	4.80
134	25	250%	30	Picker	20	$6.91	$105.14	$24.66	100.00	$1.34	2.39
135	25	250%	35	Picker	10	$9.90	$150.42	$56.41	100.00	$1.34	5.47
136	25	250%	35	Picker	20	$8.00	$121.92	$28.19	100.00	$1.34	2.73
137	25	280%	20	Picker	10	$5.61	$85.54	$31.85	112.00	$1.34	3.44
138	25	280%	20	Picker	20	$4.56	$69.22	$15.93	112.00	$1.33	1.74
139	25	280%	25	Picker	10	$6.91	$104.96	$37.99	112.00	$1.34	4.12
140	25	280%	25	Picker	20	$5.67	$86.17	$19.05	112.00	$1.34	2.06
141	25	280%	30	Picker	10	$8.24	$124.76	$44.21	112.00	$1.34	4.82
142	25	280%	30	Picker	20	$6.69	$102.16	$22.07	112.00	$1.33	2.39
143	25	280%	35	Picker	10	$9.45	$143.63	$50.35	112.00	$1.33	5.44
144	25	280%	35	Picker	20	$7.84	$118.91	$25.16	112.00	$1.34	2.74
145	25	310%	20	Picker	10	$5.42	$82.53	$28.76	124.00	$1.34	3.46
146	25	310%	20	Picker	20	$4.45	$68.05	$14.46	124.00	$1.34	1.72
147	25	310%	25	Picker	10	$6.67	$101.38	$34.50	124.00	$1.34	4.11
148	25	310%	25	Picker	20	$5.52	$83.81	$17.17	124.00	$1.33	2.06
149	25	310%	30	Picker	10	$7.95	$120.57	$39.87	124.00	$1.35	4.83
150	25	310%	30	Picker	20	$6.61	$100.11	$19.88	124.00	$1.34	2.41
151	25	310%	35	Picker	10	$9.15	$139.09	$45.57	124.00	$1.34	5.45
152	25	310%	35	Picker	20	$7.67	$116.25	$22.86	124.00	$1.33	2.74
153	25	335%	20	Picker	10	$5.28	$80.37	$26.60	134.00	$1.34	3.46
154	25	335%	20	Picker	20	$4.38	$67.03	$13.34	134.00	$1.34	1.72
155	25	335%	25	Picker	10	$6.48	$99.23	$31.86	134.00	$1.35	4.11
156	25	335%	25	Picker	20	$5.47	$82.88	$15.89	134.00	$1.34	2.07
157	25	335%	30	Picker	10	$7.71	$117.27	$36.84	134.00	$1.34	4.81
158	25	335%	30	Picker	20	$6.52	$98.82	$18.37	134.00	$1.34	2.39
159	25	335%	35	Picker	10	$8.91	$135.32	$42.07	134.00	$1.33	5.48
160	25	335%	35	Picker	20	$7.53	$114.53	$20.93	134.00	$1.34	2.73

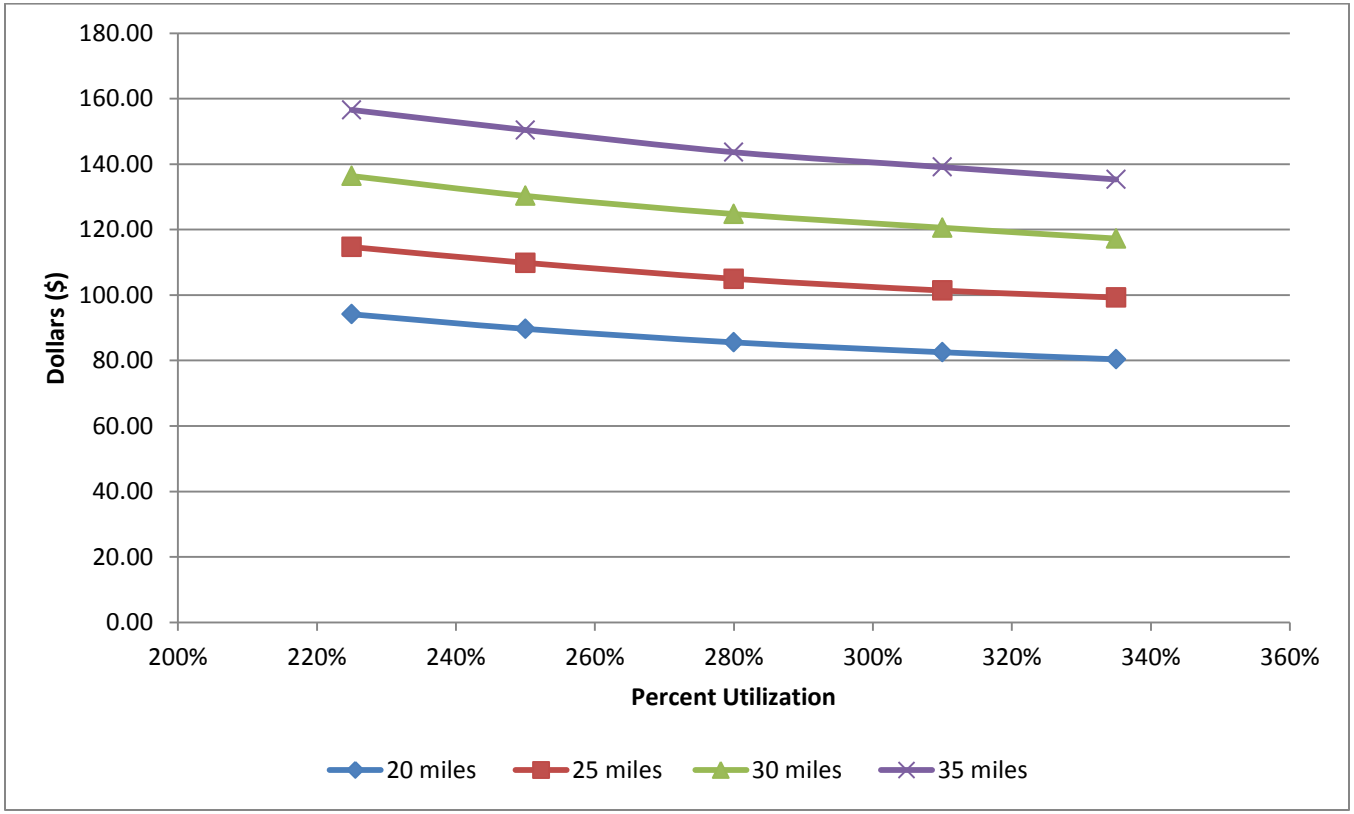

Figure A- 7. Module Truck cost per load v. percent utilization for a 25 bph gin processing picker harvested cotton transporting for 10 hours per day.

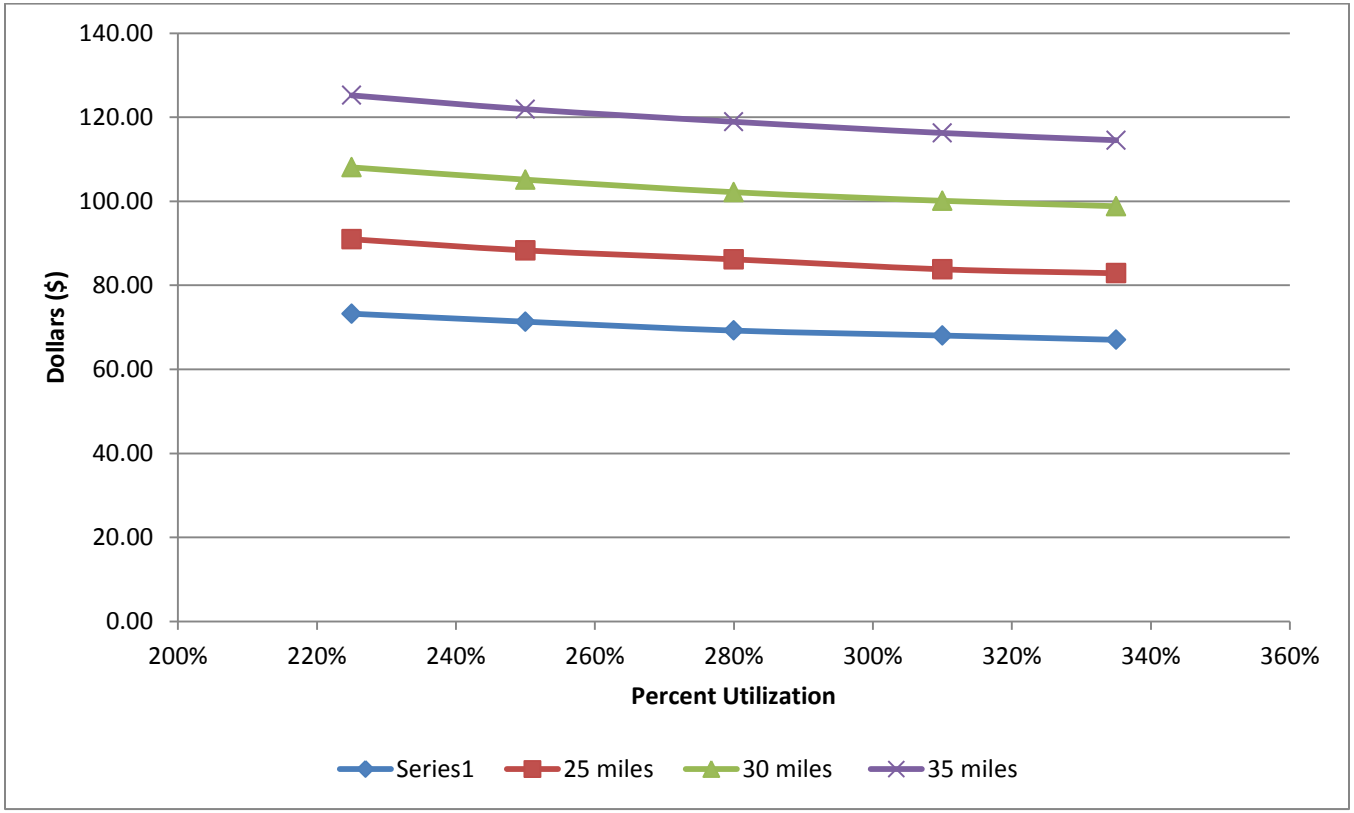

Figure A- 8. Module Truck cost per load v. percent utilization for a 25 bph gin processing picker harvested cotton transporting for 20 hours per day.

Table A- 5. Data table for a 25 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
161	25	224%	20	SWFC	10	$7.66	$93.70	$39.89	89.6	$1.35	4.32
162	25	224%	20	SWFC	20	$6.03	$73.50	$19.96	89.6	$1.34	2.16
163	25	224%	25	SWFC	10	$9.33	$114.50	$47.48	89.6	$1.34	5.11
164	25	224%	25	SWFC	20	$7.40	$90.88	$23.80	89.6	$1.34	2.56
165	25	224%	30	SWFC	10	$11.02	$135.29	$55.07	89.6	$1.34	5.93
166	25	224%	30	SWFC	20	$8.82	$108.25	$27.65	89.6	$1.34	2.97
167	25	224%	35	SWFC	10	$12.77	$156.42	$62.85	89.6	$1.34	6.77
168	25	224%	35	SWFC	20	$10.18	$125.02	$31.26	89.6	$1.34	3.37
169	25	250%	20	SWFC	10	$7.27	$88.85	$35.22	100	$1.34	4.28
170	25	250%	20	SWFC	20	$5.83	$71.47	$17.88	100	$1.34	2.15
171	25	250%	25	SWFC	10	$8.95	$109.78	$42.60	100	$1.34	5.13
172	25	250%	25	SWFC	20	$7.24	$88.71	$21.43	100	$1.35	2.57
173	25	250%	30	SWFC	10	$10.60	$130.05	$49.43	100	$1.34	5.92
174	25	250%	30	SWFC	20	$8.58	$104.91	$24.74	100	$1.34	2.99
175	25	250%	35	SWFC	10	$12.30	$150.40	$56.56	100	$1.34	6.79
176	25	250%	35	SWFC	20	$9.98	$122.09	$28.15	100	$1.34	3.39
177	25	280%	20	SWFC	10	$7.00	$85.50	$31.94	112	$1.34	4.31
178	25	280%	20	SWFC	20	$5.65	$69.22	$15.95	112	$1.33	2.14
179	25	280%	25	SWFC	10	$8.55	$104.66	$38.13	112	$1.33	5.11
180	25	280%	25	SWFC	20	$7.03	$86.21	$18.92	112	$1.35	2.56
181	25	280%	30	SWFC	10	$10.15	$124.48	$44.24	112	$1.34	5.96
182	25	280%	30	SWFC	20	$8.36	$102.50	$22.05	112	$1.34	2.98
183	25	280%	35	SWFC	10	$11.85	$144.56	$50.27	112	$1.35	6.81
184	25	280%	35	SWFC	20	$9.68	$118.72	$25.08	112	$1.34	3.38
185	25	310%	20	SWFC	10	$6.72	$82.43	$28.83	124	$1.34	4.28
186	25	310%	20	SWFC	20	$5.59	$68.45	$14.46	124	$1.35	2.14
187	25	310%	25	SWFC	10	$8.25	$101.35	$34.23	124	$1.34	5.12
188	25	310%	25	SWFC	20	$6.83	$83.71	$17.18	124	$1.33	2.57
189	25	310%	30	SWFC	10	$9.78	$120.07	$39.87	124	$1.34	5.94
190	25	310%	30	SWFC	20	$8.23	$100.91	$20.14	124	$1.35	2.99
191	25	310%	35	SWFC	10	$11.39	$138.91	$45.37	124	$1.34	6.80
192	25	310%	35	SWFC	20	$9.49	$116.64	$22.74	124	$1.34	3.40
193	25	335%	20	SWFC	10	$6.57	$80.05	$26.58	134	$1.34	4.33
194	25	335%	20	SWFC	20	$5.46	$67.04	$13.26	134	$1.34	2.15
195	25	335%	25	SWFC	10	$8.10	$98.94	$31.93	134	$1.34	5.15
196	25	335%	25	SWFC	20	$6.70	$82.65	$15.81	134	$1.34	2.54
197	25	335%	30	SWFC	10	$9.59	$117.27	$36.72	134	$1.34	5.97
198	25	335%	30	SWFC	20	$8.06	$98.32	$18.44	134	$1.33	3.00
199	25	335%	35	SWFC	10	$11.10	$136.05	$42.00	134	$1.34	6.80
200	25	335%	35	SWFC	20	$9.35	$115.10	$21.11	134	$1.34	3.37

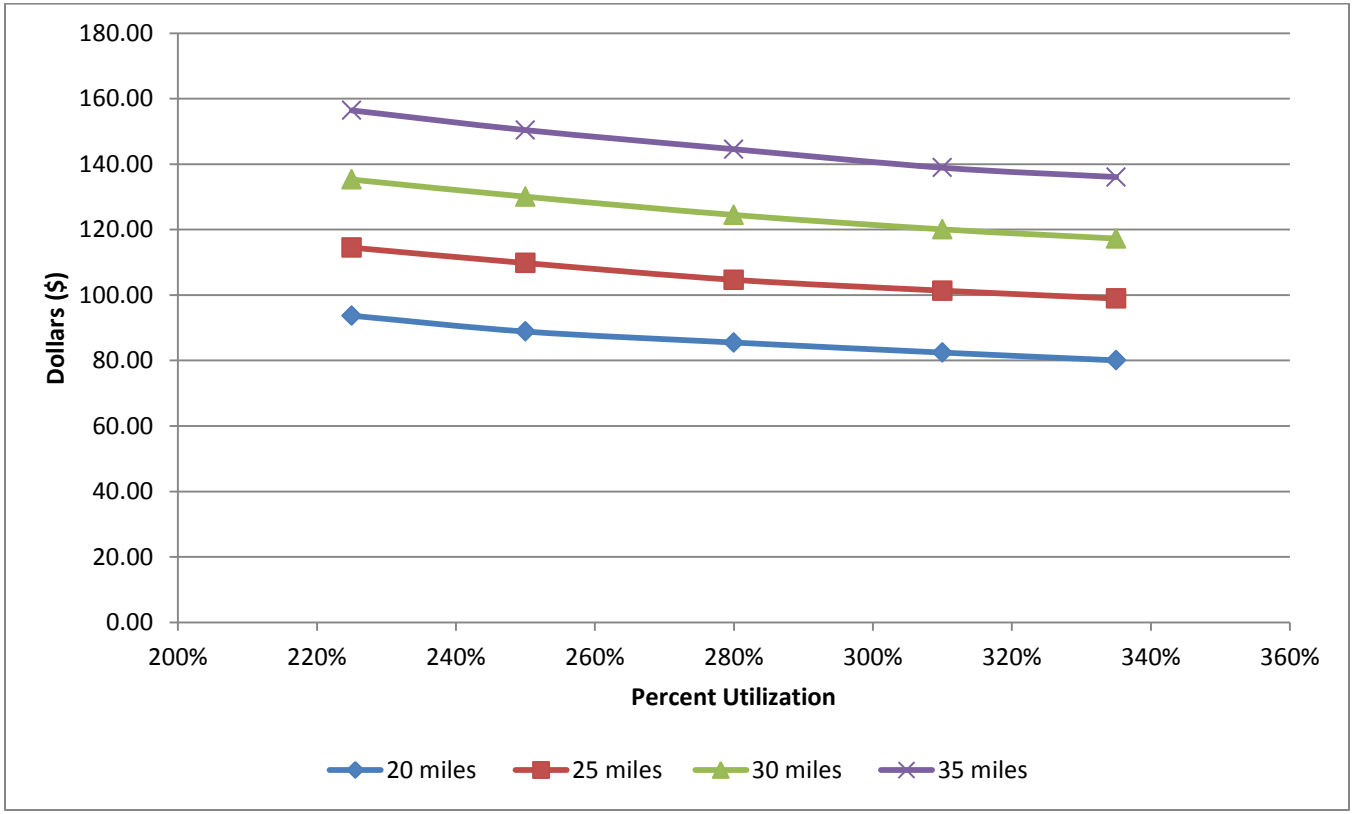

Figure A- 9. Module Truck cost per load v. percent utilization for a 25 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

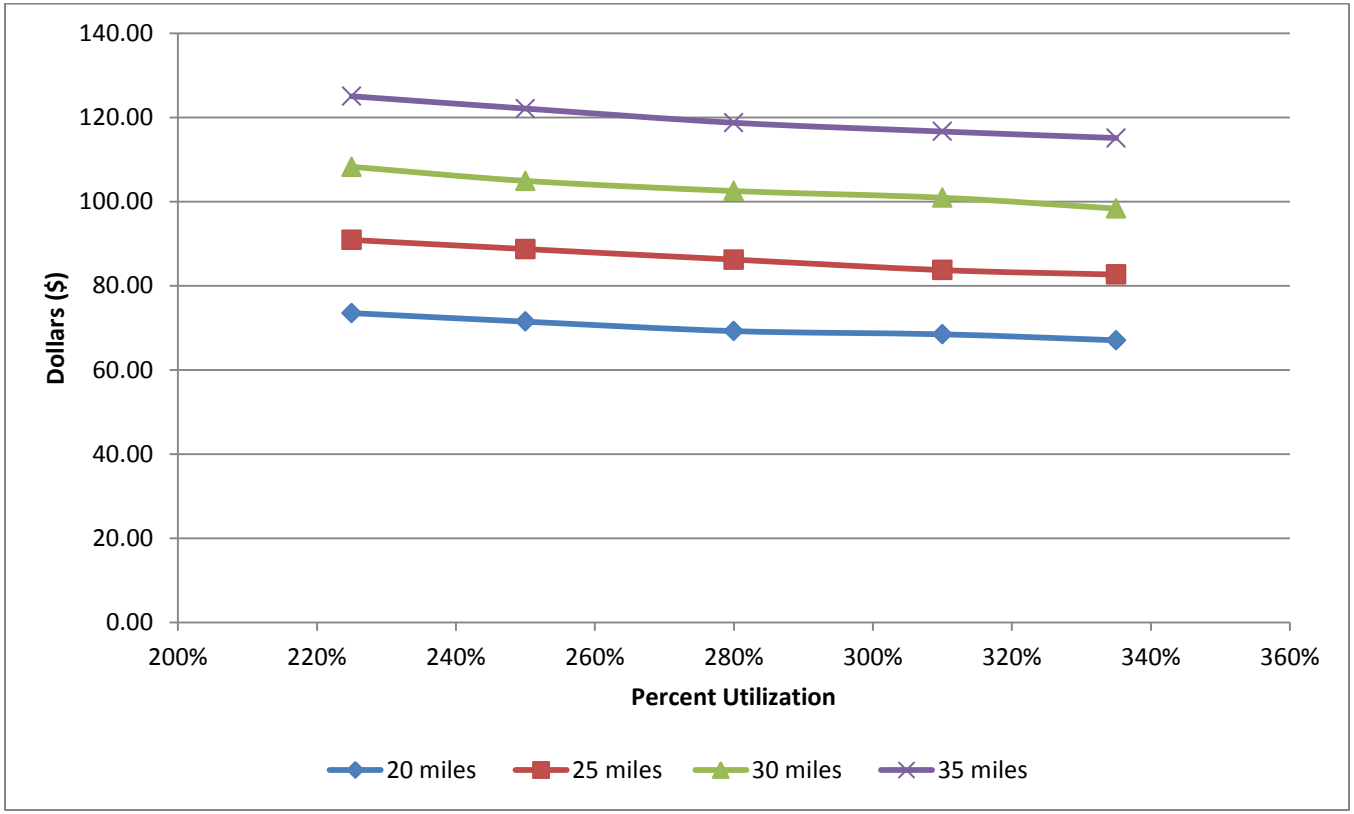

Figure A- 10. Module Truck cost per load v. percent utilization for a 25 bph gin processing picker harvested cotton transporting for 10 hours per day.

Table A- 6. Data table for a 25 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
201	25	225%	20	SWOFC	10	$9.36	$114.65	$21.03	134	$1.34	3.38
202	25	225%	20	SWOFC	20	$9.32	$114.38	$21.00	134	$1.33	3.38
203	25	225%	25	SWOFC	10	$9.32	$114.38	$21.00	134	$1.33	3.38
204	25	225%	25	SWOFC	20	$9.39	$114.72	$20.95	134	$1.34	3.41
205	25	225%	30	SWOFC	10	$9.37	$114.64	$20.99	134	$1.34	3.39
206	25	225%	30	SWOFC	20	$9.40	$114.97	$20.97	134	$1.34	3.40
207	25	225%	35	SWOFC	10	$9.36	$114.26	$20.98	134	$1.33	3.40
208	25	225%	35	SWOFC	20	$9.33	$114.47	$21.01	134	$1.34	3.38
209	25	250%	20	SWOFC	10	$9.43	$115.44	$21.02	134	$1.35	3.40
210	25	250%	20	SWOFC	20	$9.40	$114.90	$20.91	134	$1.34	3.38
211	25	250%	25	SWOFC	10	$9.42	$115.06	$21.06	134	$1.34	3.40
212	25	250%	25	SWOFC	20	$9.36	$114.79	$21.14	134	$1.34	3.39
213	25	250%	30	SWOFC	10	$9.34	$114.38	$20.96	134	$1.33	3.40
214	25	250%	30	SWOFC	20	$9.40	$114.69	$21.02	134	$1.34	3.40
215	25	250%	35	SWOFC	10	$9.32	$114.60	$20.96	134	$1.34	3.37
216	25	250%	35	SWOFC	20	$9.35	$114.62	$21.11	134	$1.34	3.39
217	25	280%	20	SWOFC	10	$9.31	$114.07	$20.96	134	$1.33	3.40
218	25	280%	20	SWOFC	20	$9.37	$114.36	$21.05	134	$1.33	3.40
219	25	280%	25	SWOFC	10	$9.37	$115.01	$20.93	134	$1.34	3.39
220	25	280%	25	SWOFC	20	$9.37	$114.82	$21.01	134	$1.34	3.38
221	25	280%	30	SWOFC	10	$9.37	$114.70	$21.05	134	$1.34	3.38
222	25	280%	30	SWOFC	20	$9.39	$114.96	$21.10	134	$1.34	3.39
223	25	280%	35	SWOFC	10	$9.44	$114.90	$21.03	134	$1.34	3.41
224	25	280%	35	SWOFC	20	$9.31	$114.29	$20.99	134	$1.33	3.38
225	25	310%	20	SWOFC	10	$9.29	$114.14	$21.07	134	$1.33	3.37
226	25	310%	20	SWOFC	20	$9.31	$114.64	$21.08	134	$1.34	3.39
227	25	310%	25	SWOFC	10	$9.37	$114.80	$21.07	134	$1.34	3.40
228	25	310%	25	SWOFC	20	$9.38	$114.79	$20.94	134	$1.34	3.39
229	25	310%	30	SWOFC	10	$9.42	$115.15	$21.02	134	$1.34	3.40
230	25	310%	30	SWOFC	20	$9.40	$115.19	$20.93	134	$1.35	3.38
231	25	310%	35	SWOFC	10	$9.38	$115.19	$21.02	134	$1.35	3.38
232	25	310%	35	SWOFC	20	$9.37	$114.69	$21.06	134	$1.34	3.40
233	25	335%	20	SWOFC	10	$9.34	$114.87	$21.00	134	$1.34	3.39
234	25	335%	20	SWOFC	20	$9.30	$114.31	$20.96	134	$1.33	3.38
235	25	335%	25	SWOFC	10	$9.34	$114.56	$21.02	134	$1.34	3.38
236	25	335%	25	SWOFC	20	$9.36	$114.35	$20.92	134	$1.33	3.40
237	25	335%	30	SWOFC	10	$9.31	$114.41	$21.04	134	$1.33	3.38
238	25	335%	30	SWOFC	20	$9.31	$114.41	$21.04	134	$1.33	3.38
239	25	335%	35	SWOFC	10	$9.34	$114.75	$21.12	134	$1.34	3.39
240	25	335%	35	SWOFC	20	$9.44	$115.53	$21.07	134	$1.35	3.40

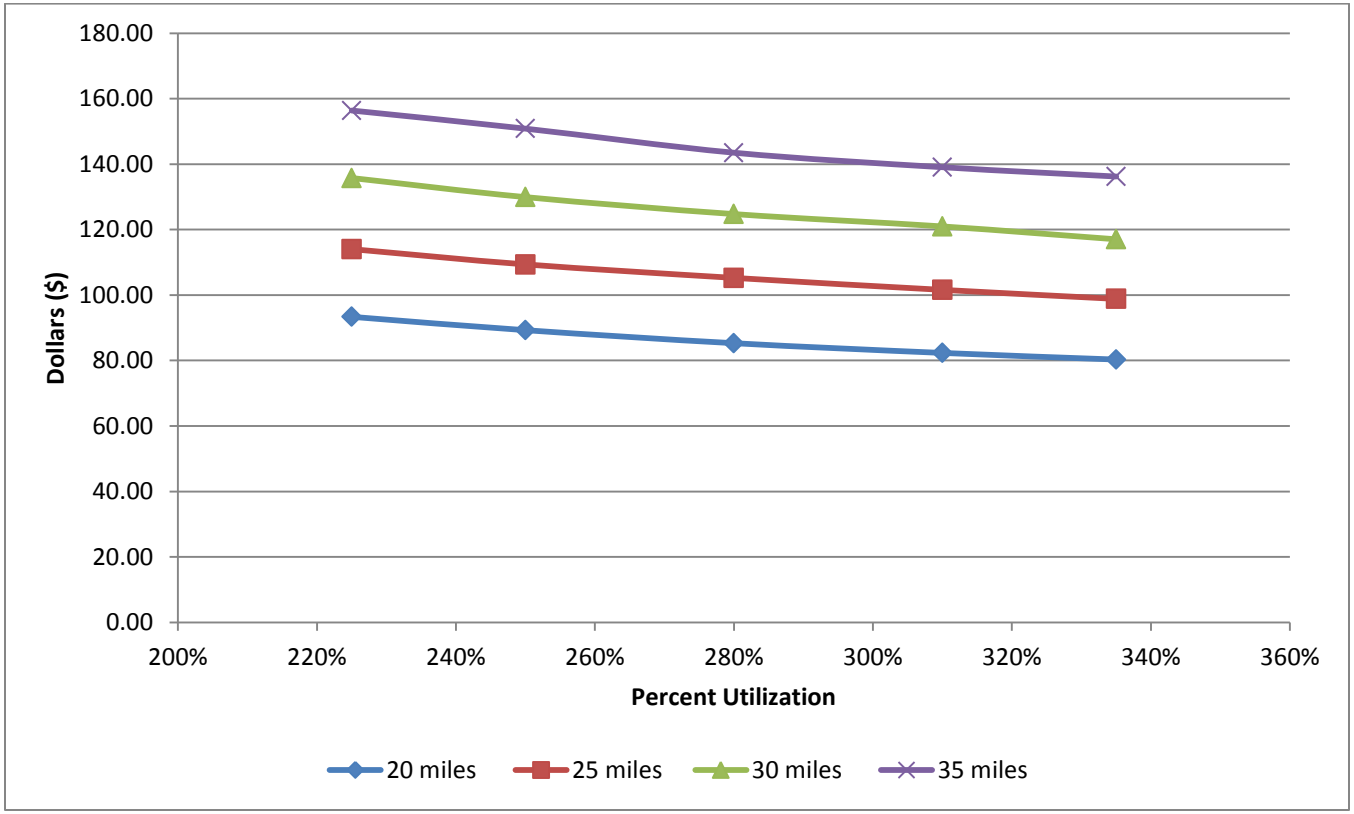

Figure A- 11. Module Truck cost per load v. percent utilization for a 25 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

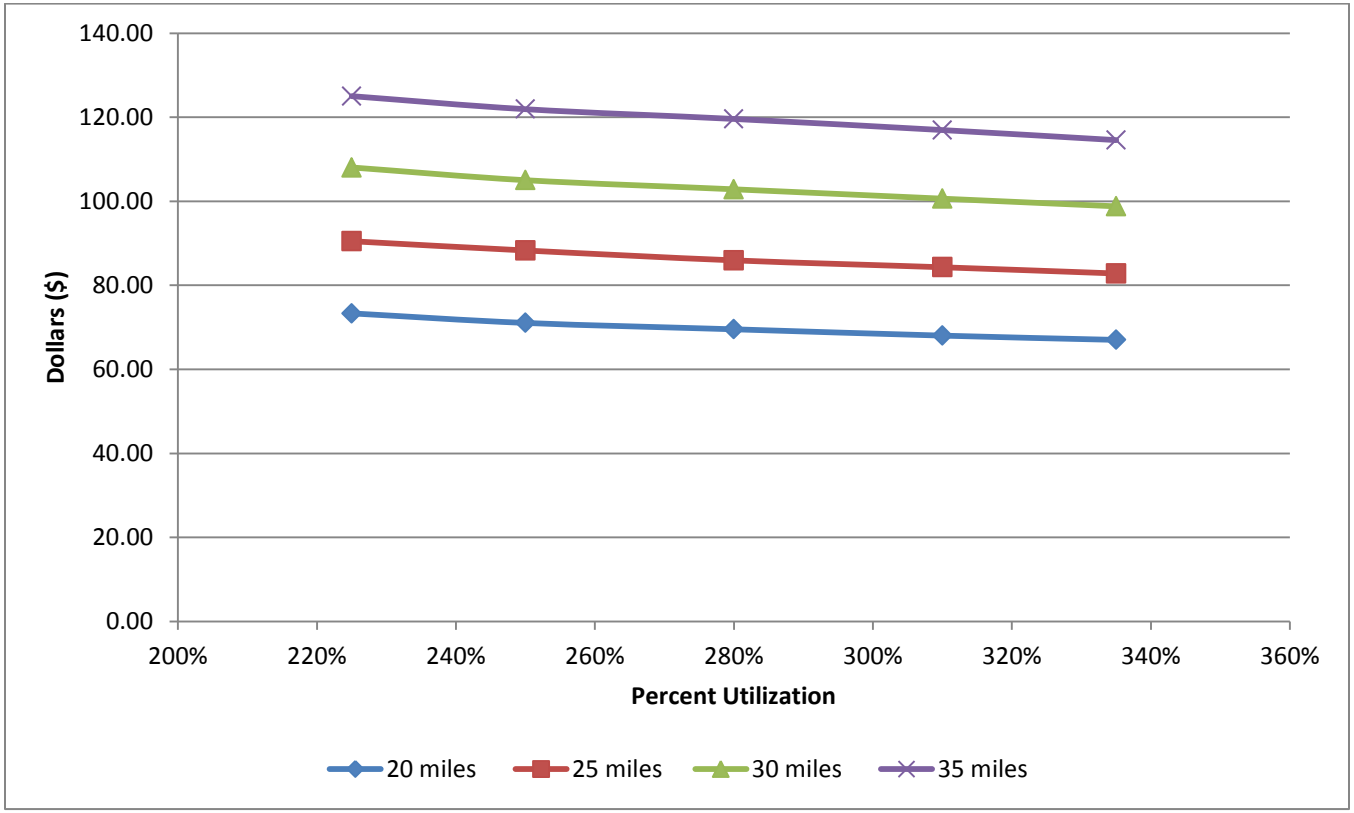

Figure A- 12. Module Truck cost per load v. percent utilization for a 25 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

40 bph

Table A- 7. Data table for a 40 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
241	40	160%	20	Picker	10	$7.24	$109.59	$55.84	64	$1.34	5.6
242	40	160%	20	Picker	20	$5.40	$81.65	$27.85	64	$1.35	2.8
243	40	160%	25	Picker	10	$8.78	$133.27	$66.41	64	$1.34	6.6
244	40	160%	25	Picker	20	$6.61	$100.23	$33.13	64	$1.34	3.3
245	40	160%	30	Picker	10	$10.43	$157.74	$77.32	64	$1.34	7.7
246	40	160%	30	Picker	20	$7.86	$119.46	$38.80	64	$1.34	3.8
247	40	160%	35	Picker	10	$11.95	$181.40	$87.22	64	$1.35	8.7
248	40	160%	35	Picker	20	$9.00	$137.58	$44.15	64	$1.33	4.3
249	40	180%	20	Picker	10	$6.84	$103.87	$49.98	72	$1.35	5.6
250	40	180%	20	Picker	20	$5.16	$78.43	$24.74	72	$1.34	2.8
251	40	180%	25	Picker	10	$8.24	$125.67	$58.63	72	$1.34	6.6
252	40	180%	25	Picker	20	$6.35	$96.51	$29.67	72	$1.34	3.3
253	40	180%	30	Picker	10	$9.81	$149.23	$68.86	72	$1.34	7.7
254	40	180%	30	Picker	20	$7.55	$114.69	$34.26	72	$1.34	3.8
255	40	180%	35	Picker	10	$11.28	$171.92	$78.02	72	$1.34	8.7
256	40	180%	35	Picker	20	$8.73	$132.75	$39.02	72	$1.34	4.4
257	40	200%	20	Picker	10	$6.49	$98.65	$44.84	80	$1.35	5.6
258	40	200%	20	Picker	20	$5.04	$76.07	$22.38	80	$1.34	2.8
259	40	200%	25	Picker	10	$7.93	$120.33	$53.08	80	$1.35	6.6
260	40	200%	25	Picker	20	$6.16	$93.77	$26.66	80	$1.34	3.3
261	40	200%	30	Picker	10	$9.43	$142.69	$61.78	80	$1.35	7.7
262	40	200%	30	Picker	20	$7.30	$111.52	$30.98	80	$1.34	3.8
263	40	200%	35	Picker	10	$10.85	$164.50	$70.24	80	$1.35	8.7
264	40	200%	35	Picker	20	$8.49	$129.04	$35.08	80	$1.34	4.4
265	40	220%	20	Picker	10	$6.21	$94.81	$40.89	88	$1.35	5.5
266	40	220%	20	Picker	20	$4.89	$74.24	$20.33	88	$1.35	2.8
267	40	220%	25	Picker	10	$7.67	$116.14	$48.62	88	$1.35	6.6
268	40	220%	25	Picker	20	$5.97	$91.03	$24.21	88	$1.34	3.3
269	40	220%	30	Picker	10	$9.01	$136.68	$56.21	88	$1.34	7.7
270	40	220%	30	Picker	20	$7.13	$108.78	$28.17	88	$1.34	3.8
271	40	220%	35	Picker	10	$10.38	$157.85	$64.39	88	$1.34	8.7
272	40	220%	35	Picker	20	$8.29	$126.54	$32.03	88	$1.35	4.4
273	40	240%	20	Picker	10	$5.97	$90.88	$37.22	96	$1.34	5.5
274	40	240%	20	Picker	20	$4.76	$72.21	$18.55	96	$1.34	2.8
275	40	240%	25	Picker	10	$7.36	$111.52	$44.27	96	$1.35	6.6
276	40	240%	25	Picker	20	$5.85	$88.85	$22.15	96	$1.33	3.3
277	40	240%	30	Picker	10	$8.66	$132.06	$51.56	96	$1.34	7.7
278	40	240%	30	Picker	20	$7.02	$106.50	$25.98	96	$1.34	3.9
279	40	240%	35	Picker	10	$10.03	$152.89	$59.06	96	$1.34	8.7
280	40	240%	35	Picker	20	$8.08	$123.07	$29.24	96	$1.34	4.4

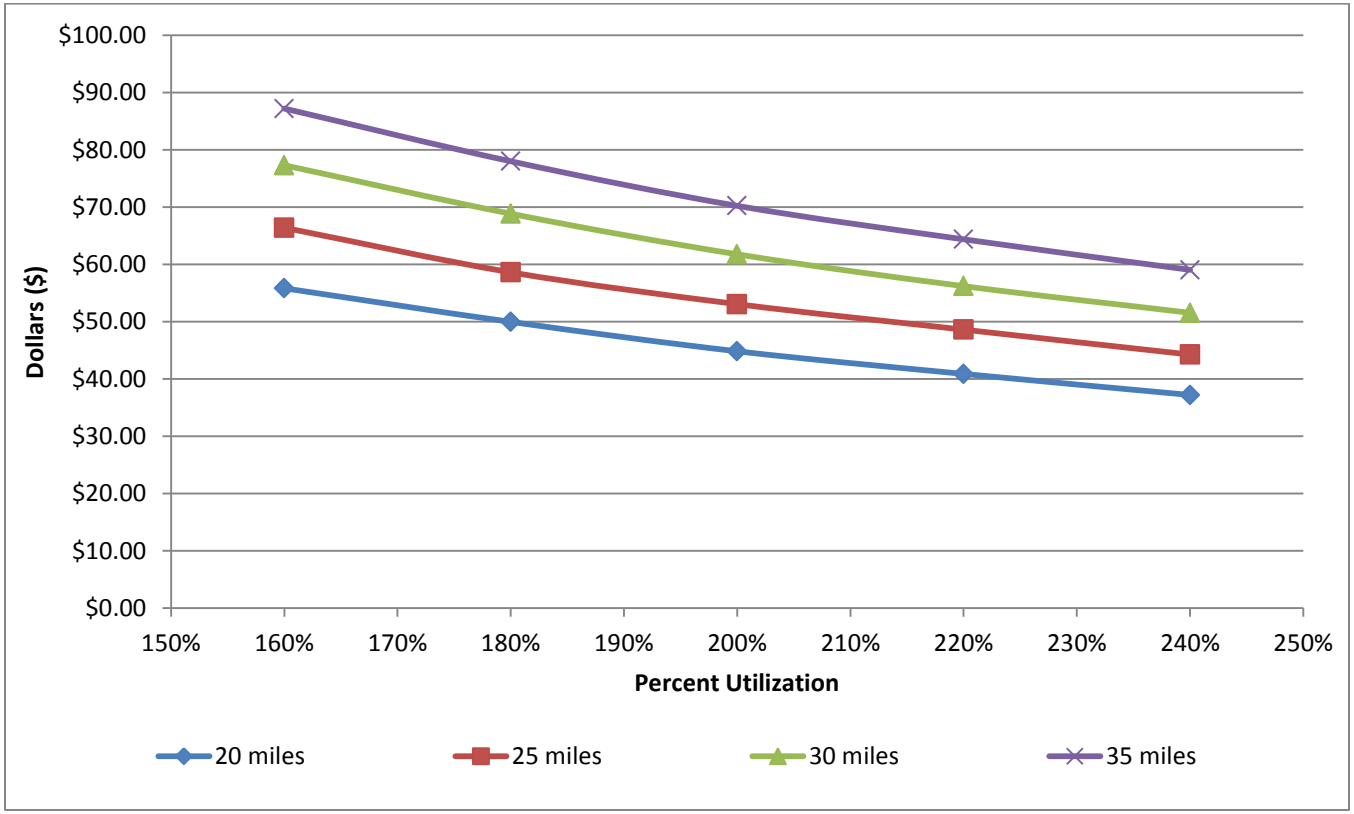

Figure A- 13. Module Truck cost per load v. percent utilization for a 40 bph gin processing picker harvested cotton transporting for 10 hours per day.

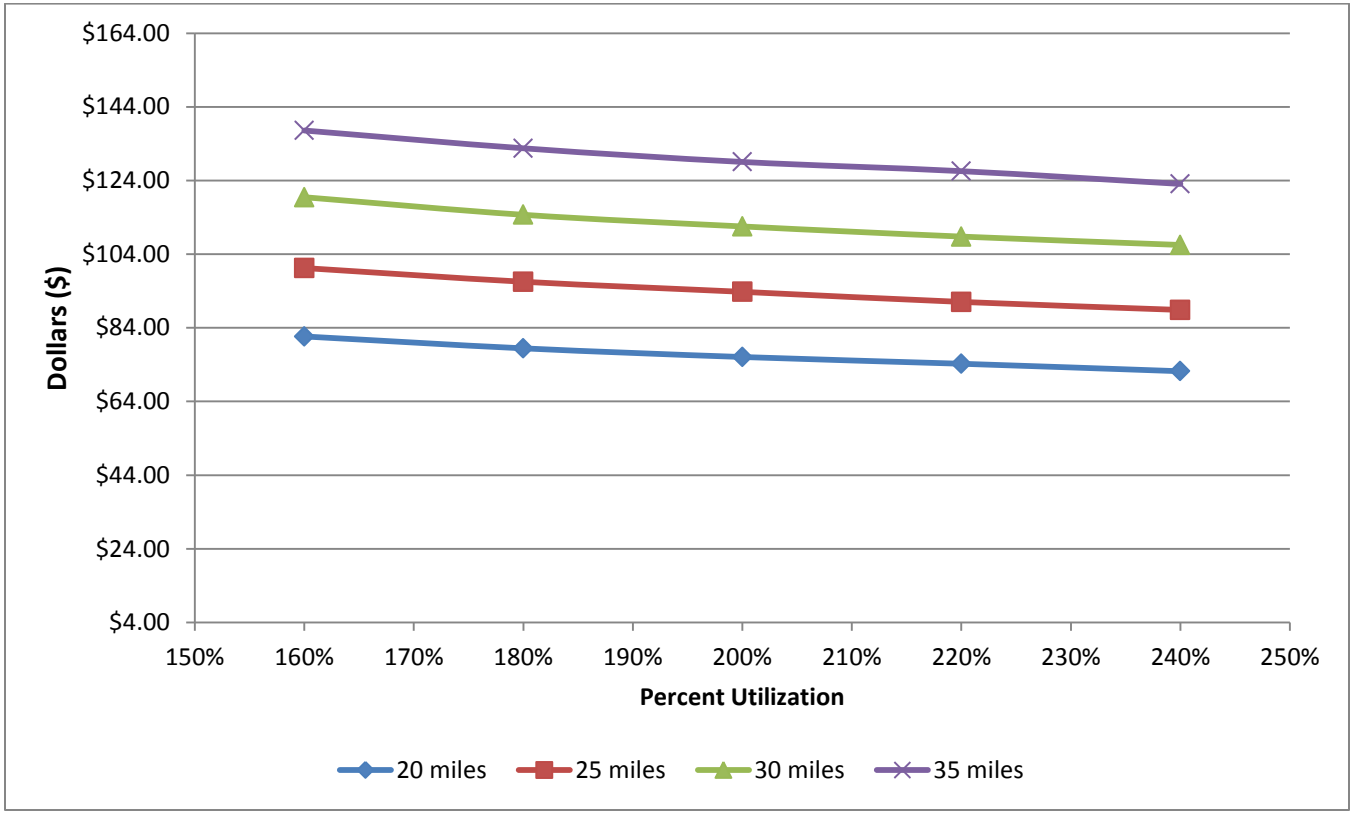

Figure A- 14. Module Truck cost per load v. percent utilization for a 40 bph gin processing picker harvested cotton transporting for 20 hours per day.

Table A- 8. Data table for a 40 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
281	40	160%	20	SWFC	10	$8.93	$109.21	$55.64	64	$1.34	6.8
282	40	160%	20	SWFC	20	$6.63	$81.39	$27.80	64	$1.34	3.4
283	40	160%	25	SWFC	10	$10.86	$133.23	$66.44	64	$1.34	8.2
284	40	160%	25	SWFC	20	$8.24	$100.72	$33.33	64	$1.35	4.1
285	40	160%	30	SWFC	10	$12.83	$157.20	$76.96	64	$1.34	9.5
286	40	160%	30	SWFC	20	$9.68	$118.73	$38.56	64	$1.34	4.8
287	40	160%	35	SWFC	10	$14.89	$181.98	$87.70	64	$1.35	10.9
288	40	160%	35	SWFC	20	$11.20	$137.67	$43.96	64	$1.34	5.4
289	40	180%	20	SWFC	10	$8.43	$102.98	$49.40	72	$1.34	6.9
290	40	180%	20	SWFC	20	$6.40	$78.35	$24.77	72	$1.34	3.4
291	40	180%	25	SWFC	10	$10.27	$126.18	$58.98	72	$1.34	8.2
292	40	180%	25	SWFC	20	$7.85	$96.34	$29.38	72	$1.34	4.1
293	40	180%	30	SWFC	10	$12.13	$148.92	$68.85	72	$1.33	9.6
294	40	180%	30	SWFC	20	$9.41	$115.03	$34.36	72	$1.34	4.8
295	40	180%	35	SWFC	10	$14.06	$172.22	$78.34	72	$1.34	10.9
296	40	180%	35	SWFC	20	$10.84	$132.88	$39.16	72	$1.34	5.4
297	40	200%	20	SWFC	10	$8.04	$98.97	$45.00	80	$1.35	6.9
298	40	200%	20	SWFC	20	$6.19	$75.99	$22.21	80	$1.34	3.4
299	40	200%	25	SWFC	10	$9.81	$120.43	$53.07	80	$1.35	8.2
300	40	200%	25	SWFC	20	$7.69	$93.97	$26.69	80	$1.35	4.1
301	40	200%	30	SWFC	10	$11.62	$142.56	$61.84	80	$1.35	9.5
302	40	200%	30	SWFC	20	$9.06	$110.99	$30.96	80	$1.33	4.8
303	40	200%	35	SWFC	10	$13.37	$164.04	$70.43	80	$1.34	10.8
304	40	200%	35	SWFC	20	$10.50	$128.86	$35.30	80	$1.34	5.5
305	40	220%	20	SWFC	10	$7.67	$94.31	$40.66	88	$1.34	6.9
306	40	220%	20	SWFC	20	$6.05	$73.99	$20.25	88	$1.34	3.4
307	40	220%	25	SWFC	10	$9.39	$115.20	$48.29	88	$1.34	8.2
308	40	220%	25	SWFC	20	$7.41	$91.35	$24.16	88	$1.34	4.1
309	40	220%	30	SWFC	10	$11.12	$136.52	$55.93	88	$1.34	9.4
310	40	220%	30	SWFC	20	$8.88	$108.53	$28.10	88	$1.34	4.7
311	40	220%	35	SWFC	10	$12.92	$157.94	$64.00	88	$1.34	10.9
312	40	220%	35	SWFC	20	$10.32	$126.30	$32.20	88	$1.34	5.4
313	40	240%	20	SWFC	10	$7.39	$90.66	$37.18	96	$1.34	6.9
314	40	240%	20	SWFC	20	$5.85	$71.97	$18.64	96	$1.33	3.4
315	40	240%	25	SWFC	10	$9.17	$111.86	$44.49	96	$1.35	8.3
316	40	240%	25	SWFC	20	$7.26	$88.99	$22.10	96	$1.34	4.1
317	40	240%	30	SWFC	10	$10.74	$131.84	$51.28	96	$1.34	9.5
318	40	240%	30	SWFC	20	$8.69	$106.48	$25.78	96	$1.35	4.8
319	40	240%	35	SWFC	10	$12.45	$153.07	$58.57	96	$1.35	10.9
320	40	240%	35	SWFC	20	$10.07	$123.47	$29.26	96	$1.35	5.4

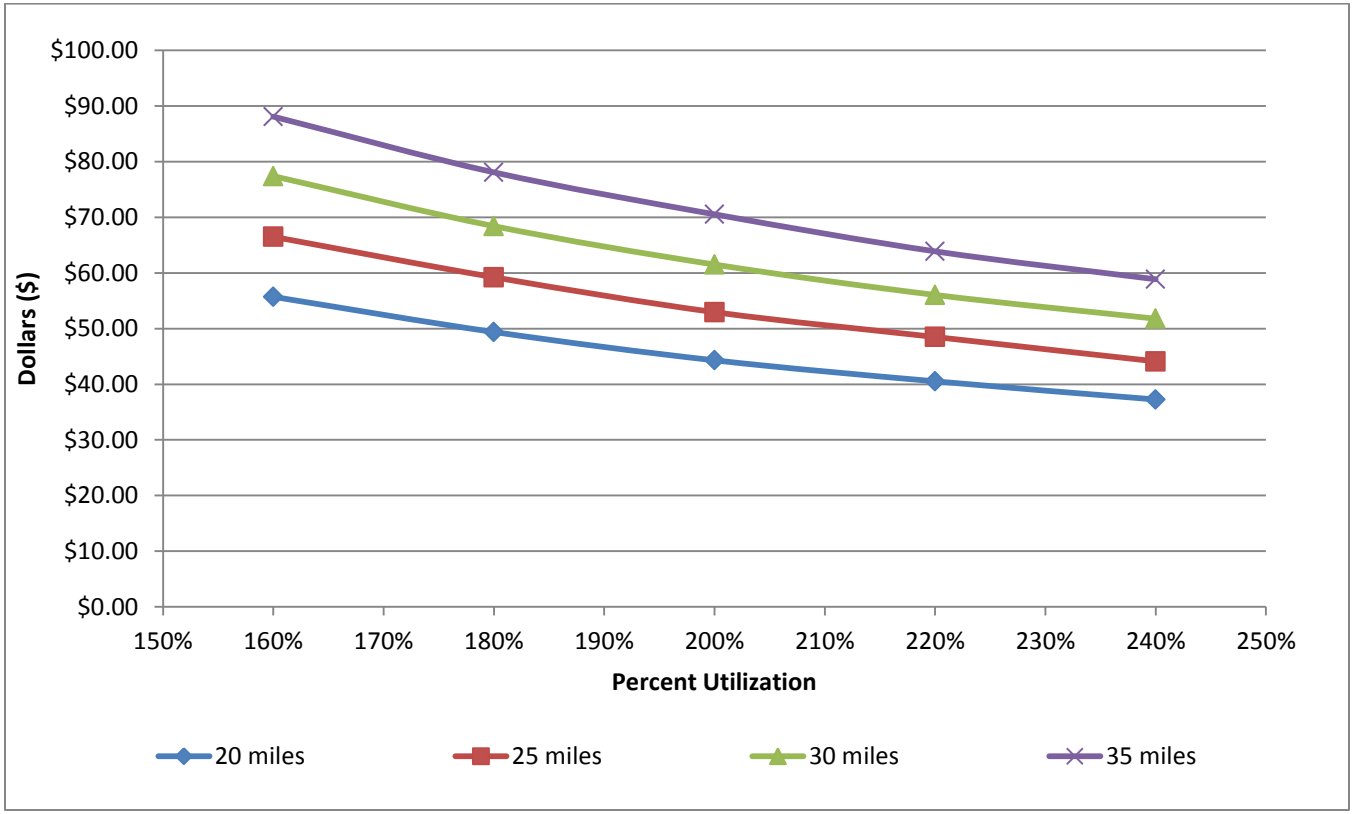

Figure A- 15. Module Truck cost per load v. percent utilization for a 40 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

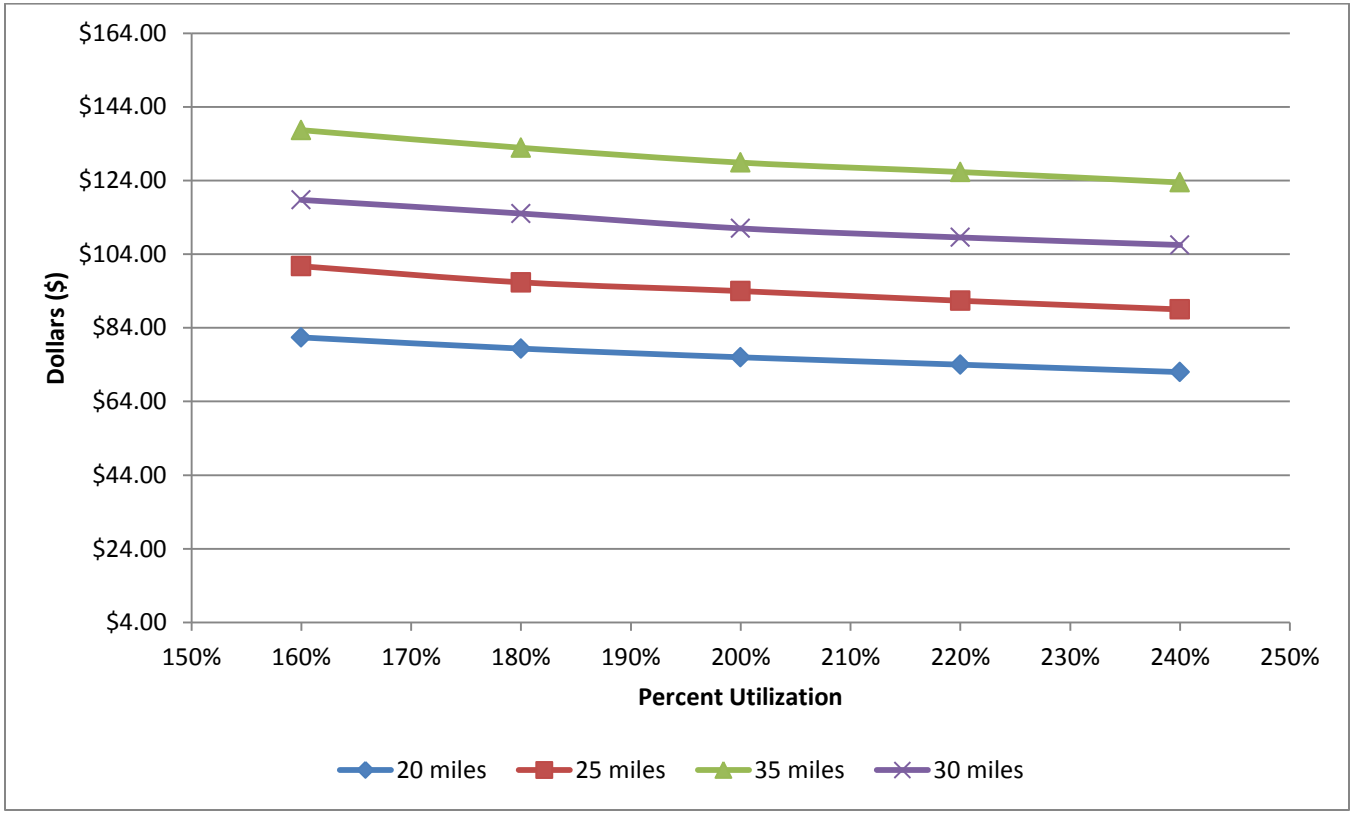

Figure A- 16. Module Truck cost per load v. percent utilization for a 40 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

Table A- 9. Data table for a 40 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Time per Season Transporting	Variable Cost	Trucks Needed
321	40	160%	20	SWOFC	10	$10.96	$109.37	$55.70	64	$1.34	8.5
322	40	160%	20	SWOFC	20	$8.22	$81.77	$27.90	64	$1.35	4.2
323	40	160%	25	SWOFC	10	$13.40	$133.40	$66.49	64	$1.34	10.1
324	40	160%	25	SWOFC	20	$10.10	$99.95	$33.22	64	$1.33	5.1
325	40	160%	30	SWOFC	10	$15.94	$158.12	$77.39	64	$1.35	11.8
326	40	160%	30	SWOFC	20	$11.99	$119.08	$38.71	64	$1.34	5.9
327	40	160%	35	SWOFC	10	$18.37	$182.06	$88.08	64	$1.34	13.4
328	40	160%	35	SWOFC	20	$13.91	$137.92	$44.08	64	$1.34	6.7
329	40	180%	20	SWOFC	10	$10.30	$102.83	$49.38	72	$1.34	8.4
330	40	180%	20	SWOFC	20	$7.93	$78.48	$24.82	72	$1.34	4.3
331	40	180%	25	SWOFC	10	$12.72	$126.17	$59.22	72	$1.34	10.1
332	40	180%	25	SWOFC	20	$9.68	$96.34	$29.41	72	$1.34	5.1
333	40	180%	30	SWOFC	10	$15.01	$149.02	$68.40	72	$1.34	11.8
334	40	180%	30	SWOFC	20	$11.54	$114.94	$34.26	72	$1.34	5.9
335	40	180%	35	SWOFC	10	$17.23	$171.61	$78.07	72	$1.34	13.3
336	40	180%	35	SWOFC	20	$13.34	$132.89	$39.21	72	$1.34	6.7
337	40	200%	20	SWOFC	10	$9.90	$98.26	$44.30	80	$1.35	8.5
338	40	200%	20	SWOFC	20	$7.61	$75.78	$22.36	80	$1.34	4.2
339	40	200%	25	SWOFC	10	$12.10	$120.08	$52.95	80	$1.34	10.1
340	40	200%	25	SWOFC	20	$9.43	$93.50	$26.60	80	$1.34	5.1
341	40	200%	30	SWOFC	10	$14.29	$142.23	$61.50	80	$1.35	11.7
342	40	200%	30	SWOFC	20	$11.21	$110.97	$30.89	80	$1.33	5.9
343	40	200%	35	SWOFC	10	$16.63	$164.67	$70.53	80	$1.34	13.5
344	40	200%	35	SWOFC	20	$13.01	$129.69	$35.33	80	$1.35	6.7
345	40	220%	20	SWOFC	10	$9.46	$94.17	$40.52	88	$1.34	8.5
346	40	220%	20	SWOFC	20	$7.44	$74.07	$20.39	88	$1.34	4.2
347	40	220%	25	SWOFC	10	$11.61	$115.35	$48.49	88	$1.34	10.1
348	40	220%	25	SWOFC	20	$9.19	$91.09	$24.11	88	$1.34	5.1
349	40	220%	30	SWOFC	10	$13.72	$136.27	$56.04	88	$1.34	11.8
350	40	220%	30	SWOFC	20	$10.92	$108.59	$28.07	88	$1.34	5.9
351	40	220%	35	SWOFC	10	$15.84	$157.45	$63.88	88	$1.34	13.4
352	40	220%	35	SWOFC	20	$12.62	$125.75	$31.93	88	$1.34	6.7
353	40	240%	20	SWOFC	10	$9.14	$90.72	$37.26	96	$1.34	8.5
354	40	240%	20	SWOFC	20	$7.24	$72.05	$18.50	96	$1.34	4.2
355	40	240%	25	SWOFC	10	$11.19	$111.00	$44.11	96	$1.34	10.1
356	40	240%	25	SWOFC	20	$8.91	$88.83	$22.03	96	$1.34	5.0
357	40	240%	30	SWOFC	10	$13.29	$132.10	$51.77	96	$1.34	11.8
358	40	240%	30	SWOFC	20	$10.69	$105.75	$25.66	96	$1.33	5.9
359	40	240%	35	SWOFC	10	$15.42	$152.76	$58.86	96	$1.34	13.4
360	40	240%	35	SWOFC	20	$12.40	$122.99	$29.41	96	$1.34	6.7

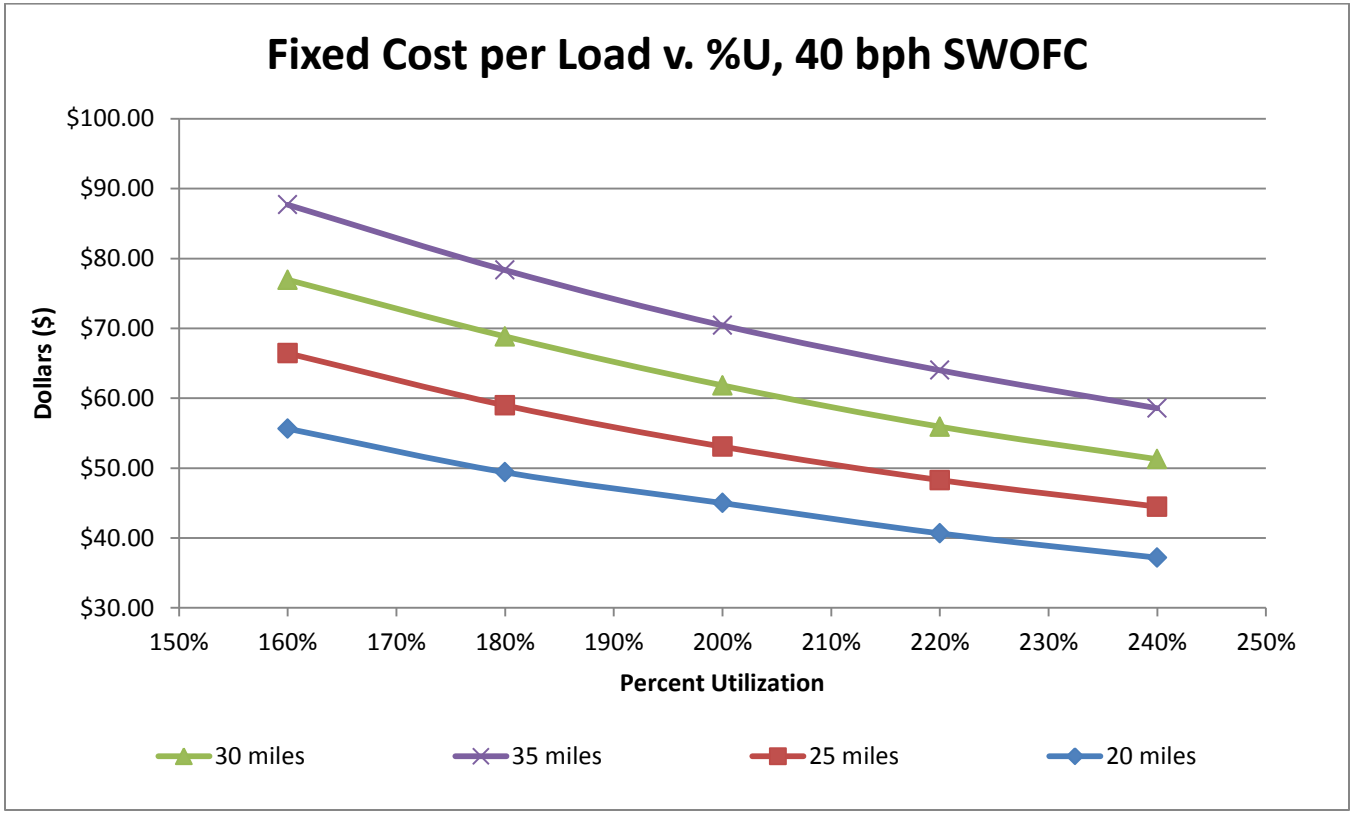

Figure A- 17. Module Truck cost per load v. percent utilization for a 40 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

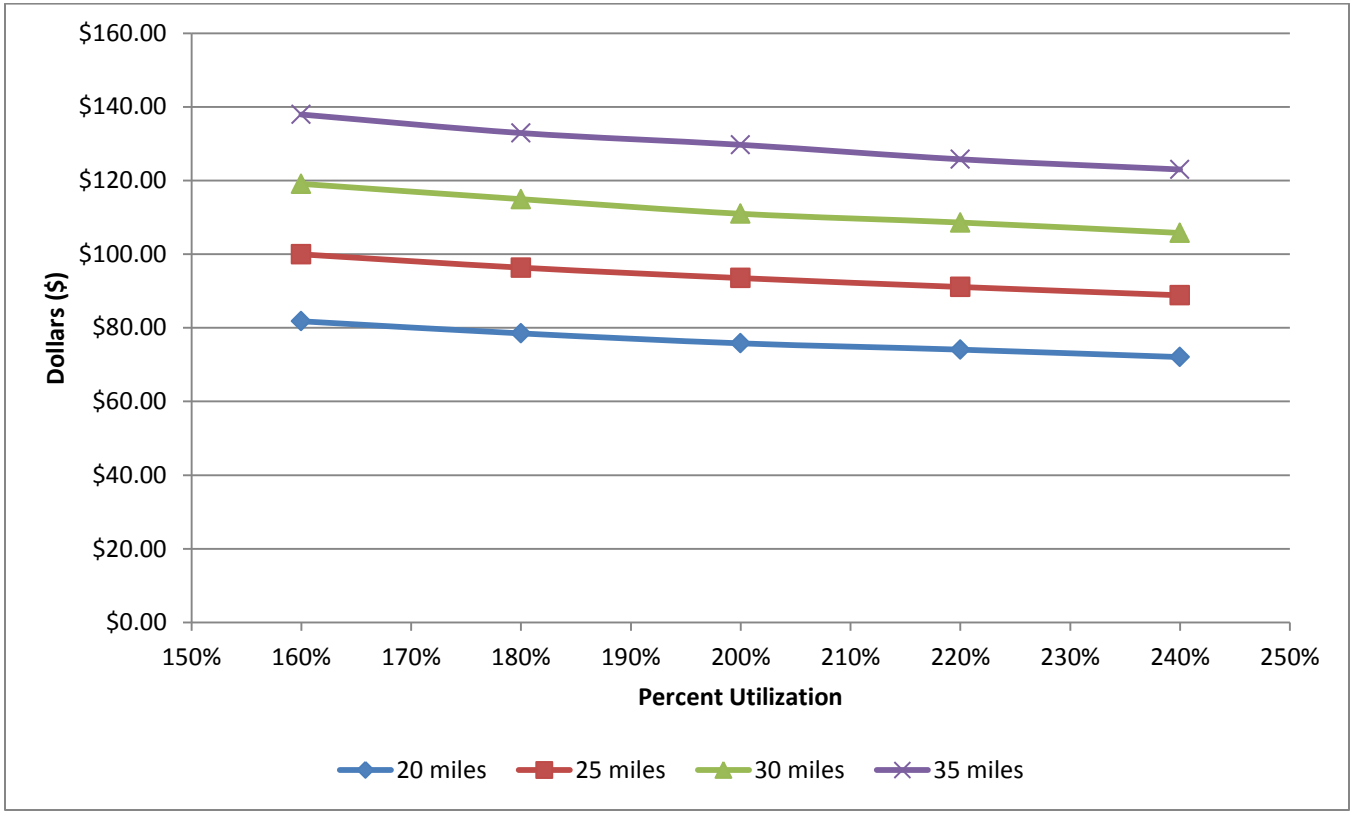

Figure A- 18. Module Truck cost per load v. percent utilization for a 40 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

65 bph

Table A- 10. Data table for a 65 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time available to Transport	Total Cost per Bale	Total Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost	Trucks Needed
361	65	190%	20	Picker	10	$6.60	$99.90	$46.54	77	$1.33	9.1
362	65	190%	20	Picker	20	$5.07	$76.94	$23.28	77	$1.34	4.5
363	65	190%	25	Picker	10	$8.07	$122.24	$55.38	77	$1.34	10.8
364	65	190%	25	Picker	20	$6.23	$94.56	$27.68	77	$1.34	5.4
365	65	190%	30	Picker	10	$9.57	$144.86	$64.20	77	$1.34	12.5
366	65	190%	30	Picker	20	$7.43	$112.53	$32.25	77	$1.34	6.2
367	65	190%	35	Picker	10	$10.97	$167.21	$73.14	77	$1.34	14.1
368	65	190%	35	Picker	20	$8.56	$130.38	$36.75	77	$1.34	7.1
369	65	215%	20	Picker	10	$6.27	$95.37	$41.67	86	$1.34	9.0
370	65	215%	20	Picker	20	$4.89	$74.09	$20.76	86	$1.33	4.5
371	65	215%	25	Picker	10	$7.69	$116.59	$49.40	86	$1.34	10.8
372	65	215%	25	Picker	20	$6.08	$92.17	$24.85	86	$1.35	5.4
373	65	215%	30	Picker	10	$9.06	$137.89	$57.64	86	$1.34	12.4
374	65	215%	30	Picker	20	$7.18	$109.50	$28.93	86	$1.34	6.2
375	65	215%	35	Picker	10	$10.46	$159.61	$65.47	86	$1.34	14.2
376	65	215%	35	Picker	20	$8.34	$126.70	$32.75	86	$1.34	7.1
377	65	240%	20	Picker	10	$5.97	$90.91	$36.95	96	$1.35	9.0
378	65	240%	20	Picker	20	$4.75	$72.31	$18.48	96	$1.35	4.5
379	65	240%	25	Picker	10	$7.32	$111.30	$44.18	96	$1.34	10.8
380	65	240%	25	Picker	20	$5.90	$89.37	$22.09	96	$1.35	5.4
381	65	240%	30	Picker	10	$8.74	$132.57	$51.75	96	$1.35	12.5
382	65	240%	30	Picker	20	$6.97	$105.92	$25.72	96	$1.34	6.2
383	65	240%	35	Picker	10	$10.01	$152.37	$58.66	96	$1.34	14.2
384	65	240%	35	Picker	20	$8.12	$122.82	$29.27	96	$1.34	7.1
385	65	265%	20	Picker	10	$5.77	$87.38	$33.76	106	$1.34	9.1
386	65	265%	20	Picker	20	$4.64	$70.39	$16.84	106	$1.34	4.5
387	65	265%	25	Picker	10	$7.04	$107.03	$40.28	106	$1.33	10.7
388	65	265%	25	Picker	20	$5.70	$87.29	$19.98	106	$1.35	5.3
389	65	265%	30	Picker	10	$8.39	$127.50	$46.65	106	$1.35	12.4
390	65	265%	30	Picker	20	$6.82	$103.85	$23.39	106	$1.34	6.2
391	65	265%	35	Picker	10	$9.64	$146.39	$53.12	106	$1.33	14.3
392	65	265%	35	Picker	20	$7.94	$120.66	$26.52	106	$1.34	7.1
393	65	290%	20	Picker	10	$5.56	$84.27	$30.75	116	$1.34	9.0
394	65	290%	20	Picker	20	$4.55	$69.14	$15.41	116	$1.34	4.5
395	65	290%	25	Picker	10	$6.83	$104.12	$36.79	116	$1.35	10.7
396	65	290%	25	Picker	20	$5.58	$85.16	$18.36	116	$1.34	5.4
397	65	290%	30	Picker	10	$8.13	$123.12	$42.73	116	$1.34	12.6
398	65	290%	30	Picker	20	$6.69	$101.98	$21.40	116	$1.34	6.2
399	65	290%	35	Picker	10	$9.37	$142.21	$48.50	116	$1.34	14.2
400	65	290%	35	Picker	20	$7.76	$118.28	$24.43	116	$1.34	7.1

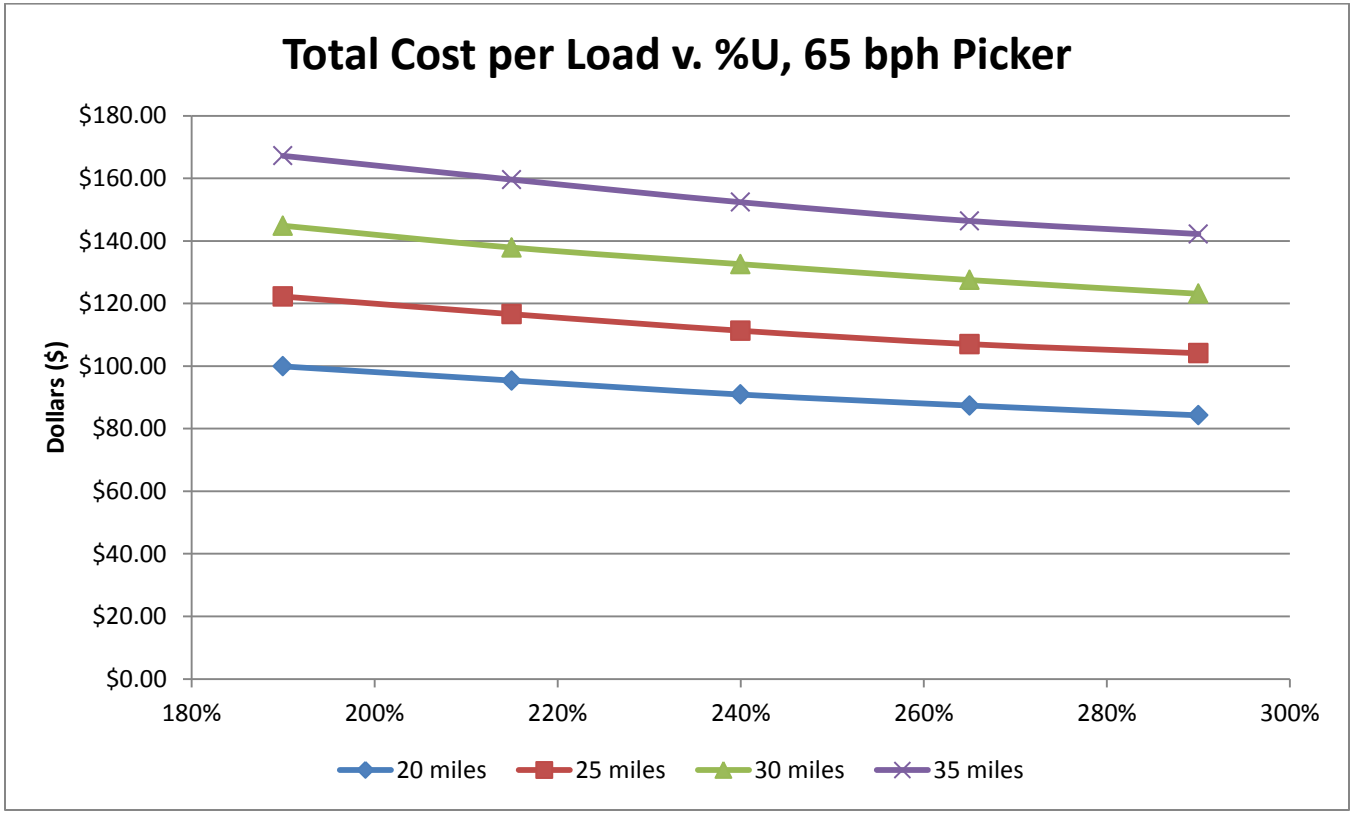

Figure A- 19. Module Truck cost per load v. percent utilization for a 65 bph gin processing Picker harvested cotton transporting for 10 hours per day.

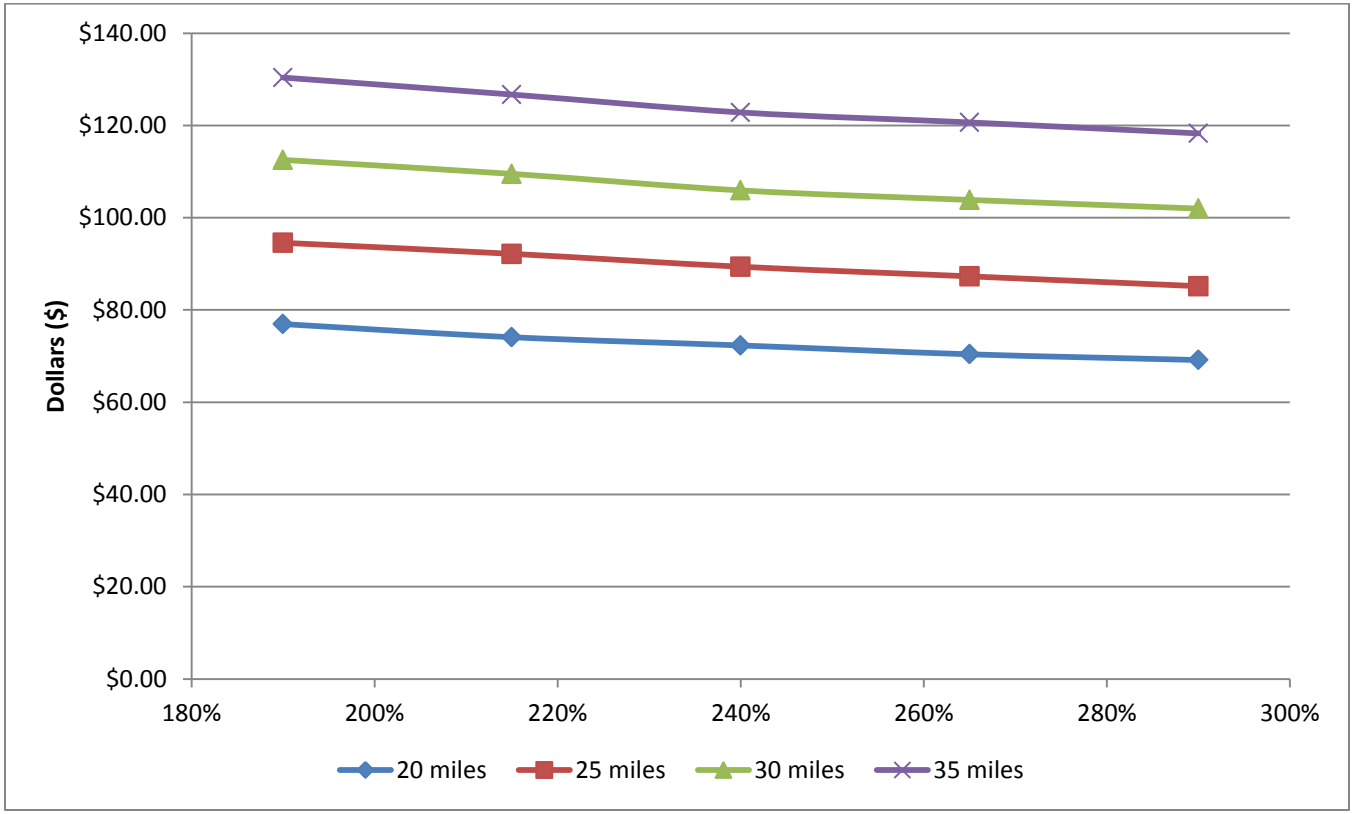

Figure A- 20. Module Truck cost per load v. percent utilization for a 65 bph gin processing Picker harvested cotton transporting for 20 hours per day.

Table A- 11. Data table for a 65 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost	Trucks Needed
401	65	192%	20	SWFC	10	$8.25	$101.07	$47.14	11.2	76	$1.35
402	65	192%	20	SWFC	20	$6.27	$76.87	$23.39	5.6	76	$1.34
403	65	192%	25	SWFC	10	$10.06	$123.40	$56.07	13.3	76	$1.35
404	65	192%	25	SWFC	20	$7.77	$95.26	$28.06	6.6	76	$1.34
405	65	192%	30	SWFC	10	$11.92	$145.36	$65.16	15.5	76	$1.34
406	65	192%	30	SWFC	20	$9.18	$112.91	$32.58	7.7	76	$1.34
407	65	192%	35	SWFC	10	$13.69	$168.19	$74.47	17.6	76	$1.34
408	65	192%	35	SWFC	20	$10.65	$130.34	$37.04	8.9	76	$1.33
409	65	216%	20	SWFC	10	$7.73	$94.14	$40.60	11.3	88	$1.34
410	65	216%	20	SWFC	20	$6.04	$73.64	$20.26	5.6	88	$1.33
411	65	216%	25	SWFC	10	$9.40	$115.06	$48.21	13.3	88	$1.34
412	65	216%	25	SWFC	20	$7.39	$91.17	$24.22	6.6	88	$1.34
413	65	216%	30	SWFC	10	$11.11	$136.14	$56.07	15.4	88	$1.33
414	65	216%	30	SWFC	20	$8.85	$108.66	$28.05	7.7	88	$1.34
415	65	216%	35	SWFC	10	$12.89	$157.94	$63.92	17.7	88	$1.34
416	65	216%	35	SWFC	20	$10.26	$125.66	$31.96	8.8	88	$1.34
417	65	240%	20	SWFC	10	$7.39	$90.55	$37.04	11.1	96	$1.34
418	65	240%	20	SWFC	20	$5.90	$72.30	$18.64	5.6	96	$1.34
419	65	240%	25	SWFC	10	$9.06	$111.19	$44.23	13.3	96	$1.34
420	65	240%	25	SWFC	20	$7.30	$89.09	$22.13	6.7	96	$1.34
421	65	240%	30	SWFC	10	$10.80	$131.93	$51.68	15.6	96	$1.34
422	65	240%	30	SWFC	20	$8.68	$105.92	$25.61	7.8	96	$1.34
423	65	240%	35	SWFC	10	$12.35	$151.96	$58.67	17.5	96	$1.33
424	65	240%	35	SWFC	20	$10.02	$123.17	$29.30	8.8	96	$1.34
425	65	264%	20	SWFC	10	$7.11	$87.14	$33.77	11.2	106	$1.33
426	65	264%	20	SWFC	20	$5.77	$70.69	$16.84	5.6	106	$1.35
427	65	264%	25	SWFC	10	$8.74	$107.09	$40.25	13.3	106	$1.34
428	65	264%	25	SWFC	20	$7.12	$87.02	$20.05	6.7	106	$1.34
429	65	264%	30	SWFC	10	$10.40	$127.01	$46.59	15.5	106	$1.34
430	65	264%	30	SWFC	20	$8.47	$103.95	$23.30	7.7	106	$1.34
431	65	264%	35	SWFC	10	$12.06	$147.10	$53.17	17.7	106	$1.34
432	65	264%	35	SWFC	20	$9.83	$120.48	$26.57	8.8	106	$1.34
433	65	288%	20	SWFC	10	$6.86	$84.27	$30.74	11.1	116	$1.34
434	65	288%	20	SWFC	20	$5.64	$69.05	$15.46	5.6	116	$1.34
435	65	288%	25	SWFC	10	$8.49	$103.66	$36.64	13.3	116	$1.34
436	65	288%	25	SWFC	20	$6.97	$85.54	$18.35	6.7	116	$1.34
437	65	288%	30	SWFC	10	$10.08	$123.21	$42.69	15.7	116	$1.34
438	65	288%	30	SWFC	20	$8.28	$101.29	$21.21	7.7	116	$1.33
439	65	288%	35	SWFC	10	$11.58	$142.23	$48.65	17.7	116	$1.34
440	65	288%	35	SWFC	20	$9.61	$117.82	$24.32	8.8	116	$1.34

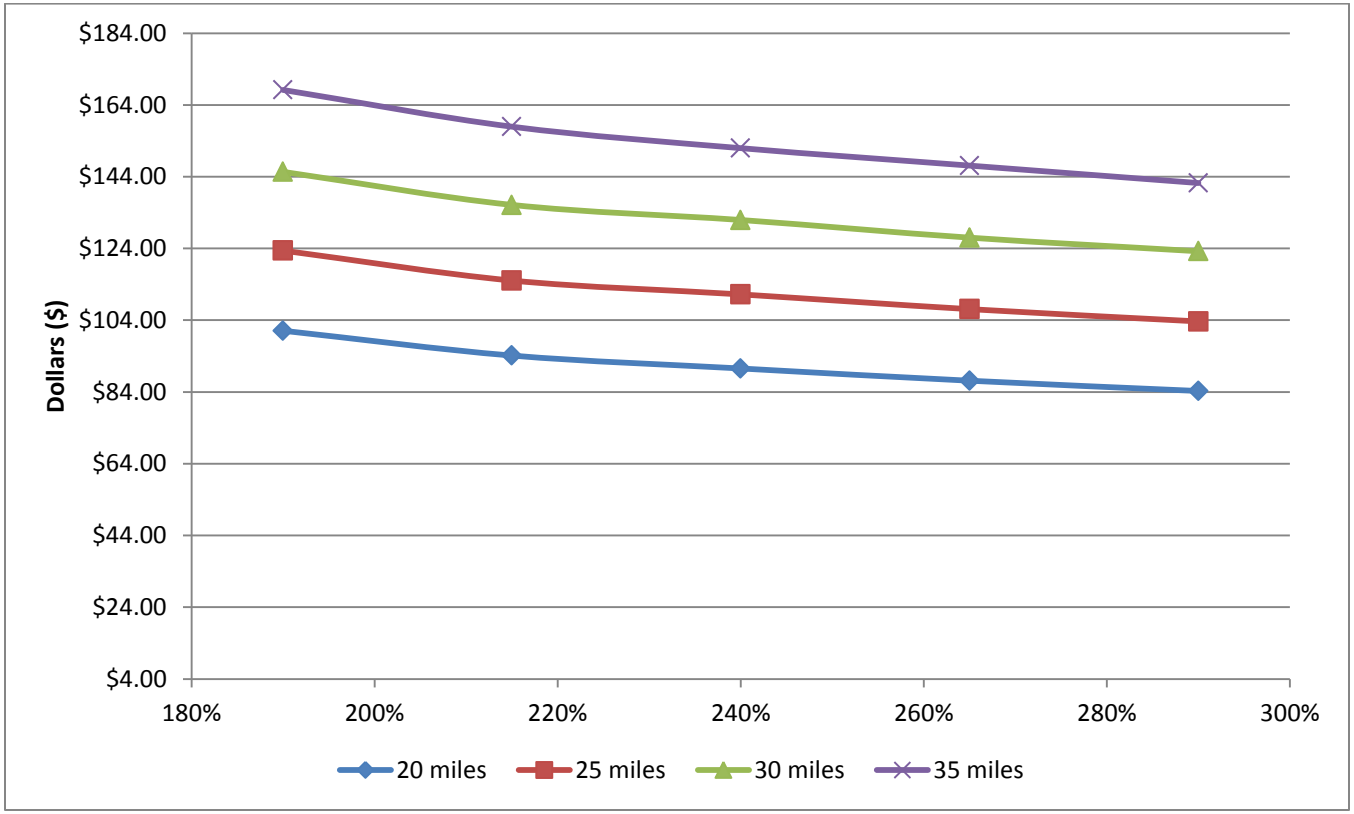

Figure A- 21. Module Truck cost per load v. percent utilization for a 65 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

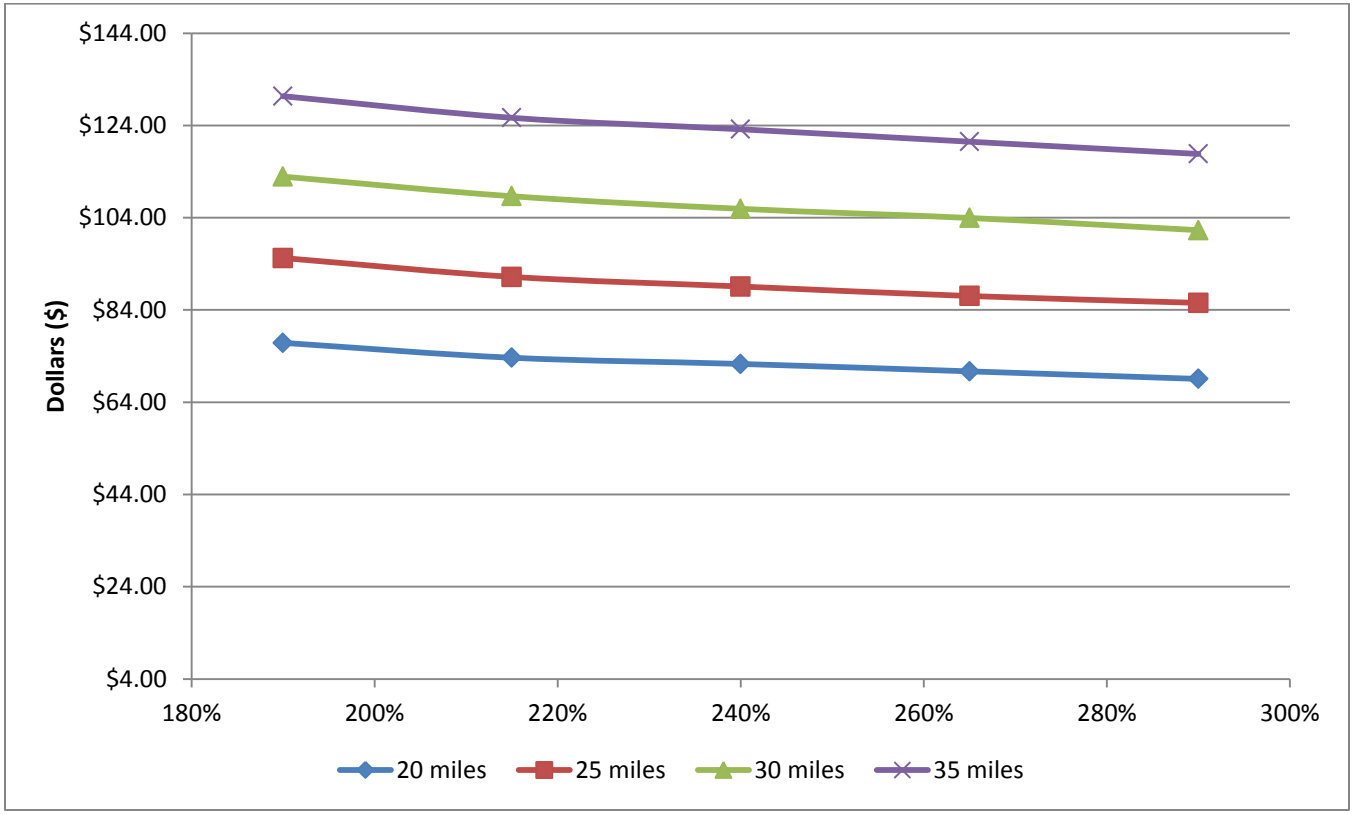

Figure A- 22. Module Truck cost per load v. percent utilization for a 65 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

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Table A- 12.Data table for a 65 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost	Trucks Needed
441	65	192%	20	SWOFC	10	$10.14	$101.06	$46.95	13.7	76	$1.35
442	65	192%	20	SWOFC	20	$7.76	$77.13	$23.42	6.9	76	$1.34
443	65	192%	25	SWOFC	10	$12.36	$122.93	$56.08	16.4	76	$1.34
444	65	192%	25	SWOFC	20	$9.54	$94.91	$28.07	8.2	76	$1.34
445	65	192%	30	SWOFC	10	$14.67	$145.81	$65.17	19.1	76	$1.34
446	65	192%	30	SWOFC	20	$11.40	$113.30	$32.52	9.6	76	$1.35
447	65	192%	35	SWOFC	10	$16.81	$168.00	$73.95	21.5	76	$1.34
448	65	192%	35	SWOFC	20	$13.16	$131.13	$37.17	10.9	76	$1.34
449	65	216%	20	SWOFC	10	$9.59	$95.27	$41.67	13.8	86	$1.34
450	65	216%	20	SWOFC	20	$7.47	$74.07	$20.73	6.9	86	$1.33
451	65	216%	25	SWOFC	10	$11.76	$116.16	$49.47	16.6	86	$1.33
452	65	216%	25	SWOFC	20	$9.21	$91.49	$24.77	8.2	86	$1.33
453	65	216%	30	SWOFC	10	$13.91	$137.77	$57.46	19.1	86	$1.34
454	65	216%	30	SWOFC	20	$10.97	$108.59	$28.71	9.5	86	$1.33
455	65	216%	35	SWOFC	10	$16.10	$159.77	$65.99	21.9	86	$1.34
456	65	216%	35	SWOFC	20	$12.67	$126.51	$32.71	10.8	86	$1.34
457	65	240%	20	SWOFC	10	$9.13	$90.79	$37.29	13.8	96	$1.34
458	65	240%	20	SWOFC	20	$7.26	$72.08	$18.58	6.9	96	$1.34
459	65	240%	25	SWOFC	10	$11.22	$111.22	$44.24	16.4	96	$1.34
460	65	240%	25	SWOFC	20	$8.99	$89.17	$22.10	8.2	96	$1.34
461	65	240%	30	SWOFC	10	$13.16	$131.25	$51.24	19.0	96	$1.33
462	65	240%	30	SWOFC	20	$10.67	$106.32	$25.76	9.5	96	$1.34
463	65	240%	35	SWOFC	10	$15.32	$152.57	$58.52	21.7	96	$1.34
464	65	240%	35	SWOFC	20	$12.40	$123.13	$29.35	10.8	96	$1.34
465	65	264%	20	SWOFC	10	$8.73	$87.01	$33.57	13.7	106	$1.34
466	65	264%	20	SWOFC	20	$7.09	$70.32	$16.81	6.9	106	$1.34
467	65	264%	25	SWOFC	10	$10.76	$107.15	$40.19	16.5	106	$1.34
468	65	264%	25	SWOFC	20	$8.80	$87.07	$20.08	8.2	106	$1.34
469	65	264%	30	SWOFC	10	$12.90	$127.35	$46.78	19.3	106	$1.34
470	65	264%	30	SWOFC	20	$10.48	$103.98	$23.30	9.6	106	$1.34
471	65	264%	35	SWOFC	10	$14.68	$146.41	$53.03	21.7	106	$1.33
472	65	264%	35	SWOFC	20	$12.15	$120.69	$26.65	11.0	106	$1.34
473	65	288%	20	SWOFC	10	$8.52	$84.57	$30.79	13.8	116	$1.34
474	65	288%	20	SWOFC	20	$6.96	$68.98	$15.38	6.9	116	$1.34
475	65	288%	25	SWOFC	10	$10.43	$103.53	$36.63	16.5	116	$1.34
476	65	288%	25	SWOFC	20	$8.60	$85.37	$18.33	8.2	116	$1.34
477	65	288%	30	SWOFC	10	$12.31	$122.63	$42.47	19.1	116	$1.34
478	65	288%	30	SWOFC	20	$10.23	$101.76	$21.28	9.5	116	$1.34
479	65	288%	35	SWOFC	10	$14.35	$142.49	$48.69	21.9	116	$1.34
480	65	288%	35	SWOFC	20	$11.93	$118.27	$24.30	10.9	116	$1.34

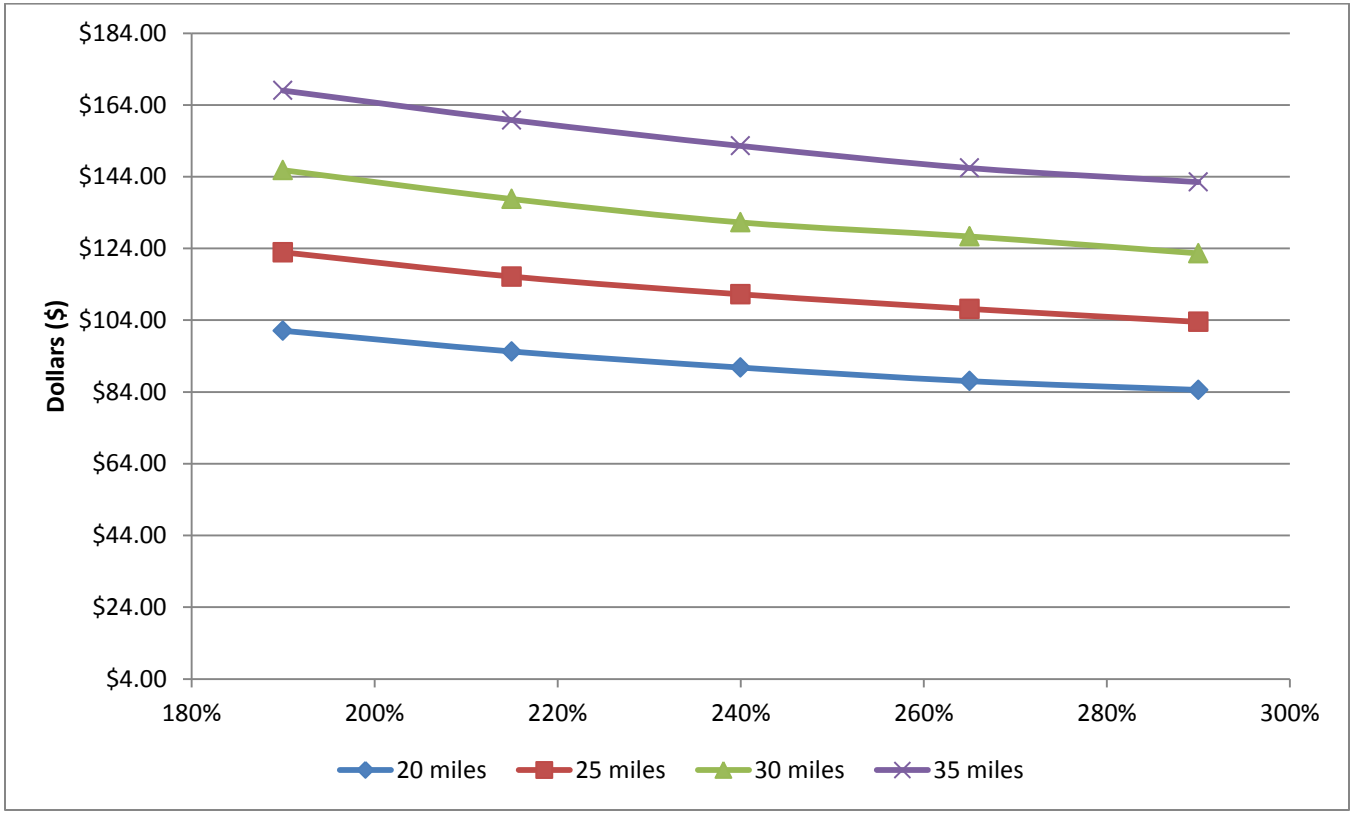

Figure A- 23. Module Truck cost per load v. percent utilization for a 65 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

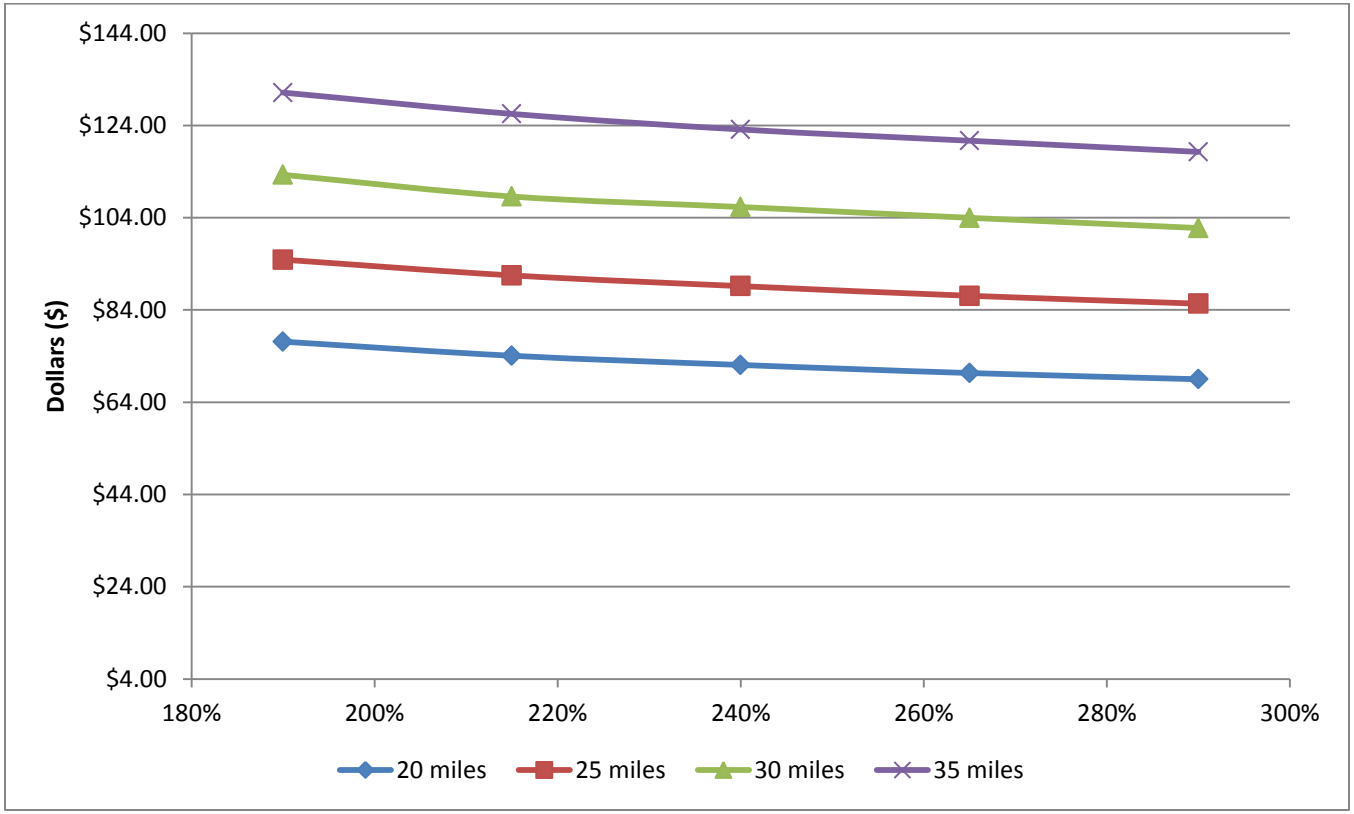

Figure A- 24. Module Truck cost per load v. percent utilization for a 65 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

Semi-Tractor and Trailer Data Tables

15 bph

Table A- 13. Data table for a 15 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
481	15	100%	32.2	Picker	10	11.78	177.31	250.59	1.77	11.53	0.42	40.02
489	15	115%	32.2	Picker	10	10.42	153.79	215.98	1.76	11.49	0.43	46.06
497	15	130%	32.2	Picker	10	9.52	140.54	194.48	1.77	11.59	0.42	52.01
505	15	145%	32.2	Picker	10	8.69	126.36	173.55	1.76	11.45	0.42	58.03
513	15	160%	32.2	Picker	10	9.47	150.57	192.57	1.76	11.46	0.43	64.01
483	15	100%	40.2	Picker	10	12.35	172.62	259.46	1.65	11.54	0.50	39.99
491	15	115%	40.2	Picker	10	11.13	155.51	229.44	1.65	11.45	0.49	46.05
499	15	130%	40.2	Picker	10	10.09	137.74	202.14	1.66	11.56	0.50	52.02
507	15	145%	40.2	Picker	10	9.33	125.12	181.87	1.66	11.52	0.49	57.98
515	15	160%	40.2	Picker	10	10.05	152.13	201.90	1.66	11.53	0.49	64.01
485	15	100%	48.3	Picker	10	13.26	175.75	276.77	1.59	11.48	0.56	40.00
493	15	115%	48.3	Picker	10	11.84	153.33	239.51	1.59	11.42	0.56	46.00
501	15	130%	48.3	Picker	10	10.74	138.47	212.78	1.59	11.52	0.56	52.03
509	15	145%	48.3	Picker	10	9.90	123.87	189.63	1.58	11.50	0.57	57.98
517	15	160%	48.3	Picker	10	10.62	150.30	209.13	1.59	11.50	0.56	64.02
487	15	100%	56.3	Picker	10	14.07	175.25	289.33	1.54	11.47	0.63	40.01
495	15	115%	56.3	Picker	10	12.52	152.55	249.99	1.54	11.54	0.64	46.01
503	15	130%	56.3	Picker	10	11.41	135.86	221.33	1.53	11.42	0.64	52.00
511	15	145%	56.3	Picker	10	10.50	125.33	200.30	1.53	11.48	0.62	58.01
519	15	160%	56.3	Picker	10	11.19	149.93	216.90	1.54	11.53	0.63	64.01
482	15	100%	32.2	Picker	20	10.04	181.66	212.81	1.77	11.51	0.21	39.99
490	15	115%	32.2	Picker	20	8.96	161.56	187.07	1.76	11.59	0.21	45.99
498	15	130%	32.2	Picker	20	8.07	140.43	161.66	1.76	11.58	0.21	52.00
506	15	145%	32.2	Picker	20	7.48	130.15	147.91	1.76	11.52	0.21	57.99
514	15	160%	32.2	Picker	20	8.44	156.43	171.70	1.77	11.55	0.21	63.99
484	15	100%	40.2	Picker	20	10.59	180.19	217.91	1.66	11.55	0.24	40.00
492	15	115%	40.2	Picker	20	9.49	158.81	190.27	1.66	11.50	0.24	45.99
500	15	130%	40.2	Picker	20	8.60	141.70	168.08	1.65	11.45	0.24	52.01
508	15	145%	40.2	Picker	20	8.00	129.28	151.91	1.65	11.48	0.24	57.99
516	15	160%	40.2	Picker	20	8.87	154.10	173.35	1.65	11.47	0.25	64.00
486	15	100%	48.3	Picker	20	11.01	177.00	221.50	1.58	11.46	0.28	40.00
494	15	115%	48.3	Picker	20	10.07	158.37	195.77	1.59	11.52	0.28	45.99
502	15	130%	48.3	Picker	20	9.09	141.85	173.74	1.59	11.55	0.28	51.99
510	15	145%	48.3	Picker	20	8.33	125.08	152.44	1.59	11.54	0.28	57.99
518	15	160%	48.3	Picker	20	9.20	152.97	176.69	1.58	11.49	0.28	64.02
488	15	100%	56.3	Picker	20	11.60	176.71	228.20	1.54	11.47	0.31	40.01
496	15	115%	56.3	Picker	20	10.53	158.41	201.49	1.53	11.47	0.31	45.99
504	15	130%	56.3	Picker	20	9.49	138.83	175.56	1.54	11.54	0.31	51.99
512	15	145%	56.3	Picker	20	8.83	126.07	158.06	1.54	11.49	0.31	57.97
520	15	160%	56.3	Picker	20	9.60	148.68	176.37	1.54	11.49	0.32	64.02

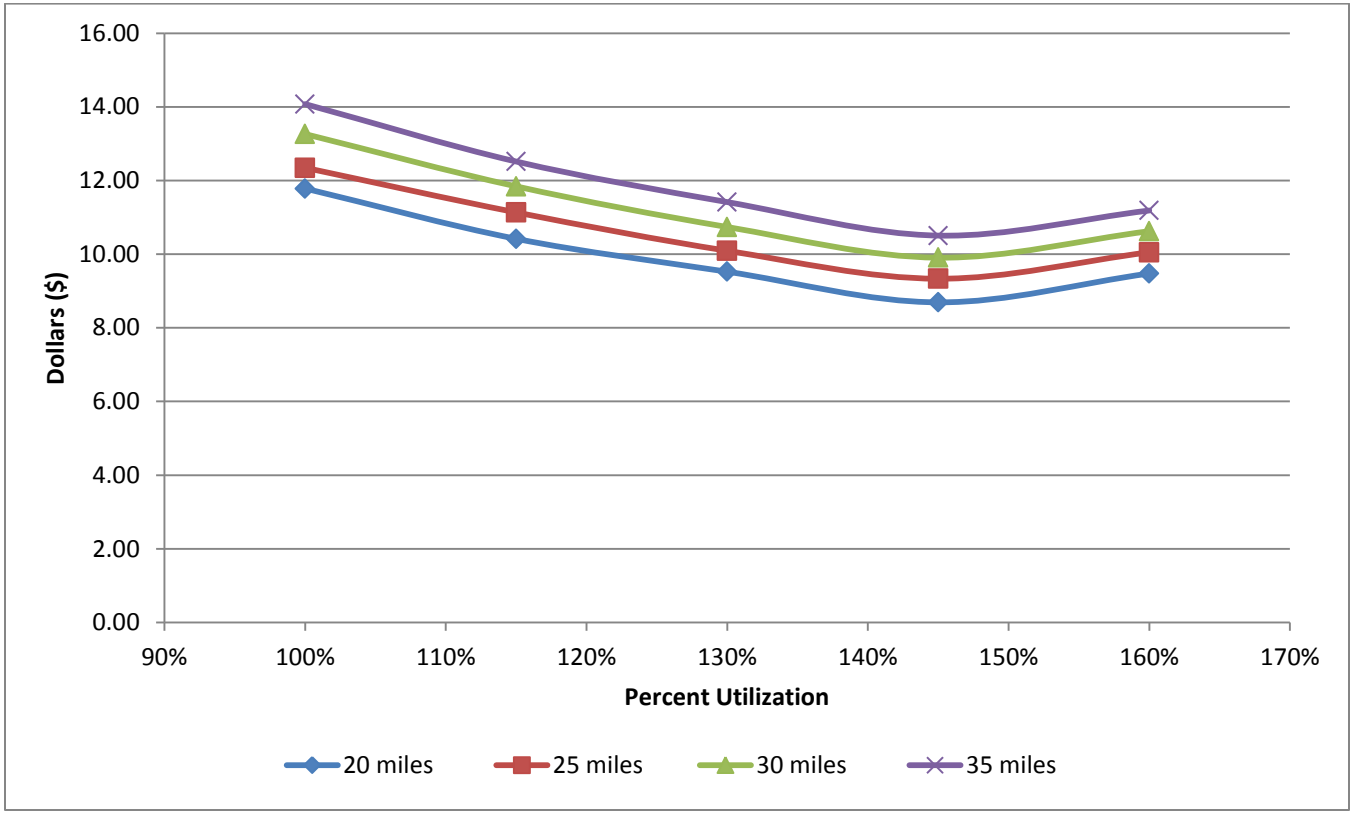

Figure A- 25. Semi-Tractor Trailer cost per load v. percent utilization for a 15 bph gin processing picker harvested cotton transporting for 10 hours per day.

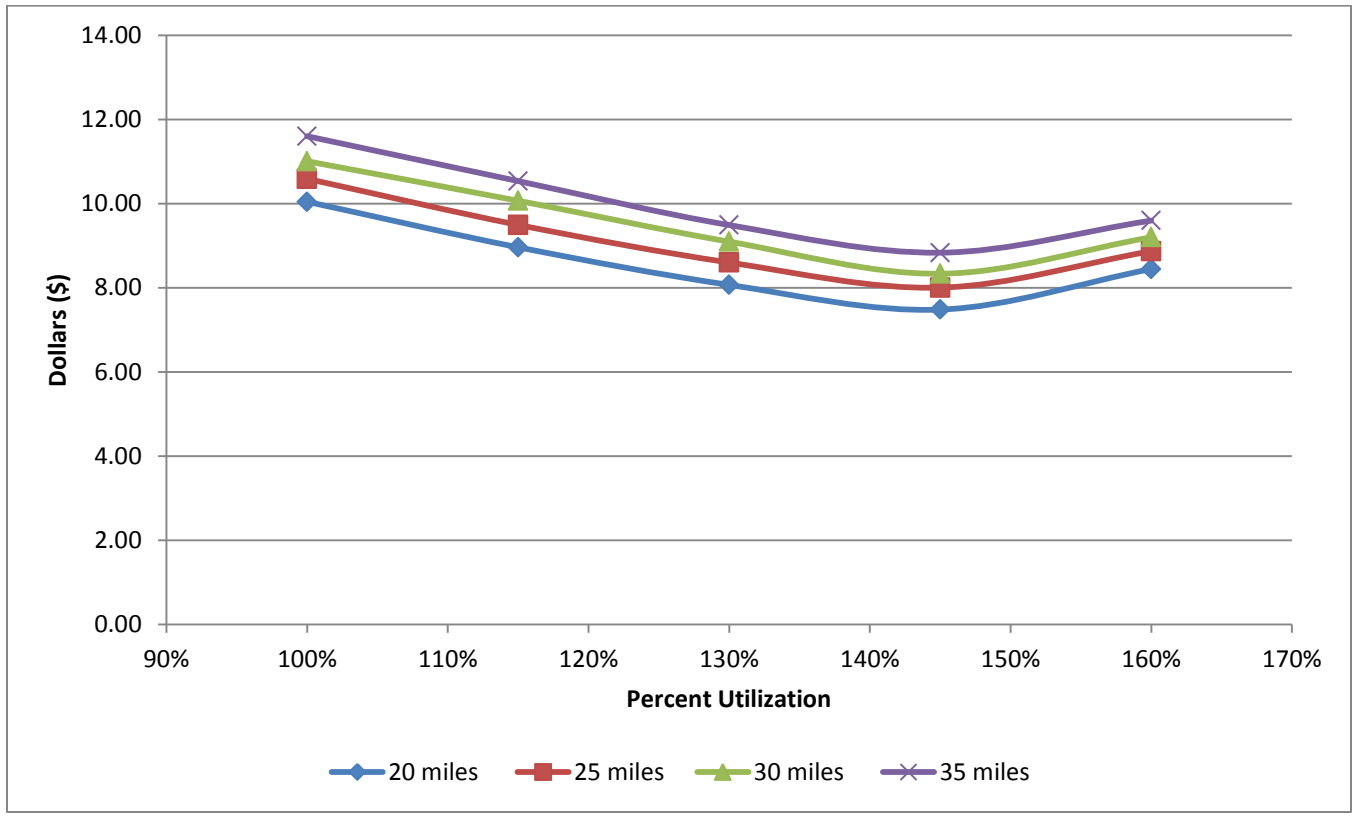

Figure A- 26. Semi-Tractor Trailer cost per load v. percent utilization for a 15 bph gin processing picker harvested cotton transporting for 20 hours per day.

Table A- 14. Data table for a 15 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
521	15	100%	32.2	SWFC	10	6.08	120.70	215.56	1.76	11.53	0.54	40.02
529	15	115%	32.2	SWFC	10	5.52	109.10	187.25	1.76	11.49	0.53	46.06
537	15	130%	32.2	SWFC	10	5.08	100.94	164.75	1.75	11.48	0.54	52.01
545	15	145%	32.2	SWFC	10	4.71	93.59	148.59	1.76	11.44	0.53	58.03
553	15	160%	32.2	SWFC	10	4.45	88.55	163.57	1.76	11.53	0.53	64.01
523	15	100%	40.2	SWFC	10	7.04	139.97	228.47	1.66	11.45	0.62	39.99
531	15	115%	40.2	SWFC	10	6.43	127.61	198.95	1.66	11.51	0.62	46.05
539	15	130%	40.2	SWFC	10	5.95	117.79	174.72	1.66	11.48	0.63	52.02
547	15	145%	40.2	SWFC	10	5.51	109.25	158.61	1.66	11.49	0.61	57.98
555	15	160%	40.2	SWFC	10	5.20	103.15	172.07	1.66	11.43	0.62	64.01
525	15	100%	48.3	SWFC	10	8.05	159.58	241.46	1.59	11.49	0.70	40.00
533	15	115%	48.3	SWFC	10	7.31	145.06	211.68	1.59	11.51	0.70	46.00
541	15	130%	48.3	SWFC	10	6.76	134.51	188.33	1.59	11.52	0.70	52.02
549	15	145%	48.3	SWFC	10	6.30	125.41	168.22	1.59	11.51	0.70	57.98
557	15	160%	48.3	SWFC	10	5.91	117.78	179.48	1.59	11.50	0.71	64.03
527	15	100%	56.3	SWFC	10	8.95	178.86	254.81	1.53	11.39	0.79	40.01
535	15	115%	56.3	SWFC	10	8.23	163.13	222.01	1.53	11.55	0.79	46.01
543	15	130%	56.3	SWFC	10	7.57	150.06	194.51	1.54	11.48	0.80	52.00
551	15	145%	56.3	SWFC	10	7.07	140.74	176.08	1.54	11.50	0.80	58.02
559	15	160%	56.3	SWFC	10	6.63	132.18	187.31	1.54	11.52	0.79	64.01
522	15	100%	32.2	SWFC	20	3.91	77.73	174.89	1.76	11.45	0.27	39.99
530	15	115%	32.2	SWFC	20	3.65	72.21	152.34	1.76	11.53	0.27	45.99
538	15	130%	32.2	SWFC	20	3.41	68.00	135.14	1.77	11.53	0.27	52.00
546	15	145%	32.2	SWFC	20	3.23	64.26	119.68	1.75	11.47	0.27	57.99
554	15	160%	32.2	SWFC	20	3.10	61.70	140.09	1.75	11.50	0.26	63.99
524	15	100%	40.2	SWFC	20	4.57	90.74	180.97	1.66	11.52	0.31	40.00
532	15	115%	40.2	SWFC	20	4.22	83.94	157.97	1.66	11.40	0.31	45.99
540	15	130%	40.2	SWFC	20	3.97	79.15	138.17	1.65	11.51	0.31	52.01
548	15	145%	40.2	SWFC	20	3.80	75.44	123.80	1.65	11.46	0.31	57.98
556	15	160%	40.2	SWFC	20	3.64	72.08	141.45	1.65	11.51	0.31	64.00
526	15	100%	48.3	SWFC	20	5.21	103.65	187.82	1.58	11.51	0.36	40.00
534	15	115%	48.3	SWFC	20	4.83	95.97	162.00	1.58	11.48	0.35	45.99
542	15	130%	48.3	SWFC	20	4.59	90.98	142.43	1.59	11.52	0.36	51.99
550	15	145%	48.3	SWFC	20	4.35	86.50	130.18	1.59	11.51	0.35	57.99
558	15	160%	48.3	SWFC	20	4.13	82.45	145.63	1.58	11.44	0.35	64.02
528	15	100%	56.3	SWFC	20	5.85	116.25	192.01	1.53	11.47	0.40	40.01
536	15	115%	56.3	SWFC	20	5.46	108.33	171.07	1.54	11.53	0.39	45.99
544	15	130%	56.3	SWFC	20	5.15	102.47	146.92	1.54	11.60	0.40	51.99
552	15	145%	56.3	SWFC	20	4.89	97.18	134.39	1.54	11.54	0.39	57.97
560	15	160%	56.3	SWFC	20	4.67	92.68	147.81	1.54	11.49	0.40	64.02

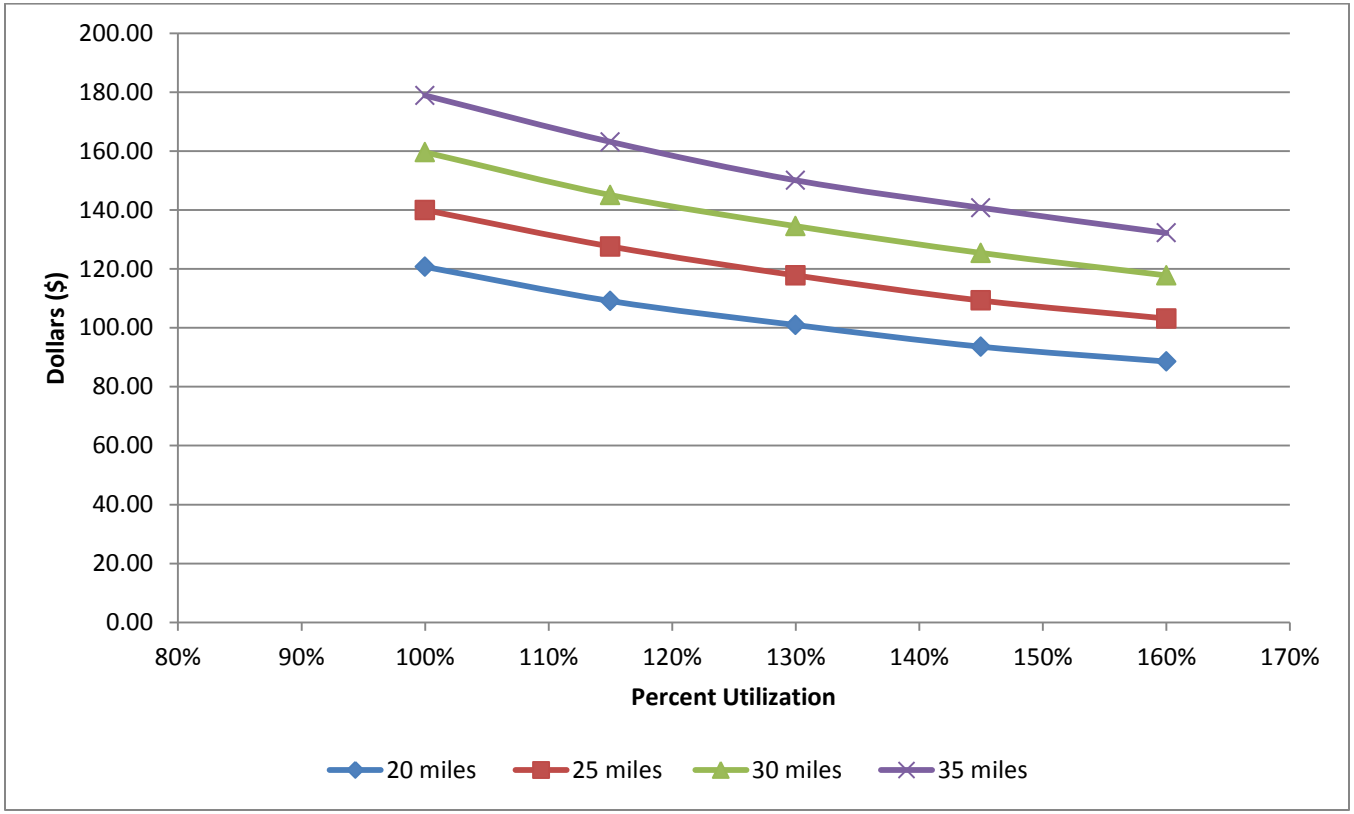

Figure A- 27. Semi-Tractor Trailer cost per load v. percent utilization for a 15 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

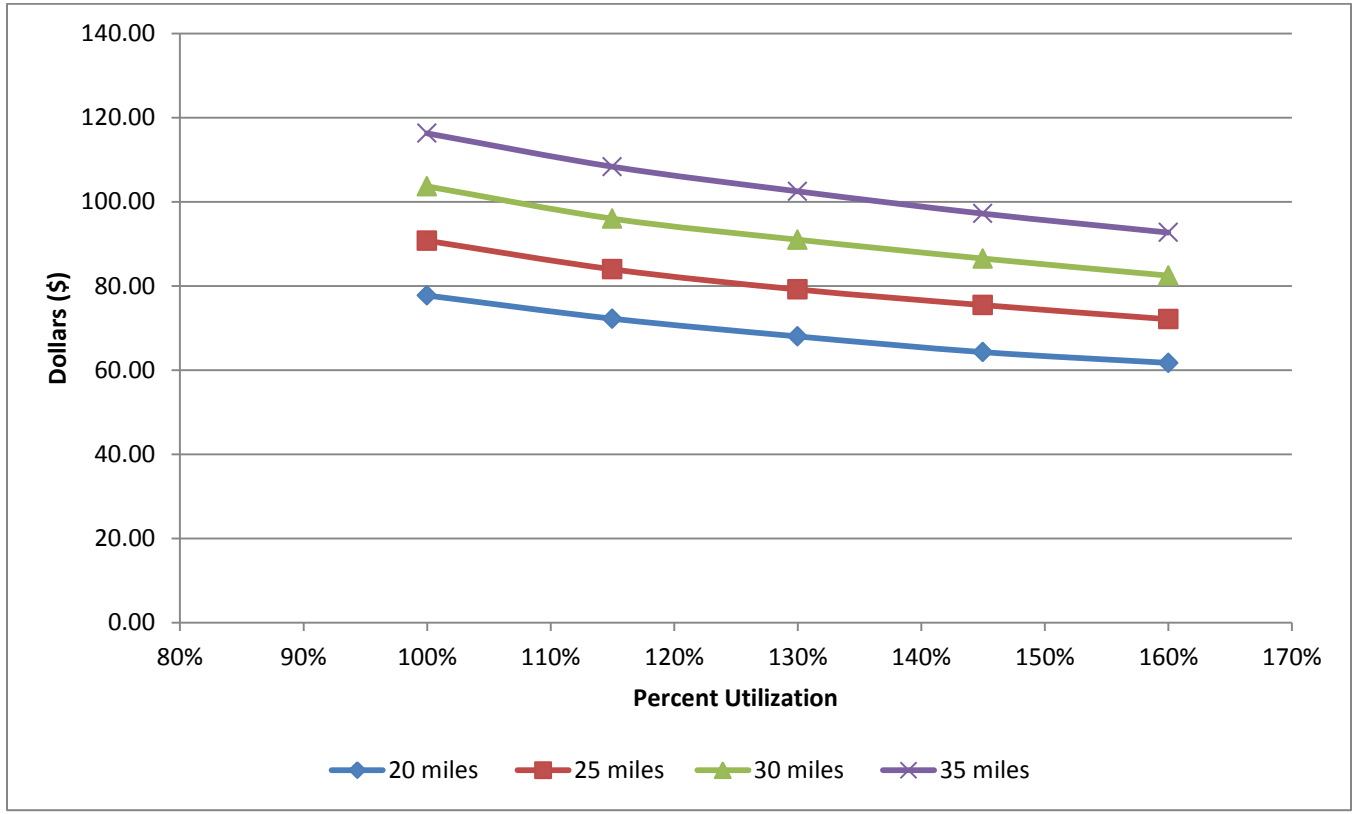

Figure A- 28.Semi-Tractor Trailer cost per load v. percent utilization for a 15 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

Table A- 15. Data table for a 15 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
561	15	100%	20	SWOFC	10	14.78	236.11	189.18	1.77	11.55	0.67	40.02
562	15	100%	20	SWOFC	20	12.10	195.07	148.55	1.75	11.47	0.33	39.99
563	15	100%	25	SWOFC	10	15.99	254.05	201.12	1.66	11.54	0.79	39.99
564	15	100%	25	SWOFC	20	12.98	207.56	154.68	1.65	11.52	0.39	40.00
565	15	100%	30	SWOFC	10	17.25	273.42	214.19	1.59	11.53	0.91	40.00
566	15	100%	30	SWOFC	20	13.73	219.33	160.37	1.58	11.43	0.44	40.00
567	15	100%	35	SWOFC	10	18.50	293.97	228.51	1.54	11.54	0.99	40.01
568	15	100%	35	SWOFC	20	14.62	233.31	168.16	1.53	11.43	0.49	40.01
569	15	115%	20	SWOFC	10	13.19	210.02	163.47	1.76	11.45	0.68	46.06
570	15	115%	20	SWOFC	20	10.88	173.68	127.36	1.75	11.42	0.34	45.99
571	15	115%	25	SWOFC	10	14.38	228.48	175.26	1.67	11.56	0.79	46.05
572	15	115%	25	SWOFC	20	11.61	186.01	133.17	1.66	11.47	0.39	45.99
573	15	115%	30	SWOFC	10	15.47	244.68	185.48	1.59	11.47	0.90	46.00
574	15	115%	30	SWOFC	20	12.46	199.63	140.41	1.59	11.52	0.44	45.99
575	15	115%	35	SWOFC	10	16.73	264.16	198.70	1.54	11.51	0.99	46.01
576	15	115%	35	SWOFC	20	13.29	210.66	145.50	1.53	11.47	0.50	45.99
577	15	130%	20	SWOFC	10	12.06	190.98	144.39	1.76	11.44	0.68	52.01
578	15	130%	20	SWOFC	20	9.97	159.15	112.50	1.76	11.44	0.34	52.00
579	15	130%	25	SWOFC	10	13.09	208.45	155.77	1.65	11.51	0.77	52.02
580	15	130%	25	SWOFC	20	10.71	169.98	117.11	1.66	11.47	0.39	52.01
581	15	130%	30	SWOFC	10	14.14	224.89	165.55	1.59	11.53	0.89	52.03
582	15	130%	30	SWOFC	20	11.50	184.03	124.75	1.59	11.51	0.44	51.99
583	15	130%	35	SWOFC	10	15.13	241.47	176.26	1.53	11.52	0.99	52.01
584	15	130%	35	SWOFC	20	12.16	192.71	127.23	1.54	11.53	0.50	51.99
585	15	145%	20	SWOFC	10	11.12	177.09	130.23	1.77	11.54	0.68	58.03
586	15	145%	20	SWOFC	20	9.33	148.26	101.28	1.77	11.60	0.34	57.99
587	15	145%	25	SWOFC	10	12.15	192.37	139.57	1.65	11.47	0.78	57.98
588	15	145%	25	SWOFC	20	9.92	158.56	105.64	1.66	11.51	0.39	57.99
589	15	145%	30	SWOFC	10	13.06	207.77	148.79	1.58	11.48	0.88	57.98
590	15	145%	30	SWOFC	20	10.57	169.00	109.93	1.59	11.47	0.44	57.99
591	15	145%	35	SWOFC	10	13.92	221.14	155.93	1.54	11.47	1.01	58.02
592	15	145%	35	SWOFC	20	11.34	180.90	115.55	1.54	11.47	0.49	57.97
593	15	160%	20	SWOFC	10	11.87	187.80	141.14	1.76	11.48	0.67	64.00
594	15	160%	20	SWOFC	20	10.12	161.56	114.82	1.76	11.58	0.34	63.99
595	15	160%	25	SWOFC	10	12.72	202.55	149.65	1.65	11.54	0.78	64.01
596	15	160%	25	SWOFC	20	10.77	171.96	119.35	1.65	11.34	0.39	64.00
597	15	160%	30	SWOFC	10	13.56	215.85	156.62	1.59	11.50	0.90	64.03
598	15	160%	30	SWOFC	20	11.38	180.56	121.45	1.59	11.53	0.45	64.02
599	15	160%	35	SWOFC	10	14.67	232.48	167.25	1.54	11.49	0.98	64.01
600	15	160%	35	SWOFC	20	12.10	193.26	127.68	1.54	11.55	0.50	64.02

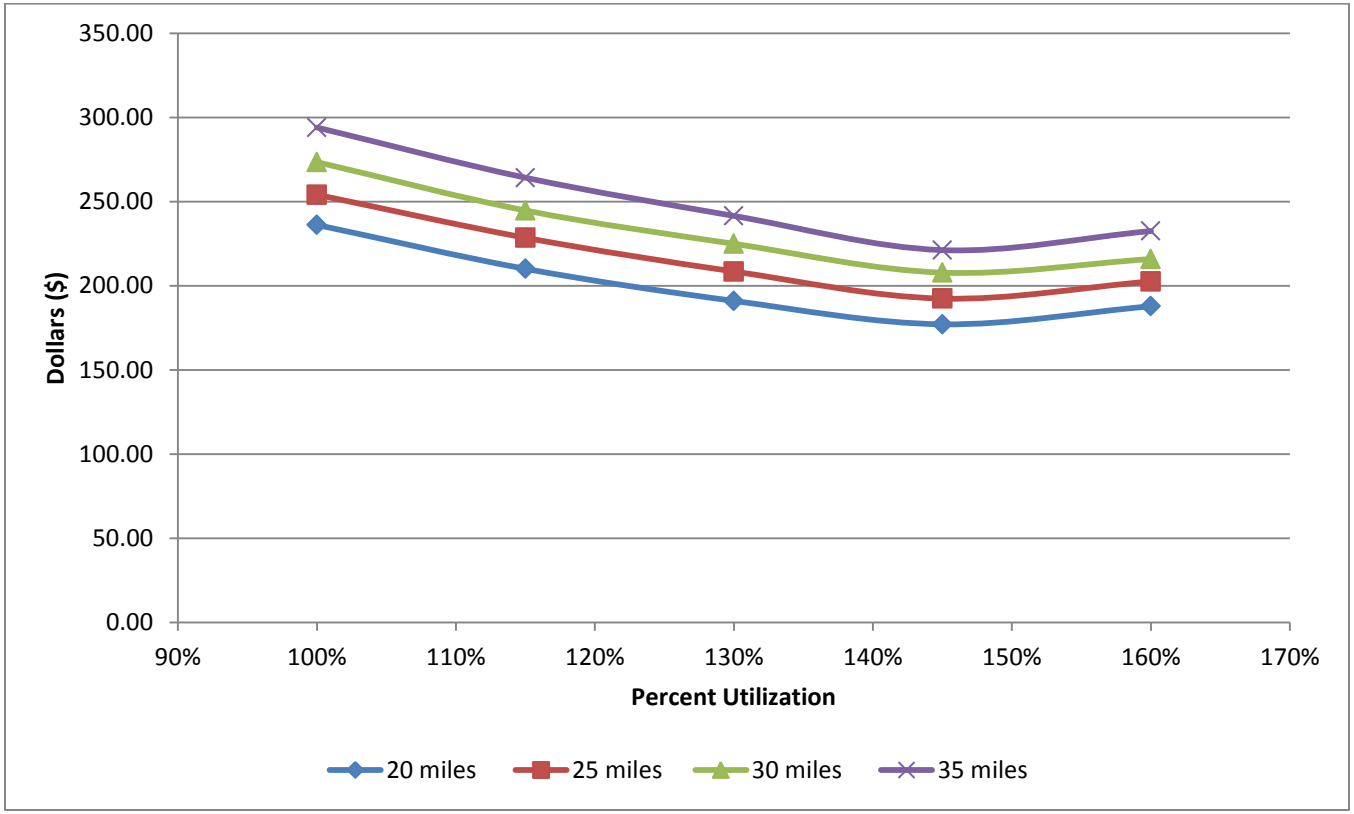

Figure A- 29. Semi-Tractor Trailer cost per load v. percent utilization for a 15 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

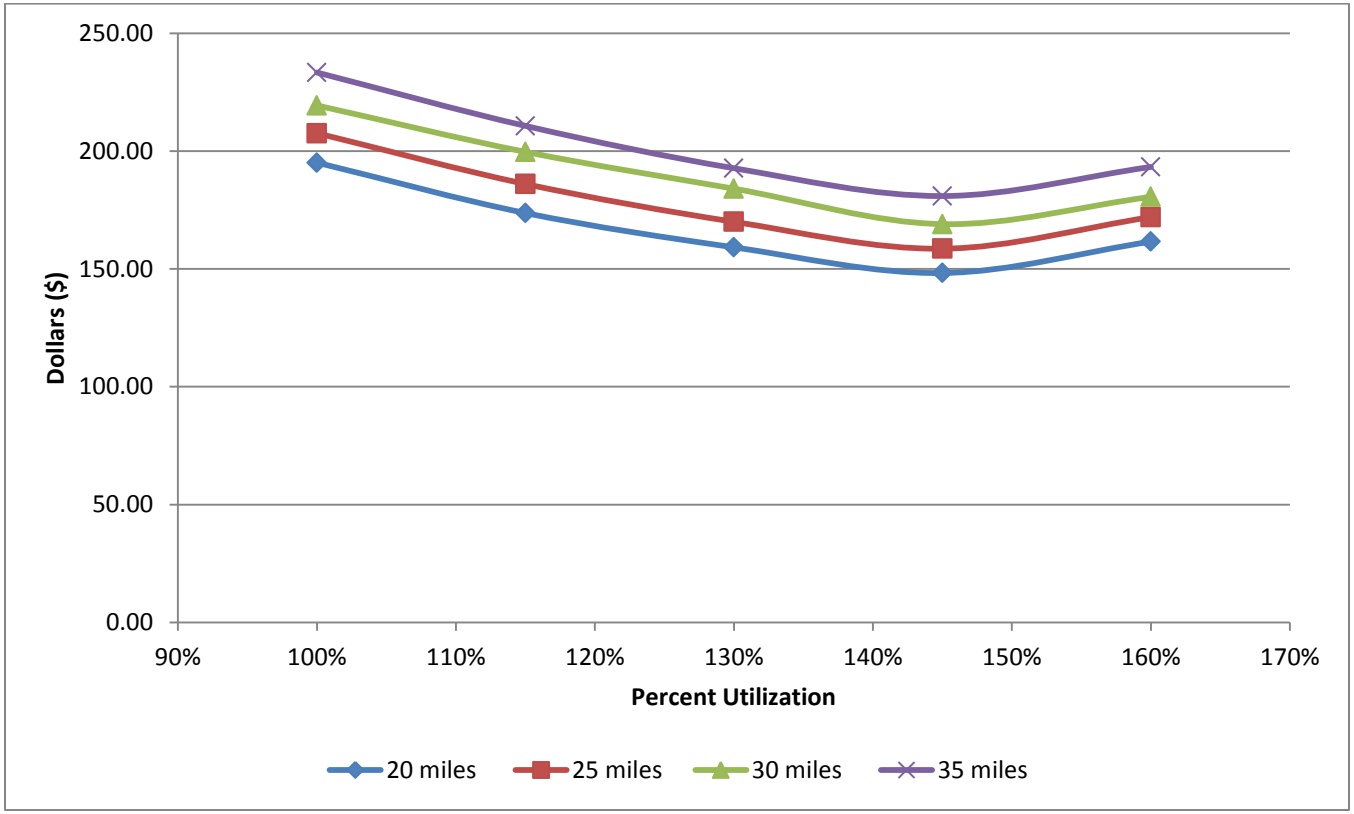

Figure A- 30. Semi-Tractor Trailer cost per load v. percent utilization for a 15 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

25 bph

Table A- 16. Data table for a 25 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
601	25	220%	20	Picker	10	5.74	144.82	108.63	62.69	1.24	11.40	1.00
602	25	220%	20	Picker	20	5.15	129.64	93.27	31.87	1.24	11.52	1.00
603	25	220%	25	Picker	10	6.18	157.94	115.56	69.44	1.24	11.43	1.00
604	25	220%	25	Picker	20	5.52	139.29	96.73	36.76	1.24	11.48	1.00
605	25	220%	30	Picker	10	6.61	169.37	120.65	76.36	1.24	11.49	1.03
606	25	220%	30	Picker	20	5.86	147.30	98.54	42.19	1.24	11.54	1.00
607	25	220%	35	Picker	10	6.97	179.71	124.94	80.93	1.24	11.49	1.09
608	25	220%	35	Picker	20	6.20	156.51	101.36	46.82	1.25	11.52	1.00
609	25	250%	20	Picker	10	5.40	136.42	100.09	70.71	1.24	11.49	1.00
610	25	250%	20	Picker	20	4.84	121.58	85.16	35.63	1.24	11.55	1.00
611	25	250%	25	Picker	10	5.86	149.86	107.43	78.42	1.24	11.45	1.01
612	25	250%	25	Picker	20	5.15	130.34	87.77	41.11	1.24	11.47	1.00
613	25	250%	30	Picker	10	6.34	162.25	113.73	84.85	1.24	11.44	1.03
614	25	250%	30	Picker	20	5.55	139.32	90.63	46.81	1.24	11.55	1.00
615	25	250%	35	Picker	10	6.79	175.69	120.69	89.70	1.24	11.47	1.10
616	25	250%	35	Picker	20	5.88	148.10	93.33	52.47	1.24	11.49	1.00
617	25	280%	20	Picker	10	5.13	129.49	93.38	77.59	1.24	11.41	1.00
618	25	280%	20	Picker	20	4.54	114.22	77.92	39.99	1.24	11.50	1.00
619	25	280%	25	Picker	10	5.57	142.31	99.76	86.95	1.24	11.49	1.00
620	25	280%	25	Picker	20	4.86	122.73	80.15	46.55	1.24	11.48	1.00
621	25	280%	30	Picker	10	5.95	153.26	104.72	95.24	1.24	11.46	1.03
622	25	280%	30	Picker	20	5.26	132.54	83.86	51.73	1.24	11.48	1.00
623	25	280%	35	Picker	10	6.41	165.30	110.49	101.23	1.24	11.45	1.08
624	25	280%	35	Picker	20	5.59	140.55	85.77	59.06	1.24	11.50	1.00
625	25	310%	20	Picker	10	4.87	123.48	87.27	87.03	1.24	11.43	1.00
626	25	310%	20	Picker	20	4.29	107.90	71.61	44.29	1.24	11.51	1.00
627	25	310%	25	Picker	10	5.29	135.14	92.78	98.33	1.24	11.43	1.01
628	25	310%	25	Picker	20	4.64	117.24	74.65	50.89	1.24	11.49	1.00
629	25	310%	30	Picker	10	5.82	149.79	101.12	104.37	1.24	11.42	1.03
630	25	310%	30	Picker	20	5.03	126.70	77.96	57.38	1.24	11.49	1.00
631	25	310%	35	Picker	10	6.26	161.80	106.85	110.68	1.24	11.53	1.09
632	25	310%	35	Picker	20	5.31	133.97	79.24	64.52	1.24	11.32	1.00
633	25	335%	20	Picker	10	4.77	120.42	84.17	92.46	1.24	11.54	1.00
634	25	335%	20	Picker	20	4.13	103.63	67.21	48.19	1.24	11.58	1.00
635	25	335%	25	Picker	10	5.16	131.52	89.06	104.94	1.24	11.46	1.00
636	25	335%	25	Picker	20	4.52	113.78	71.26	55.01	1.24	11.56	1.00
637	25	335%	30	Picker	10	5.58	143.26	94.67	114.22	1.24	11.46	1.04
638	25	335%	30	Picker	20	4.83	121.82	73.00	62.31	1.25	11.39	1.00
639	25	335%	35	Picker	10	6.05	155.84	100.85	119.55	1.24	11.48	1.09
640	25	335%	35	Picker	20	5.11	128.41	73.68	71.19	1.24	11.49	1.00

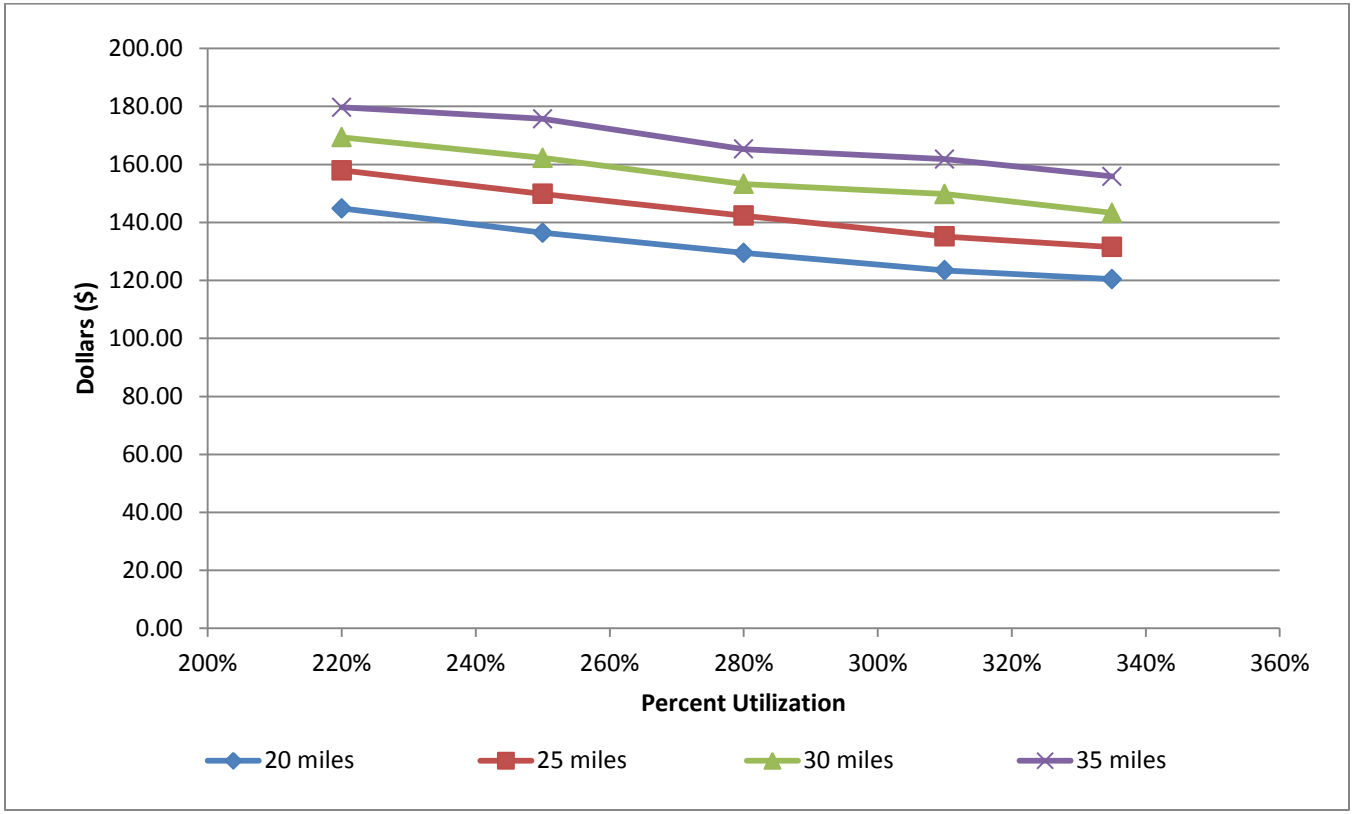

Figure A- 31. Semi-Tractor Trailer cost per load v. percent utilization for a 25 bph gin processing Picker harvested cotton transporting for 10 hours per day.

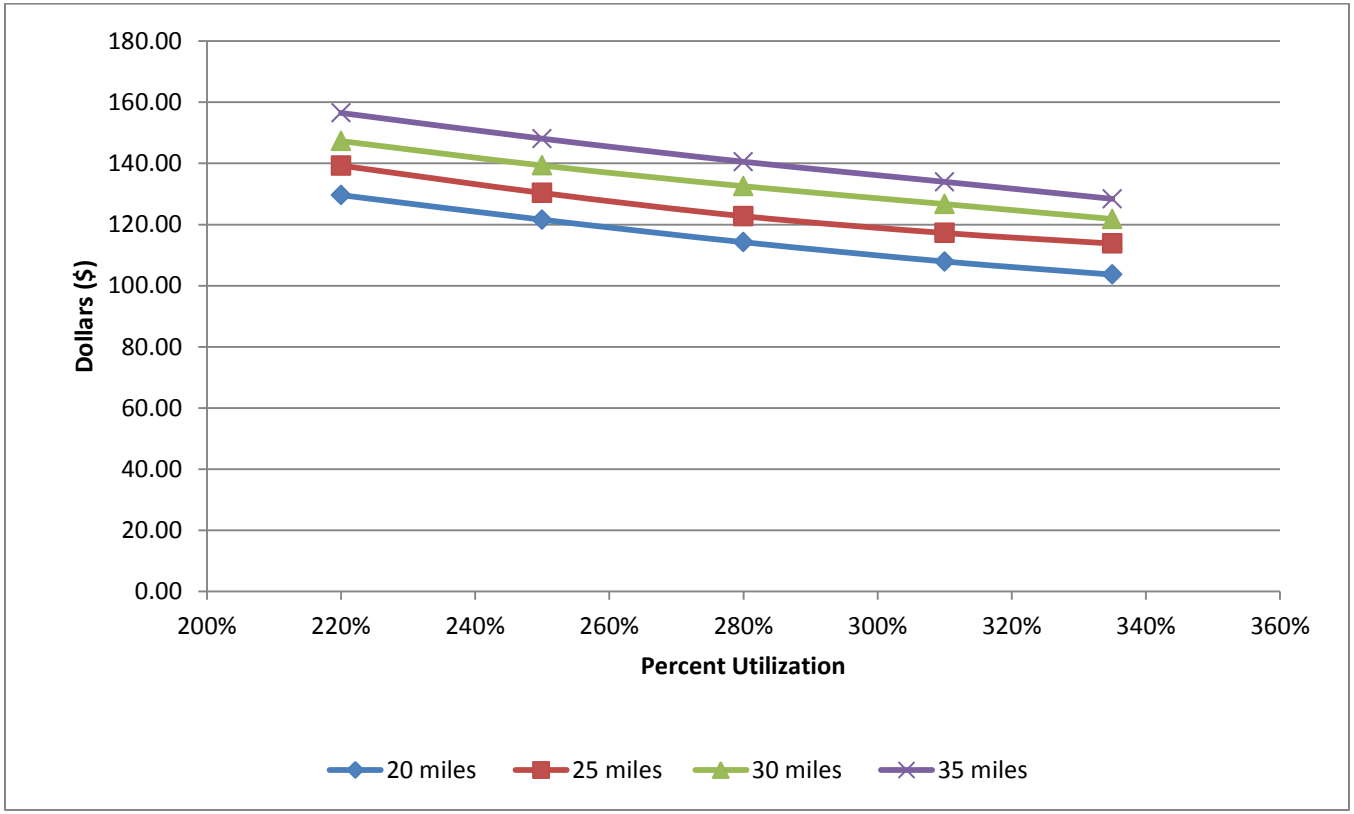

Figure A- 32. Semi-Tractor Trailer cost per load v. percent utilization for a 25 bph gin processing Picker harvested cotton transporting for 20 hours per day.

Table A- 17. Data table for a 25 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
641	25	220%	20	SWFC	10	6.42	130.42	94.10	72.94	1.24	11.51	1.02
642	25	220%	20	SWFC	20	5.78	114.98	78.70	39.42	1.24	11.46	1.00
643	25	220%	25	SWFC	10	6.98	142.59	100.11	78.82	1.24	11.49	1.08
644	25	220%	25	SWFC	20	6.23	124.30	81.81	45.13	1.24	11.45	1.00
645	25	220%	30	SWFC	10	7.51	153.38	104.69	82.91	1.24	11.56	1.19
646	25	220%	30	SWFC	20	6.62	132.56	83.90	51.14	1.24	11.46	1.00
647	25	220%	35	SWFC	10	8.07	165.61	110.80	85.14	1.24	11.50	1.30
648	25	220%	35	SWFC	20	7.07	141.20	86.29	57.47	1.24	11.43	1.00
649	25	250%	20	SWFC	10	6.14	124.38	88.10	83.34	1.24	11.53	1.03
650	25	250%	20	SWFC	20	5.37	107.31	71.11	44.56	1.24	11.39	1.00
651	25	250%	25	SWFC	10	6.72	137.84	95.47	89.75	1.23	11.54	1.07
652	25	250%	25	SWFC	20	5.84	115.76	73.12	51.91	1.24	11.57	1.00
653	25	250%	30	SWFC	10	7.31	150.60	101.82	94.39	1.24	11.50	1.18
654	25	250%	30	SWFC	20	6.28	125.50	76.75	57.94	1.24	11.47	1.00
655	25	250%	35	SWFC	10	7.91	161.98	107.10	96.85	1.24	11.46	1.30
656	25	250%	35	SWFC	20	6.66	132.79	78.29	65.02	1.23	11.39	1.00
657	25	280%	20	SWFC	10	5.79	117.61	81.27	92.98	1.24	11.45	1.02
658	25	280%	20	SWFC	20	5.11	102.48	66.03	49.47	1.24	11.55	1.00
659	25	280%	25	SWFC	10	6.35	128.80	86.29	100.54	1.24	11.50	1.10
660	25	280%	25	SWFC	20	5.52	110.33	67.96	57.53	1.24	11.44	1.00
661	25	280%	30	SWFC	10	6.89	140.79	92.29	104.68	1.23	11.47	1.19
662	25	280%	30	SWFC	20	5.99	119.23	70.52	65.06	1.24	11.50	1.00
663	25	280%	35	SWFC	10	7.35	151.07	96.13	108.86	1.24	11.50	1.32
664	25	280%	35	SWFC	20	6.32	126.09	71.27	74.46	1.24	11.52	1.00
665	25	310%	20	SWFC	10	5.59	113.36	77.14	104.12	1.24	11.49	1.02
666	25	310%	20	SWFC	20	4.87	97.00	60.68	55.03	1.24	11.52	1.00
667	25	310%	25	SWFC	10	6.21	126.94	84.38	110.52	1.24	11.54	1.09
668	25	310%	25	SWFC	20	5.29	105.19	62.61	64.43	1.24	11.49	1.00
669	25	310%	30	SWFC	10	6.78	139.10	90.23	116.45	1.25	11.47	1.19
670	25	310%	30	SWFC	20	5.70	113.76	65.20	72.72	1.24	11.48	1.00
671	25	310%	35	SWFC	10	7.28	149.81	94.92	119.89	1.24	11.53	1.32
672	25	310%	35	SWFC	20	6.12	122.21	67.41	81.95	1.24	11.48	1.00
673	25	335%	20	SWFC	10	5.38	109.01	72.70	112.41	1.24	11.47	1.02
674	25	335%	20	SWFC	20	4.66	92.89	56.56	60.18	1.24	11.52	1.00
675	25	335%	25	SWFC	10	5.92	121.00	78.46	122.43	1.24	11.55	1.08
676	25	335%	25	SWFC	20	5.05	100.68	58.23	70.86	1.24	11.47	1.00
677	25	335%	30	SWFC	10	6.43	132.35	83.59	128.43	1.24	11.50	1.17
678	25	335%	30	SWFC	20	5.50	109.35	60.53	81.18	1.24	11.55	1.00
679	25	335%	35	SWFC	10	6.94	142.90	88.19	131.03	1.24	11.35	1.28
680	25	335%	35	SWFC	20	5.93	118.27	63.33	88.91	1.24	11.39	1.00

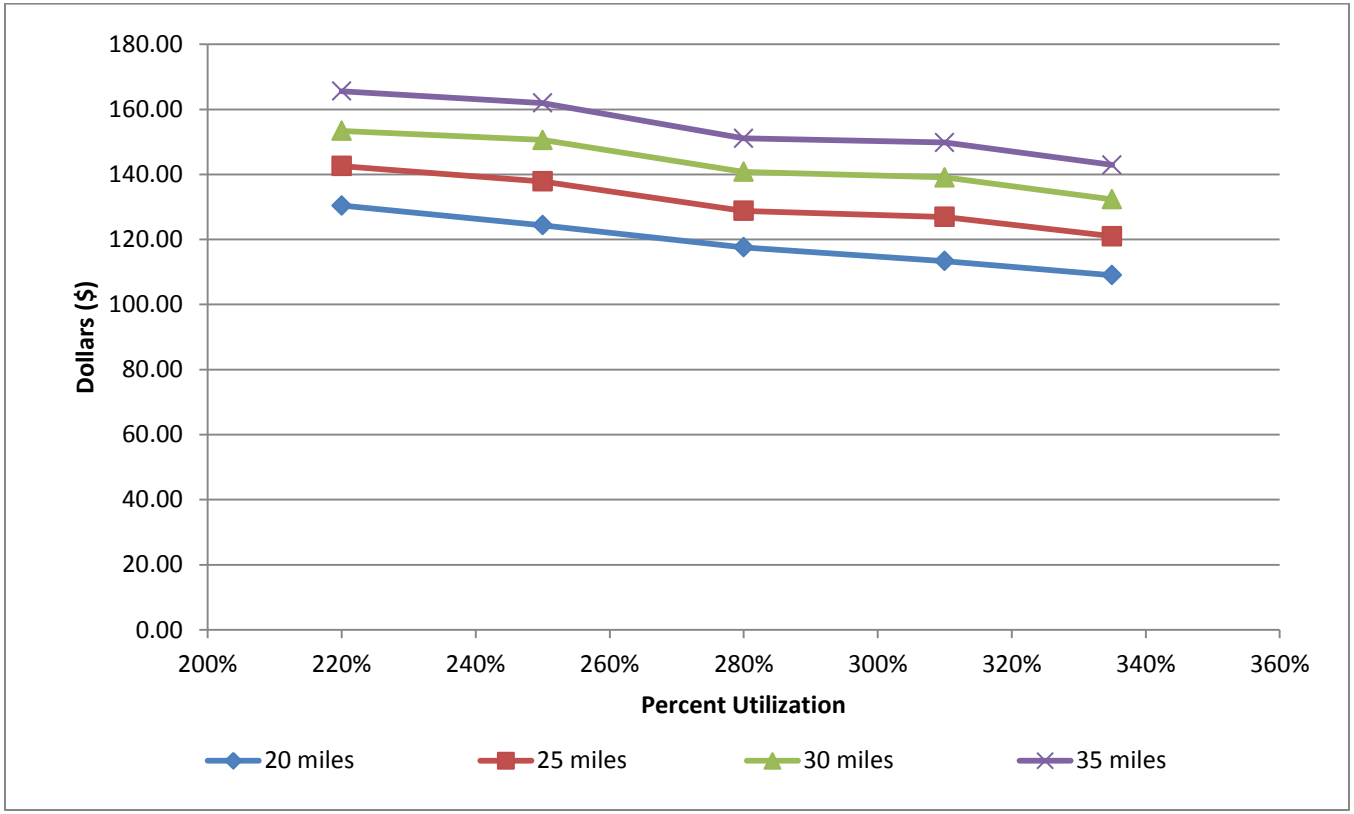

Figure A- 33. Semi-Tractor Trailer cost per load v. percent utilization for a 25 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

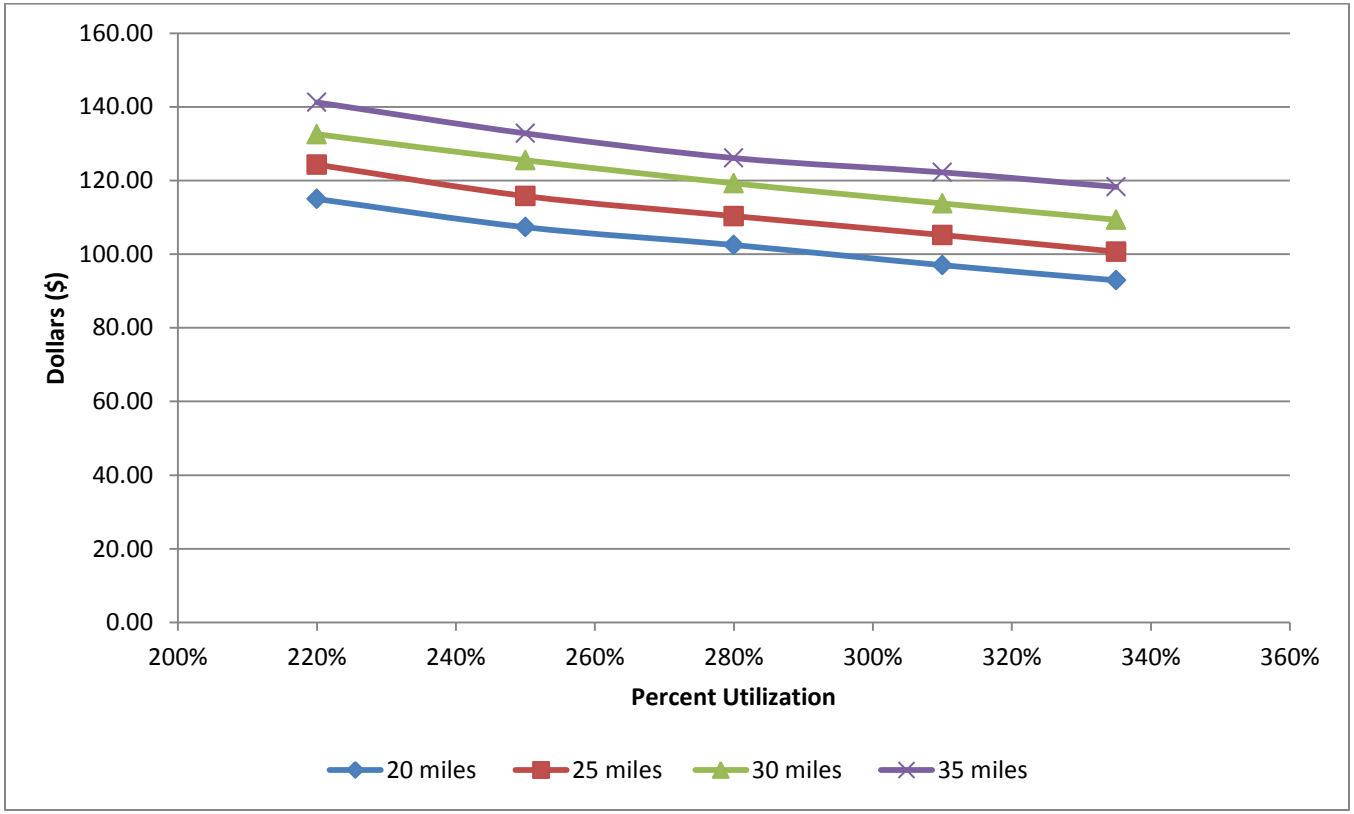

Figure A- 34. Semi-Tractor Trailer cost per load v. percent utilization for a 25 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

Table A- 18. Data table for a 25 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
681	25	220%	20	SWOFC	10	7.53	119.59	76.73	88.04	1.76	7.73	1.13
689	25	250%	20	SWOFC	10	7.52	119.83	76.93	100.01	1.76	7.73	1.11
697	25	280%	20	SWOFC	10	7.06	112.16	69.19	112.02	1.76	7.75	1.10
705	25	310%	20	SWOFC	10	7.04	111.49	68.52	124.02	1.76	7.76	1.14
713	25	340%	20	SWOFC	10	6.65	105.77	62.81	136.00	1.76	7.76	1.12
683	25	220%	25	SWOFC	10	8.33	132.62	83.44	88.02	1.66	7.75	1.28
691	25	250%	25	SWOFC	10	8.24	131.03	81.93	100.00	1.65	7.75	1.31
699	25	280%	25	SWOFC	10	7.71	122.16	73.01	111.98	1.66	7.75	1.31
707	25	310%	25	SWOFC	10	7.77	122.92	73.73	124.00	1.66	7.76	1.30
715	25	340%	25	SWOFC	10	7.27	115.31	66.04	136.03	1.66	7.78	1.32
685	25	220%	30	SWOFC	10	9.10	144.92	89.66	88.00	1.58	7.71	1.47
693	25	250%	30	SWOFC	10	8.97	143.53	88.08	100.00	1.59	7.80	1.47
701	25	280%	30	SWOFC	10	8.45	133.55	78.24	111.96	1.59	7.75	1.47
709	25	310%	30	SWOFC	10	8.36	132.79	77.59	124.00	1.58	7.71	1.47
717	25	340%	30	SWOFC	10	7.90	125.67	70.49	136.03	1.58	7.74	1.48
687	25	220%	35	SWOFC	10	9.90	157.46	95.84	88.03	1.54	7.79	1.65
695	25	250%	35	SWOFC	10	9.77	154.83	93.44	100.04	1.53	7.77	1.64
703	25	280%	35	SWOFC	10	9.10	144.41	82.94	112.00	1.53	7.75	1.63
711	25	310%	35	SWOFC	10	9.02	143.15	81.67	124.01	1.54	7.70	1.66
719	25	340%	35	SWOFC	10	8.62	136.62	75.02	136.00	1.54	7.74	1.67
682	25	220%	20	SWOFC	20	6.35	101.08	58.15	87.99	1.76	7.77	0.56
690	25	250%	20	SWOFC	20	6.44	102.76	59.72	99.99	1.76	7.76	0.56
698	25	280%	20	SWOFC	20	6.04	95.99	52.92	111.99	1.77	7.75	0.56
706	25	310%	20	SWOFC	20	6.20	98.79	55.79	123.99	1.76	7.76	0.56
714	25	340%	20	SWOFC	20	5.85	93.42	50.52	135.99	1.76	7.76	0.56
684	25	220%	25	SWOFC	20	6.93	110.23	60.98	87.99	1.66	7.73	0.65
692	25	250%	25	SWOFC	20	7.03	111.41	62.18	99.99	1.66	7.78	0.65
700	25	280%	25	SWOFC	20	6.56	104.73	55.56	112.00	1.66	7.77	0.65
708	25	310%	25	SWOFC	20	6.71	107.26	58.19	124.01	1.65	7.73	0.64
716	25	340%	25	SWOFC	20	6.44	102.40	53.25	136.00	1.66	7.78	0.64
686	25	220%	30	SWOFC	20	7.49	119.11	63.64	87.99	1.59	7.77	0.74
694	25	250%	30	SWOFC	20	7.59	120.46	65.04	99.99	1.59	7.73	0.74
702	25	280%	30	SWOFC	20	7.18	114.30	59.06	112.00	1.58	7.77	0.73
710	25	310%	30	SWOFC	20	7.24	115.48	59.82	123.99	1.60	7.79	0.74
718	25	340%	30	SWOFC	20	6.89	109.54	54.22	136.00	1.59	7.69	0.73
688	25	220%	35	SWOFC	20	8.09	128.22	66.66	87.99	1.54	7.73	0.84
696	25	250%	35	SWOFC	20	8.15	129.72	68.17	100.00	1.54	7.71	0.82
704	25	280%	35	SWOFC	20	7.66	121.83	60.31	112.00	1.54	7.71	0.84
712	25	310%	35	SWOFC	20	7.75	123.57	62.04	123.98	1.54	7.76	0.83
720	25	340%	35	SWOFC	20	7.44	118.10	56.51	135.99	1.54	7.80	0.83

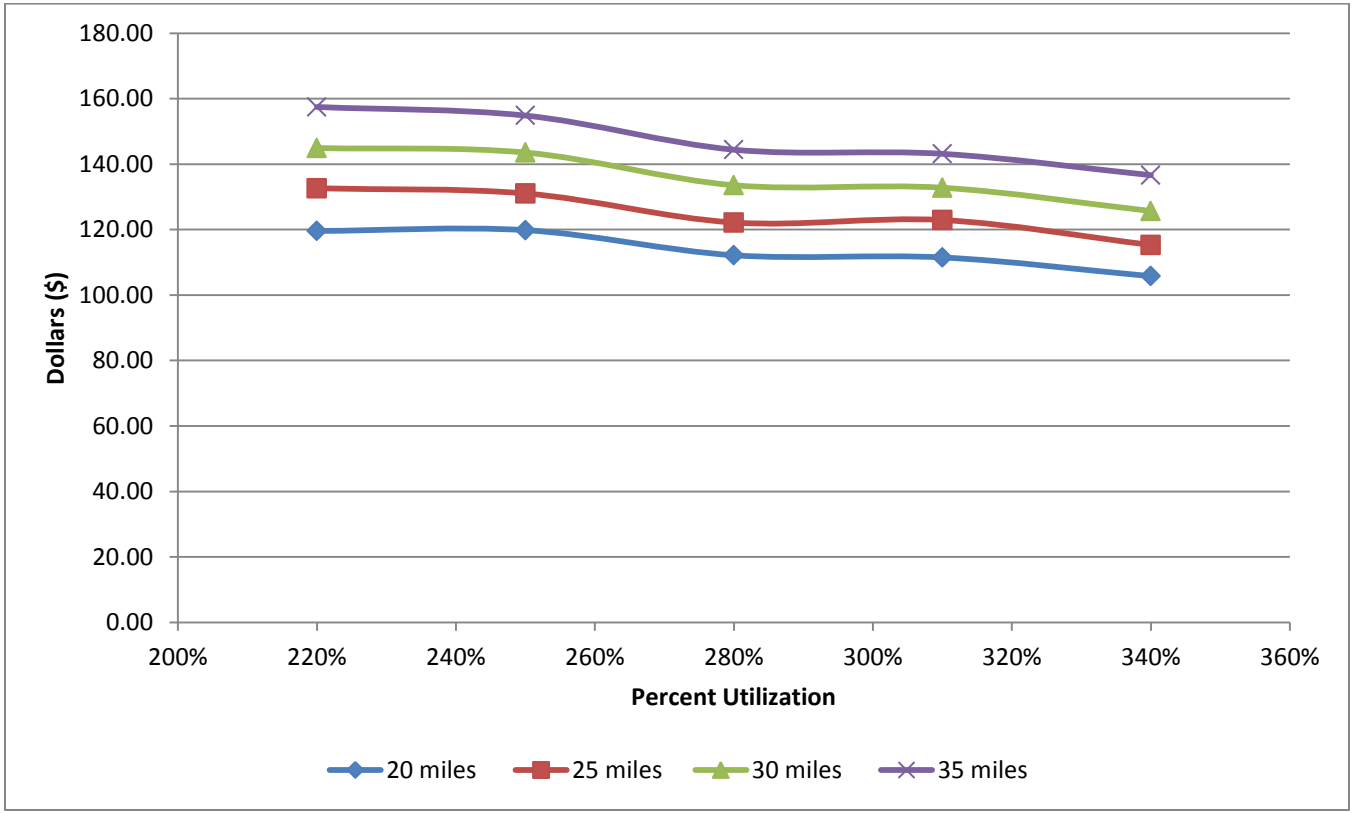

Figure A- 35. Semi-Tractor Trailer cost per load v. percent utilization for a 25 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

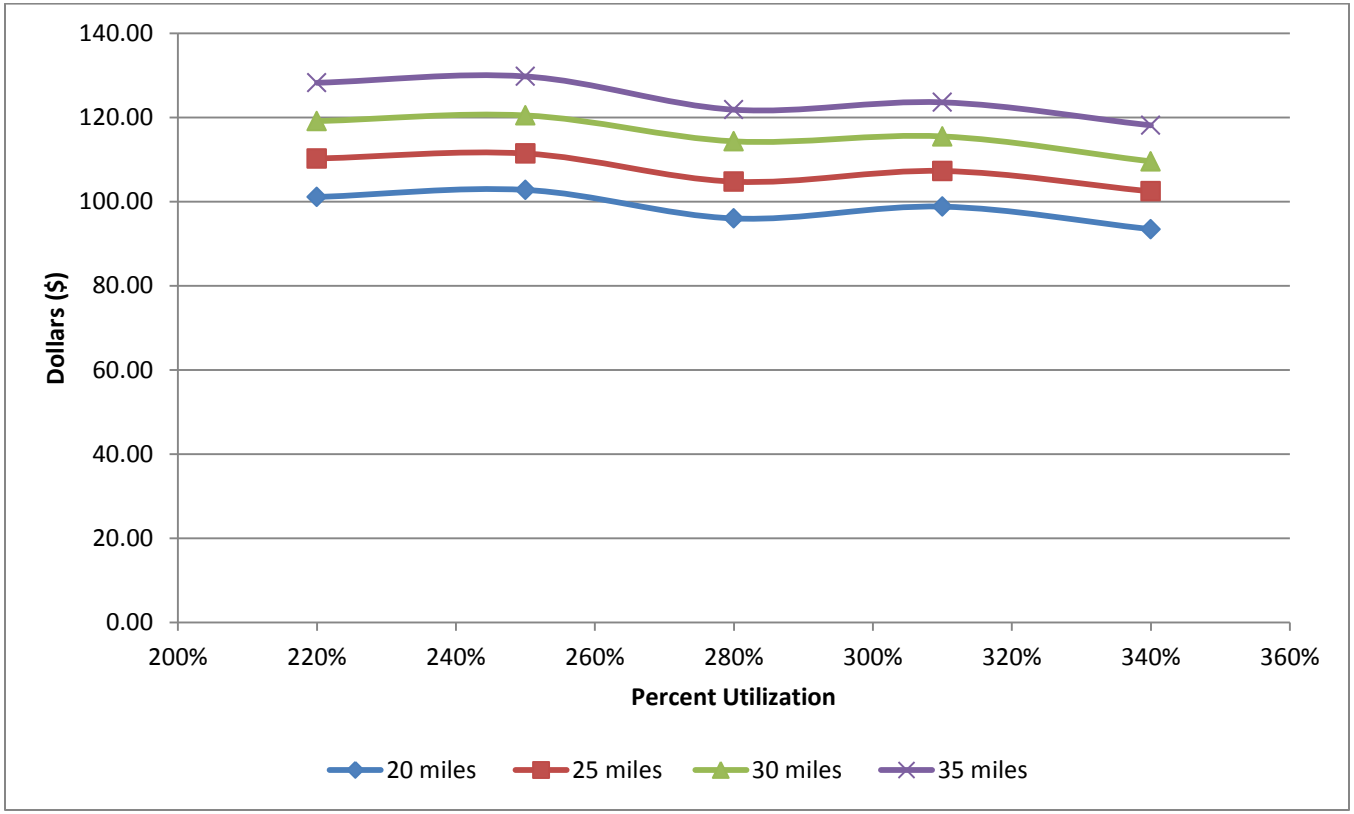

Figure A- 36. Semi-Tractor Trailer cost per load v. percent utilization for a 25 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

40 bph

Table A- 19. Data table for a 40 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
721	40	160%	20	Picker	10	5.62	142.53	106.19	64.01	1.24	11.53	1.12
722	40	160%	20	Picker	20	4.58	115.27	79.03	63.99	1.24	11.47	0.56
723	40	160%	25	Picker	10	6.20	156.28	113.87	64.01	1.24	11.50	1.30
724	40	160%	25	Picker	20	4.98	125.69	83.11	64.00	1.24	11.55	0.65
725	40	160%	30	Picker	10	6.79	171.40	122.82	64.02	1.24	11.52	1.48
726	40	160%	30	Picker	20	5.39	135.90	87.05	64.02	1.25	11.47	0.75
727	40	160%	35	Picker	10	7.36	185.80	130.85	64.01	1.24	11.50	1.66
728	40	160%	35	Picker	20	5.81	146.91	92.13	64.02	1.24	11.40	0.83
729	40	180%	20	Picker	10	5.13	129.61	93.42	72.00	1.23	11.51	1.12
730	40	180%	20	Picker	20	4.22	107.22	70.95	72.01	1.24	11.50	0.56
731	40	180%	25	Picker	10	5.68	143.25	101.01	72.03	1.24	11.32	1.30
732	40	180%	25	Picker	20	4.63	116.36	73.83	72.00	1.24	11.44	0.65
733	40	180%	30	Picker	10	6.23	157.31	108.71	72.00	1.24	11.45	1.48
734	40	180%	30	Picker	20	5.00	126.53	77.85	72.01	1.24	11.48	0.74
735	40	180%	35	Picker	10	6.76	170.29	115.44	71.99	1.24	11.51	1.68
736	40	180%	35	Picker	20	5.43	136.39	81.48	72.02	1.24	11.46	0.84
737	40	200%	20	Picker	10	4.79	120.80	84.35	79.97	1.25	11.51	1.14
738	40	200%	20	Picker	20	3.92	98.77	62.66	80.01	1.23	11.44	0.57
739	40	200%	25	Picker	10	5.36	134.68	92.05	80.00	1.25	11.49	1.30
740	40	200%	25	Picker	20	4.29	108.64	65.93	80.00	1.25	11.57	0.66
741	40	200%	30	Picker	10	5.81	146.42	97.83	80.00	1.24	11.42	1.48
742	40	200%	30	Picker	20	4.69	118.69	69.93	80.00	1.24	11.49	0.74
743	40	200%	35	Picker	10	6.33	159.01	104.26	80.02	1.24	11.50	1.68
744	40	200%	35	Picker	20	5.06	127.31	72.50	80.01	1.24	11.39	0.84
745	40	220%	20	Picker	10	4.49	113.69	77.36	88.04	1.24	11.51	1.12
746	40	220%	20	Picker	20	3.73	93.98	57.71	87.99	1.24	11.48	0.56
747	40	220%	25	Picker	10	4.98	125.28	82.73	88.02	1.24	11.58	1.31
748	40	220%	25	Picker	20	4.08	102.46	59.87	87.99	1.24	11.47	0.66
749	40	220%	30	Picker	10	5.47	137.46	89.03	88.00	1.23	11.42	1.48
750	40	220%	30	Picker	20	4.46	112.17	63.47	87.99	1.24	11.53	0.75
751	40	220%	35	Picker	10	5.96	150.54	95.79	88.03	1.24	11.44	1.64
752	40	220%	35	Picker	20	4.82	121.18	66.27	87.99	1.24	11.57	0.84
753	40	240%	20	Picker	10	4.60	115.75	79.48	96.01	1.24	11.52	1.13
754	40	240%	20	Picker	20	3.87	97.79	61.43	95.99	1.24	11.52	0.57
755	40	240%	25	Picker	10	5.04	126.76	84.37	95.99	1.24	11.43	1.31
756	40	240%	25	Picker	20	4.26	108.17	65.80	96.01	1.23	11.50	0.64
757	40	240%	30	Picker	10	5.50	138.90	90.15	95.97	1.24	11.49	1.50
758	40	240%	30	Picker	20	4.61	115.13	66.45	96.01	1.24	11.46	0.76
759	40	240%	35	Picker	10	6.02	151.35	96.46	95.95	1.24	11.49	1.69
760	40	240%	35	Picker	20	4.94	124.80	70.18	96.01	1.23	11.40	0.84

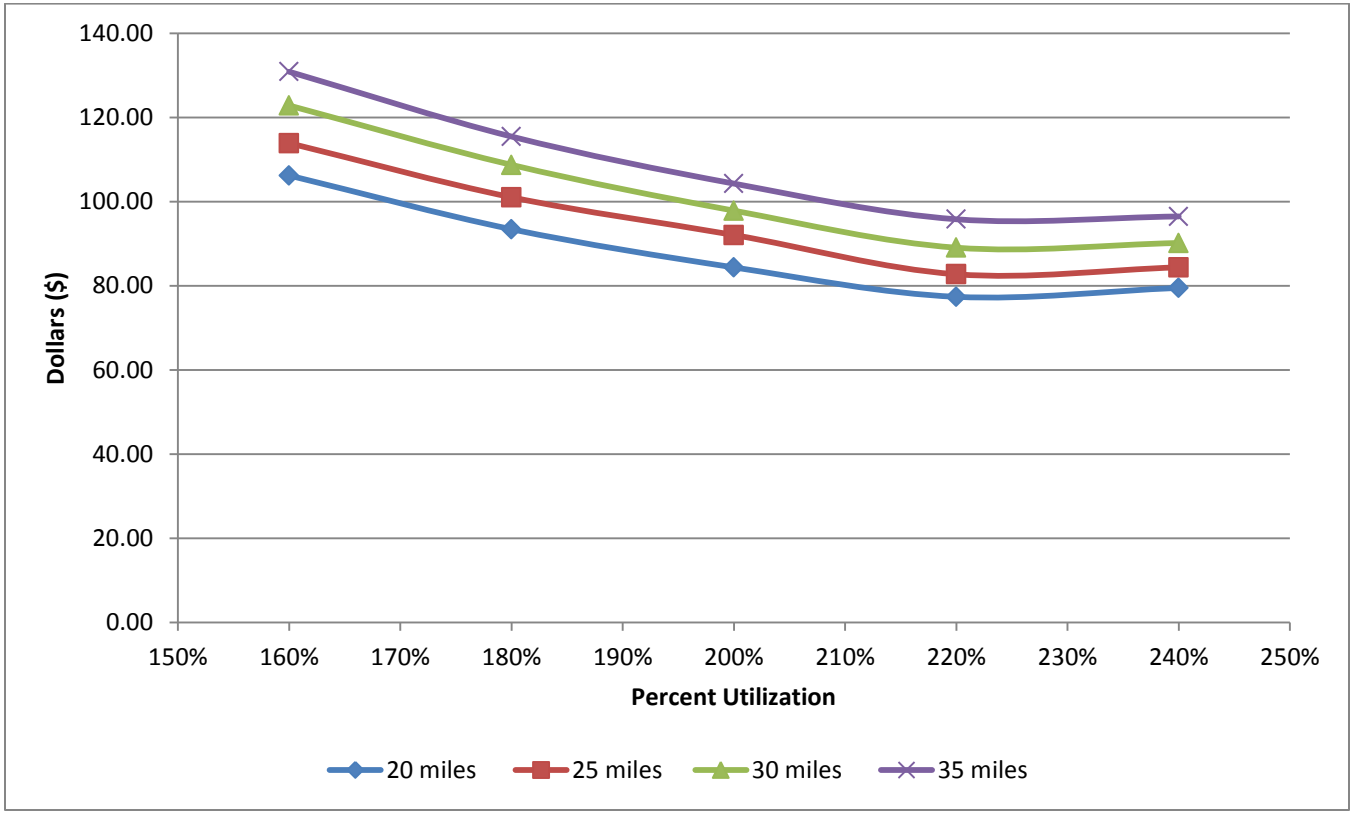

Figure A- 37.Semi-Tractor Trailer cost per load v. percent utilization for a 40 bph gin processing Picker harvested cotton transporting for 10 hours per day.

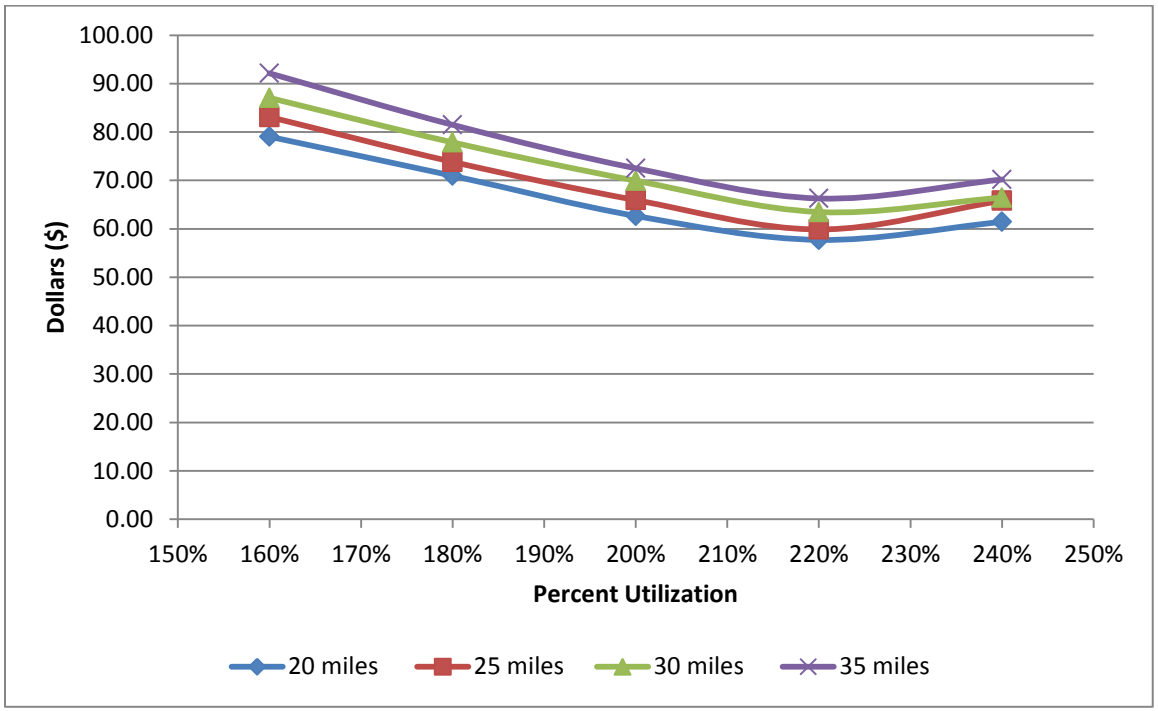

Figure A- 38. Semi-Tractor Trailer cost per load v. percent utilization for a 40 bph gin processing Picker harvested cotton transporting for 20 hours per day.

Table A- 20. Data table for a 40 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
761	40	160%	20	SWFC	10	6.52	133.32	97.07	62.72	1.24	11.48	1.41
762	40	160%	20	SWFC	20	5.32	106.35	70.06	45.20	1.24	11.49	1.00
763	40	160%	25	SWFC	10	7.24	148.49	106.02	63.57	1.24	11.50	1.64
764	40	160%	25	SWFC	20	5.81	117.45	74.93	49.89	1.24	11.46	1.00
765	40	160%	30	SWFC	10	7.99	162.49	113.95	63.92	1.24	11.40	1.84
766	40	160%	30	SWFC	20	6.26	126.32	77.72	54.89	1.24	11.53	1.03
767	40	160%	35	SWFC	10	8.78	176.37	121.42	63.98	1.24	11.47	2.10
768	40	160%	35	SWFC	20	6.76	136.98	82.19	58.05	1.24	11.46	1.09
769	40	180%	20	SWFC	10	6.04	123.64	87.37	70.63	1.24	11.39	1.40
770	40	180%	20	SWFC	20	5.03	100.37	64.07	51.17	1.24	11.51	1.00
771	40	180%	25	SWFC	10	6.69	137.23	94.70	71.43	1.24	11.46	1.61
772	40	180%	25	SWFC	20	5.49	110.35	67.79	56.78	1.24	11.58	1.00
773	40	180%	30	SWFC	10	7.45	150.05	101.33	71.77	1.24	11.46	1.87
774	40	180%	30	SWFC	20	5.87	119.50	70.63	61.92	1.25	11.41	1.03
775	40	180%	35	SWFC	10	8.10	163.26	108.34	71.95	1.24	11.46	2.11
776	40	180%	35	SWFC	20	6.41	130.63	75.75	64.44	1.24	11.45	1.09
777	40	200%	20	SWFC	10	5.63	114.90	78.60	78.27	1.24	11.48	1.42
778	40	200%	20	SWFC	20	4.77	95.33	59.12	55.96	1.24	11.43	1.00
779	40	200%	25	SWFC	10	6.33	127.99	85.41	79.29	1.24	11.57	1.64
780	40	200%	25	SWFC	20	5.21	105.07	62.56	62.82	1.24	11.45	1.01
781	40	200%	30	SWFC	10	6.94	139.84	91.15	79.77	1.24	11.44	1.88
782	40	200%	30	SWFC	20	5.62	113.91	65.29	68.52	1.24	11.50	1.02
783	40	200%	35	SWFC	10	7.60	152.68	97.85	79.95	1.24	11.50	2.09
784	40	200%	35	SWFC	20	6.09	123.41	68.51	72.07	1.24	11.50	1.11
785	40	220%	20	SWFC	10	5.27	108.20	71.91	86.46	1.24	11.52	1.40
786	40	220%	20	SWFC	20	4.57	91.00	54.86	61.61	1.24	11.41	1.00
787	40	220%	25	SWFC	10	5.88	119.35	76.95	87.40	1.24	11.43	1.65
788	40	220%	25	SWFC	20	4.99	100.20	57.56	69.09	1.25	11.49	1.01
789	40	220%	30	SWFC	10	6.52	131.35	82.67	87.74	1.24	11.51	1.88
790	40	220%	30	SWFC	20	5.35	108.84	60.06	75.38	1.24	11.52	1.03
791	40	220%	35	SWFC	10	7.15	143.31	88.61	87.93	1.23	11.51	2.10
792	40	220%	35	SWFC	20	5.81	117.95	63.12	79.64	1.24	11.48	1.08
793	40	240%	20	SWFC	10	5.30	108.31	72.04	93.62	1.24	11.43	1.44
794	40	240%	20	SWFC	20	4.44	88.31	52.09	66.95	1.24	11.47	1.00
795	40	240%	25	SWFC	10	5.97	121.43	78.71	95.30	1.25	11.55	1.63
796	40	240%	25	SWFC	20	4.85	97.84	55.25	75.62	1.24	11.51	1.00
797	40	240%	30	SWFC	10	6.46	131.07	82.67	95.74	1.23	11.41	1.86
798	40	240%	30	SWFC	20	5.31	107.74	59.14	81.26	1.24	11.50	1.04
799	40	240%	35	SWFC	10	7.12	143.75	88.87	95.88	1.24	11.43	2.08
800	40	240%	35	SWFC	20	5.72	115.95	61.21	87.38	1.24	11.50	1.12

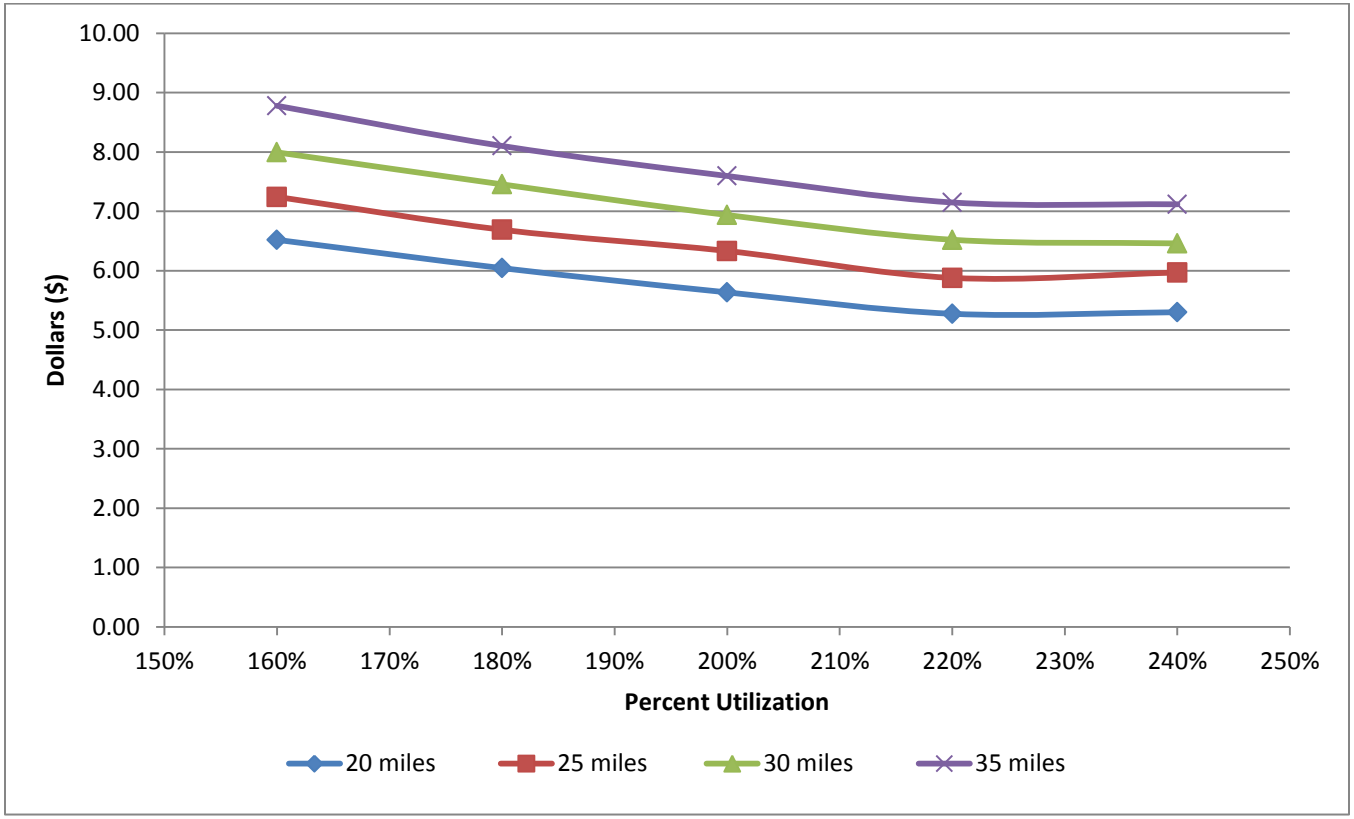

Figure A- 39. Semi-Tractor Trailer cost per load v. percent utilization for a 40 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

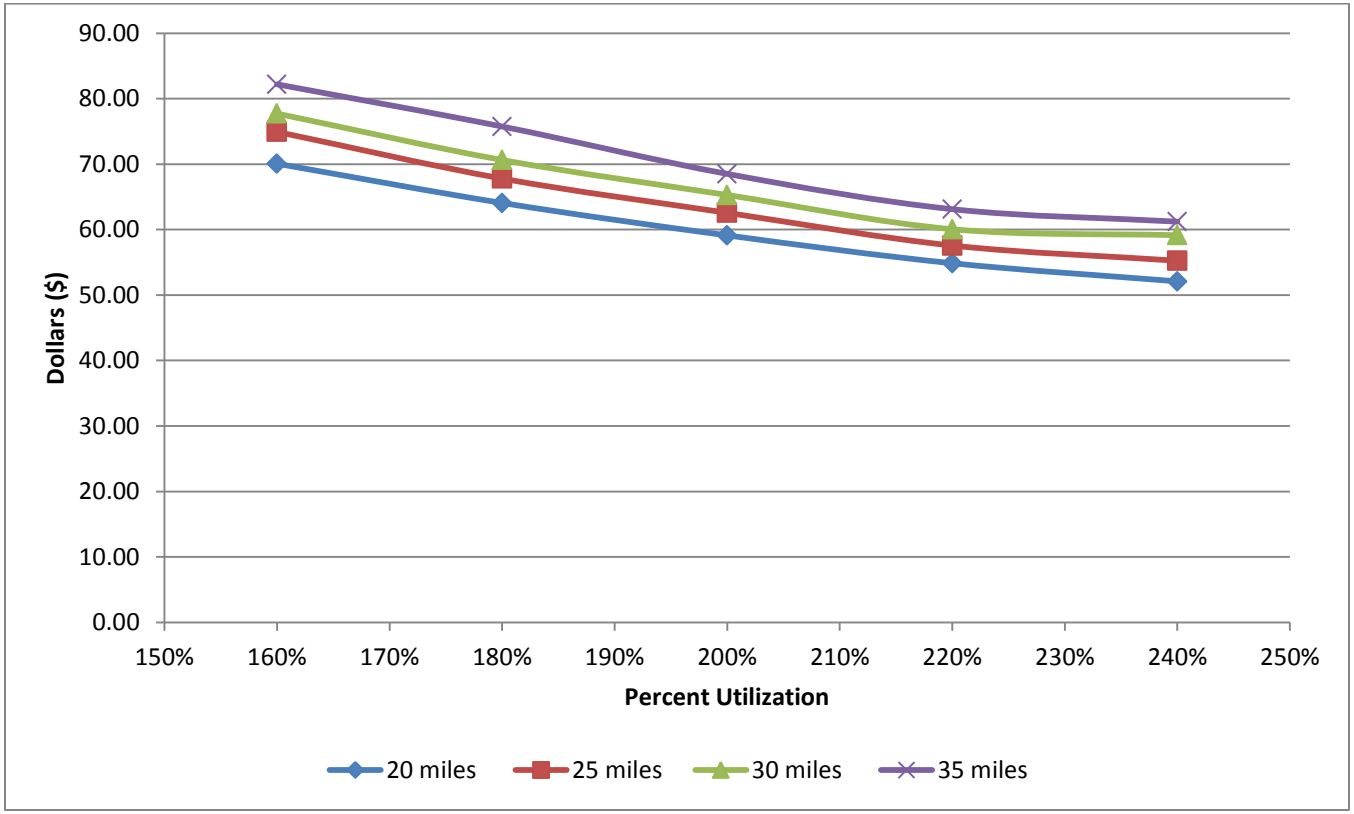

Figure A- 40. Semi-Tractor Trailer cost per load v. percent utilization for a 40 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

Table A- 21. Data table for a 40 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
801	40	160%	20	SWOFC	10	7.65	124.04	87.81	63.73	1.24	11.46	1.77
802	40	160%	20	SWOFC	20	6.06	97.77	61.50	53.14	1.24	11.48	1.02
803	40	160%	25	SWOFC	10	8.63	138.18	95.61	63.97	1.24	11.57	2.10
804	40	160%	25	SWOFC	20	6.63	108.20	65.58	57.44	1.24	11.56	1.08
805	40	160%	30	SWOFC	10	9.59	153.00	104.30	64.02	1.24	11.51	2.35
806	40	160%	30	SWOFC	20	7.30	119.09	70.37	59.84	1.24	11.51	1.19
807	40	160%	35	SWOFC	10	10.46	167.22	112.27	64.01	1.24	11.44	2.62
808	40	160%	35	SWOFC	20	7.95	129.94	74.99	61.50	1.24	11.49	1.30
809	40	180%	20	SWOFC	10	7.09	114.48	78.29	71.64	1.24	11.48	1.79
810	40	180%	20	SWOFC	20	5.72	92.36	56.10	59.63	1.24	11.50	1.02
811	40	180%	25	SWOFC	10	7.88	128.22	85.70	71.94	1.24	11.49	2.05
812	40	180%	25	SWOFC	20	6.28	101.65	59.19	64.64	1.24	11.44	1.09
813	40	180%	30	SWOFC	10	8.86	141.25	92.45	72.00	1.24	11.50	2.37
814	40	180%	30	SWOFC	20	6.84	111.88	63.10	67.65	1.24	11.55	1.19
815	40	180%	35	SWOFC	10	9.73	155.34	100.41	71.99	1.24	11.54	2.62
816	40	180%	35	SWOFC	20	7.51	122.00	67.17	69.42	1.24	11.50	1.31
817	40	200%	20	SWOFC	10	6.64	107.18	70.87	79.68	1.24	11.53	1.78
818	40	200%	20	SWOFC	20	5.39	87.34	51.16	66.26	1.24	11.41	1.02
819	40	200%	25	SWOFC	10	7.40	119.20	76.78	79.96	1.24	11.50	2.04
820	40	200%	25	SWOFC	20	5.92	96.49	54.07	72.08	1.24	11.51	1.08
821	40	200%	30	SWOFC	10	8.24	131.48	82.75	79.99	1.24	11.48	2.39
822	40	200%	30	SWOFC	20	6.55	105.87	57.27	75.04	1.24	11.50	1.21
823	40	200%	35	SWOFC	10	9.07	144.18	89.23	80.02	1.24	11.47	2.71
824	40	200%	35	SWOFC	20	7.15	115.72	60.76	77.12	1.24	11.57	1.31
825	40	220%	20	SWOFC	10	6.28	100.76	64.46	87.57	1.24	11.53	1.80
826	40	220%	20	SWOFC	20	5.14	83.07	46.82	73.30	1.24	11.47	1.02
827	40	220%	25	SWOFC	10	6.99	112.10	69.64	87.98	1.24	11.45	2.11
828	40	220%	25	SWOFC	20	5.69	92.22	49.61	79.28	1.24	11.57	1.08
829	40	220%	30	SWOFC	10	7.75	124.51	75.86	87.99	1.24	11.52	2.37
830	40	220%	30	SWOFC	20	6.26	101.33	52.65	83.15	1.24	11.47	1.17
831	40	220%	35	SWOFC	10	8.57	136.67	81.86	88.03	1.24	11.50	2.64
832	40	220%	35	SWOFC	20	6.79	110.63	55.63	85.14	1.24	11.47	1.29
833	40	240%	20	SWOFC	10	6.24	100.89	64.60	95.57	1.24	11.53	1.79
834	40	240%	20	SWOFC	20	5.06	81.88	45.51	80.01	1.24	11.52	1.03
835	40	240%	25	SWOFC	10	7.04	112.51	69.95	95.90	1.24	11.46	2.09
836	40	240%	25	SWOFC	20	5.63	91.66	49.10	85.49	1.24	11.48	1.09
837	40	240%	30	SWOFC	10	7.78	124.30	75.55	95.95	1.24	11.51	2.36
838	40	240%	30	SWOFC	20	6.21	101.44	52.61	90.65	1.24	11.53	1.20
839	40	240%	35	SWOFC	10	8.44	135.15	80.39	95.95	1.24	11.45	2.63
840	40	240%	35	SWOFC	20	6.82	111.06	56.15	92.36	1.24	11.52	1.30

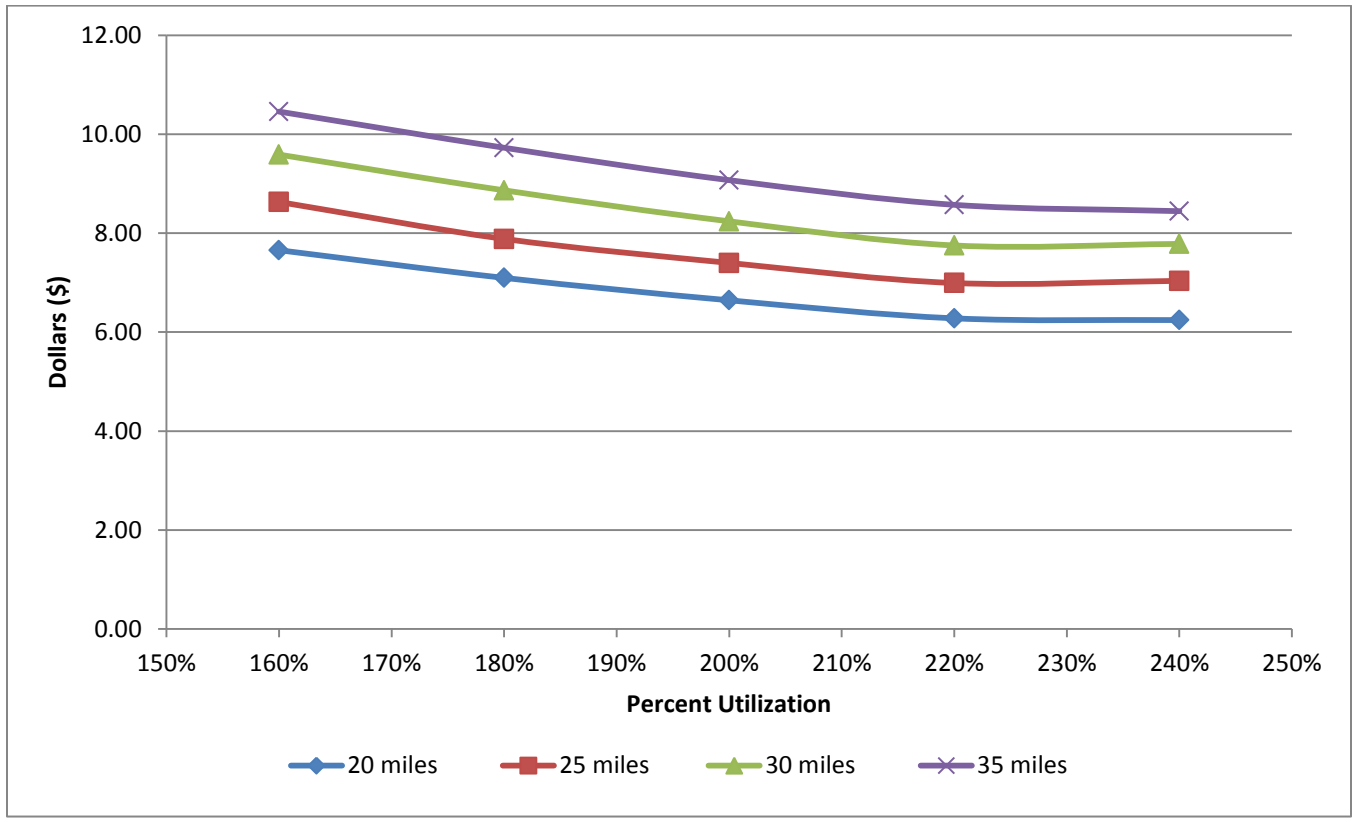

Figure A- 41. Semi-Tractor Trailer cost per load v. percent utilization for a 40 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

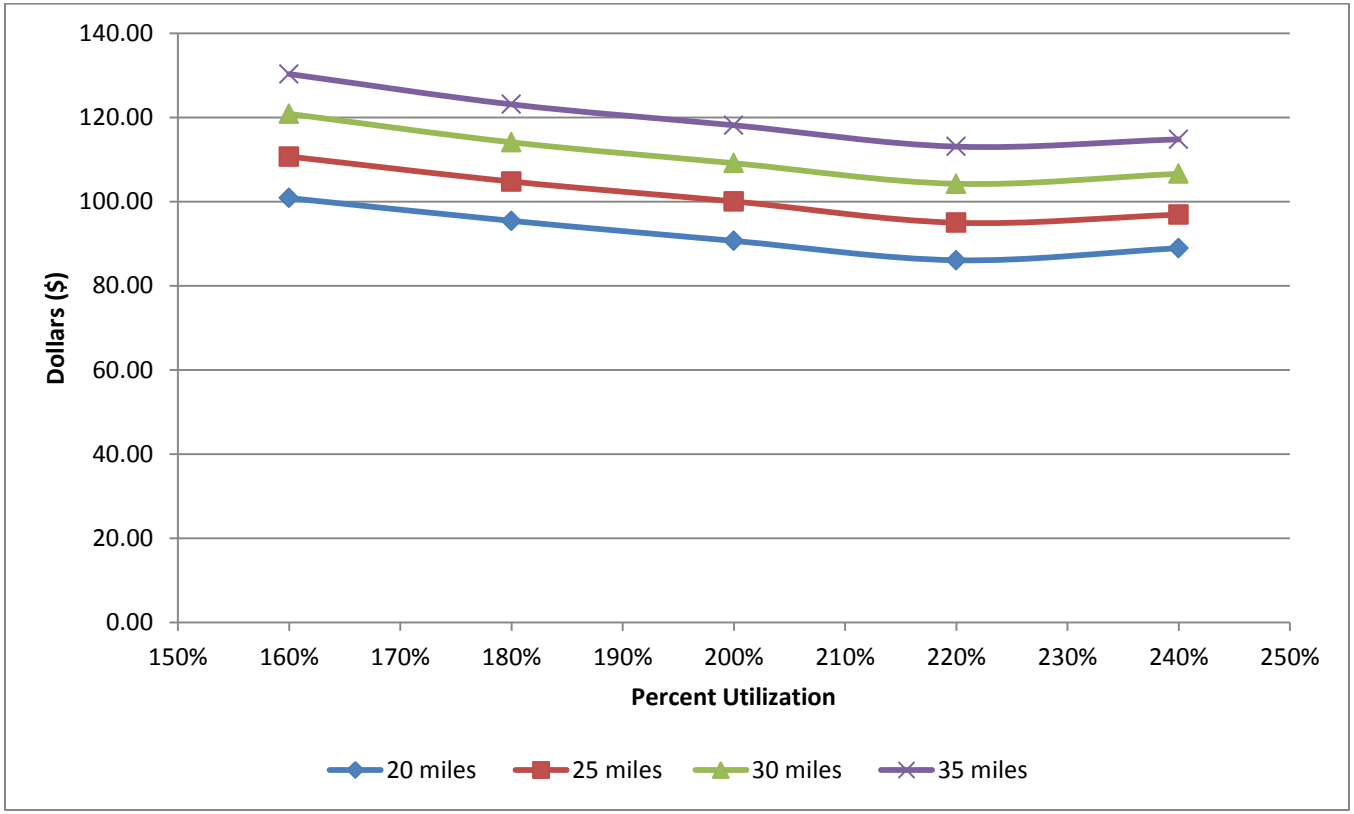

Figure A- 42. Semi-Tractor Trailer cost per load v. percent utilization for a 40 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.

65 bph

Table A- 22. Data table for a 65 bph gin processing picker harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
841	65	190%	20	Picker	10	5.32	137.52	101.23	65.96	1.24	11.50	1.06
842	65	190%	20	Picker	20	4.66	117.23	80.97	37.68	1.24	11.51	1.00
843	65	190%	25	Picker	10	5.84	151.27	108.70	70.52	1.24	11.46	1.15
844	65	190%	25	Picker	20	5.00	126.51	84.10	43.56	1.24	11.44	1.00
845	65	190%	30	Picker	10	6.28	162.94	114.26	73.39	1.24	11.44	1.27
846	65	190%	30	Picker	20	5.33	134.94	86.18	49.17	1.24	11.52	1.00
847	65	190%	35	Picker	10	6.83	176.45	121.57	74.29	1.24	11.47	1.44
848	65	190%	35	Picker	20	5.68	143.82	89.07	54.30	1.24	11.46	1.00
849	65	215%	20	Picker	10	4.88	126.46	90.34	75.53	1.23	11.45	1.05
850	65	215%	20	Picker	20	4.36	109.73	73.47	43.09	1.24	11.48	1.00
851	65	215%	25	Picker	10	5.36	139.18	96.48	80.25	1.25	11.57	1.15
852	65	215%	25	Picker	20	4.69	118.30	76.02	49.44	1.23	11.42	1.00
853	65	215%	30	Picker	10	5.80	150.46	101.97	82.71	1.23	11.46	1.28
854	65	215%	30	Picker	20	5.11	128.43	79.55	55.18	1.24	11.54	1.00
855	65	215%	35	Picker	10	6.31	162.01	107.22	84.17	1.24	11.49	1.46
856	65	215%	35	Picker	20	5.36	135.54	80.77	61.79	1.24	11.49	1.00
857	65	240%	20	Picker	10	4.74	122.24	86.04	84.95	1.24	11.49	1.06
858	65	240%	20	Picker	20	4.14	103.73	67.36	48.06	1.24	11.50	1.00
859	65	240%	25	Picker	10	5.21	135.82	93.27	89.72	1.24	11.52	1.15
860	65	240%	25	Picker	20	4.45	112.76	70.29	54.70	1.24	11.47	1.00
861	65	240%	30	Picker	10	5.69	148.80	100.26	92.55	1.24	11.49	1.28
862	65	240%	30	Picker	20	4.80	120.74	71.90	62.74	1.25	11.46	1.00
863	65	240%	35	Picker	10	6.24	161.62	106.65	94.24	1.24	11.54	1.44
864	65	240%	35	Picker	20	5.19	131.16	76.34	67.87	1.24	11.56	1.00
865	65	265%	20	Picker	10	4.52	116.27	80.06	93.54	1.24	11.48	1.05
866	65	265%	20	Picker	20	3.95	99.79	63.46	52.30	1.24	11.50	1.00
867	65	265%	25	Picker	10	4.96	128.86	86.43	98.64	1.24	11.52	1.16
868	65	265%	25	Picker	20	4.27	107.30	64.81	60.99	1.24	11.46	1.00
869	65	265%	30	Picker	10	5.43	141.02	92.11	101.72	1.24	11.61	1.29
870	65	265%	30	Picker	20	4.66	117.52	68.78	67.66	1.24	11.50	1.00
871	65	265%	35	Picker	10	5.86	151.97	97.08	103.77	1.24	11.50	1.43
872	65	265%	35	Picker	20	4.91	124.89	70.00	76.51	1.24	11.49	1.00
873	65	290%	20	Picker	10	4.31	111.17	74.87	101.73	1.24	11.47	1.05
874	65	290%	20	Picker	20	3.79	95.43	59.16	56.95	1.24	11.50	1.00
875	65	290%	25	Picker	10	4.74	122.45	79.95	107.36	1.24	11.47	1.17
876	65	290%	25	Picker	20	4.14	103.72	61.16	66.75	1.24	11.53	1.00
877	65	290%	30	Picker	10	5.15	133.13	84.71	111.29	1.23	11.45	1.28
878	65	290%	30	Picker	20	4.47	112.98	64.26	74.33	1.24	11.48	1.00
879	65	290%	35	Picker	10	5.52	142.96	87.99	114.20	1.24	11.48	1.44
880	65	290%	35	Picker	20	4.80	121.19	66.09	83.77	1.24	11.61	1.00

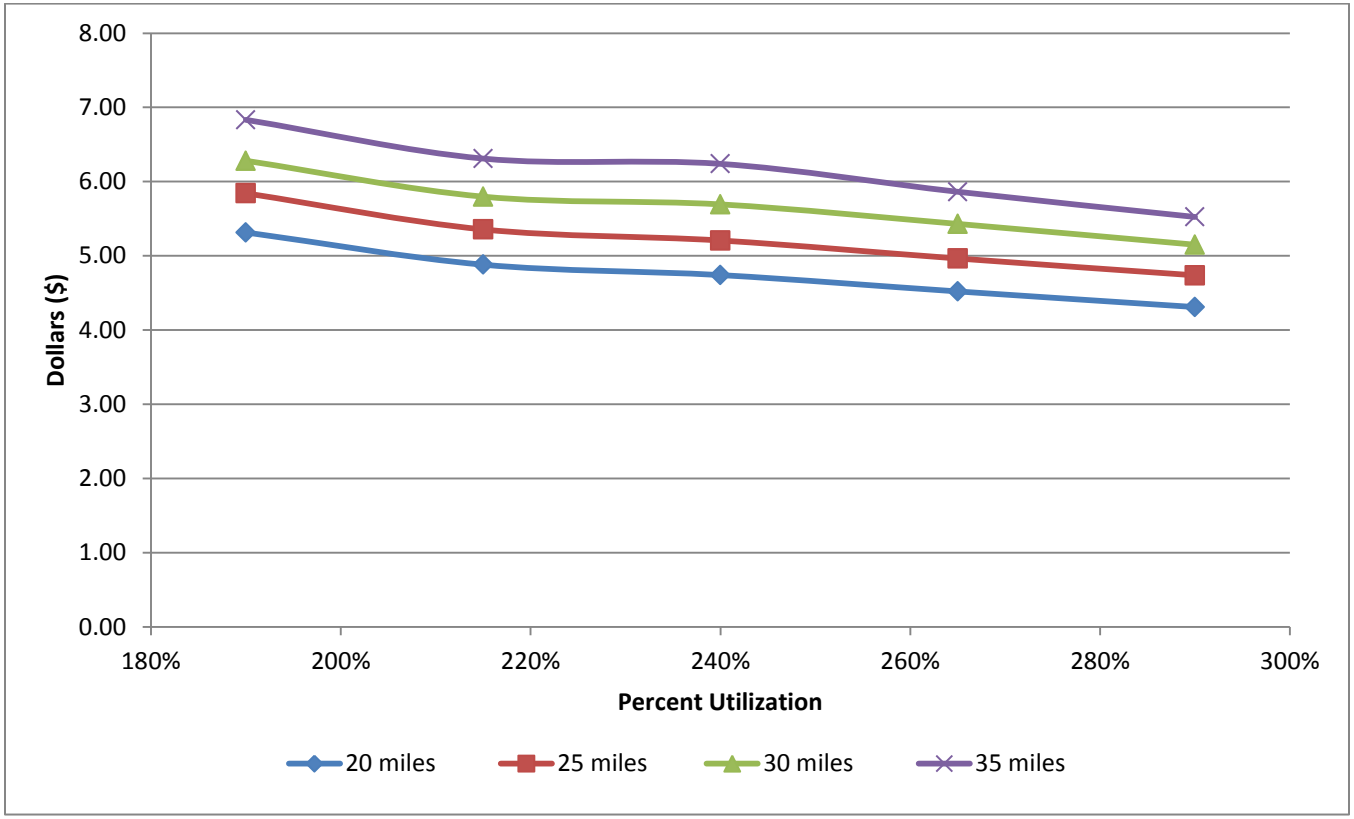

Figure A- 43. Semi-Tractor Trailer cost per load v. percent utilization for a 65 bph gin processing Picker harvested cotton transporting for 10 hours per day.

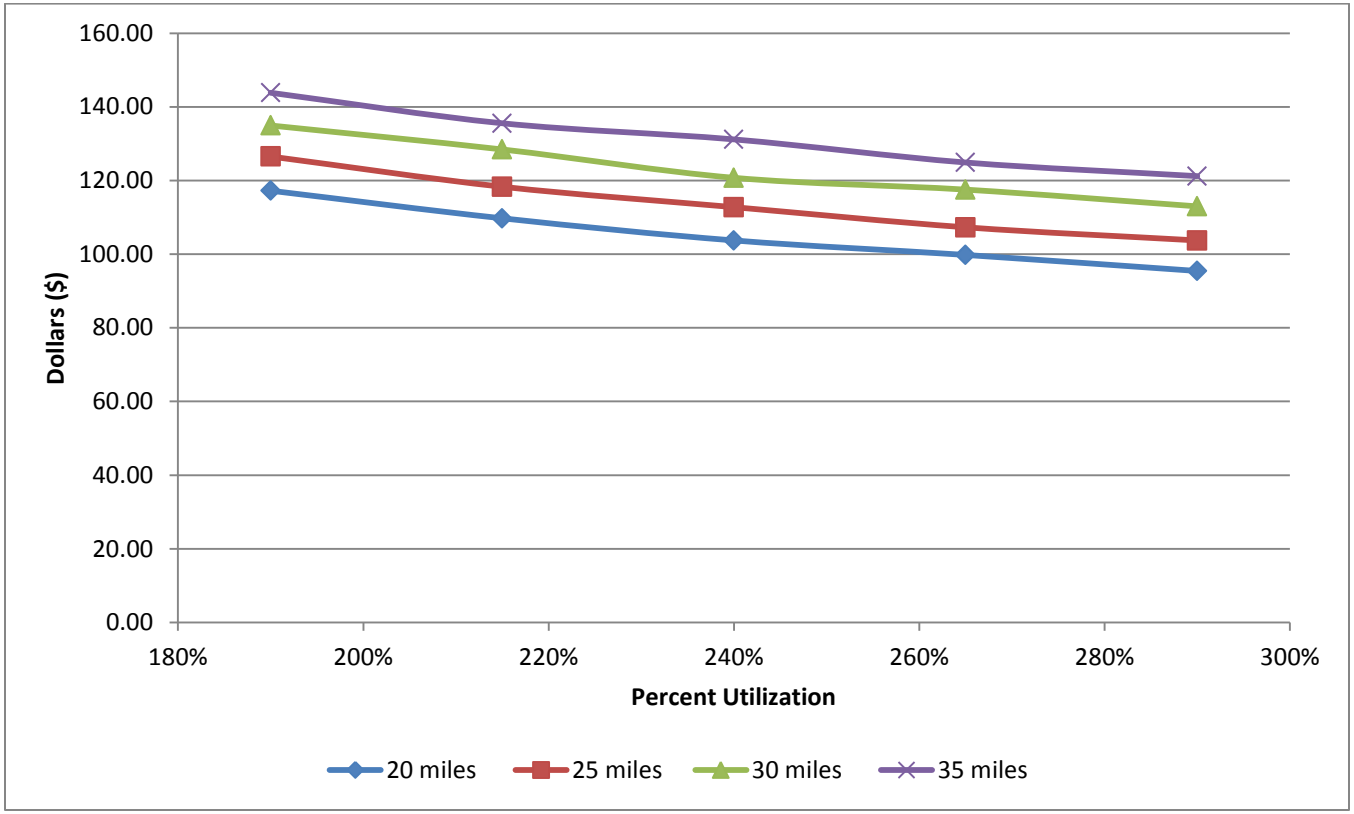

Figure A- 44. Semi-Tractor Trailer cost per load v. percent utilization for a 65 bph gin processing Picker harvested cotton transporting for 20 hours per day.

Table A- 23. Data table for a 65 bph gin processing SWFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
881	65	190%	20	SWFC	10	5.15	102.98	66.62	76.02	1.24	11.56	2.34
882	65	190%	20	SWFC	20	4.03	82.77	46.40	71.09	1.24	11.58	1.15
883	65	190%	25	SWFC	10	5.85	116.56	74.08	75.99	1.24	11.46	2.71
884	65	190%	25	SWFC	20	4.50	91.33	48.92	73.87	1.24	11.42	1.35
885	65	190%	30	SWFC	10	6.51	129.42	80.67	75.99	1.24	11.53	3.04
886	65	190%	30	SWFC	20	4.97	101.62	53.08	74.90	1.24	11.46	1.48
887	65	190%	35	SWFC	10	7.15	142.83	88.10	75.97	1.23	11.51	3.44
888	65	190%	35	SWFC	20	5.50	111.28	56.39	75.59	1.24	11.47	1.68
889	65	215%	20	SWFC	10	4.76	95.01	58.76	85.97	1.24	11.45	2.33
890	65	215%	20	SWFC	20	3.81	77.58	41.28	80.65	1.24	11.51	1.17
891	65	215%	25	SWFC	10	5.40	107.43	65.12	86.04	1.23	11.47	2.68
892	65	215%	25	SWFC	20	4.25	86.00	43.51	83.50	1.24	11.47	1.35
893	65	215%	30	SWFC	10	5.99	119.78	71.10	86.05	1.24	11.48	3.06
894	65	215%	30	SWFC	20	4.69	95.72	46.92	84.92	1.24	11.50	1.50
895	65	215%	35	SWFC	10	6.66	132.92	77.93	86.02	1.24	11.48	3.36
896	65	215%	35	SWFC	20	5.15	104.93	49.98	85.54	1.24	11.49	1.67
897	65	240%	20	SWFC	10	4.65	93.54	57.28	96.00	1.24	11.42	2.30
898	65	240%	20	SWFC	20	3.75	76.84	40.45	89.27	1.25	11.49	1.14
899	65	240%	25	SWFC	10	5.29	105.44	62.99	95.99	1.24	11.43	2.68
900	65	240%	25	SWFC	20	4.19	86.22	43.72	92.97	1.24	11.53	1.31
901	65	240%	30	SWFC	10	5.89	116.79	68.09	95.96	1.24	11.48	3.09
902	65	240%	30	SWFC	20	4.66	95.36	46.57	94.70	1.24	11.49	1.48
903	65	240%	35	SWFC	10	6.47	128.77	73.83	95.95	1.24	11.54	3.42
904	65	240%	35	SWFC	20	5.16	104.37	49.20	95.48	1.24	11.62	1.69
905	65	265%	20	SWFC	10	4.43	88.80	52.32	106.04	1.25	11.53	2.33
906	65	265%	20	SWFC	20	3.58	73.37	37.01	99.43	1.24	11.51	1.15
907	65	265%	25	SWFC	10	4.97	99.01	56.66	106.05	1.24	11.45	2.68
908	65	265%	25	SWFC	20	4.01	81.96	39.51	102.89	1.24	11.54	1.34
909	65	265%	30	SWFC	10	5.54	111.04	62.25	106.02	1.24	11.47	3.04
910	65	265%	30	SWFC	20	4.47	91.12	42.53	104.49	1.24	11.48	1.49
911	65	265%	35	SWFC	10	6.11	121.89	66.88	106.04	1.25	11.42	3.42
912	65	265%	35	SWFC	20	4.88	99.14	44.27	105.54	1.24	11.45	1.69
913	65	290%	20	SWFC	10	4.20	84.02	47.64	115.97	1.24	11.55	2.33
914	65	290%	20	SWFC	20	3.45	70.40	33.98	108.71	1.24	11.59	1.18
915	65	290%	25	SWFC	10	4.73	94.28	51.96	115.97	1.23	11.46	2.68
916	65	290%	25	SWFC	20	3.87	79.15	36.66	112.00	1.24	11.50	1.32
917	65	290%	30	SWFC	10	5.30	105.35	56.68	115.98	1.24	11.43	3.06
918	65	290%	30	SWFC	20	4.31	87.90	39.04	114.18	1.24	11.54	1.48
919	65	290%	35	SWFC	10	5.79	115.99	61.17	115.94	1.24	11.50	3.41
920	65	290%	35	SWFC	20	4.74	95.47	40.60	115.38	1.24	11.50	1.70

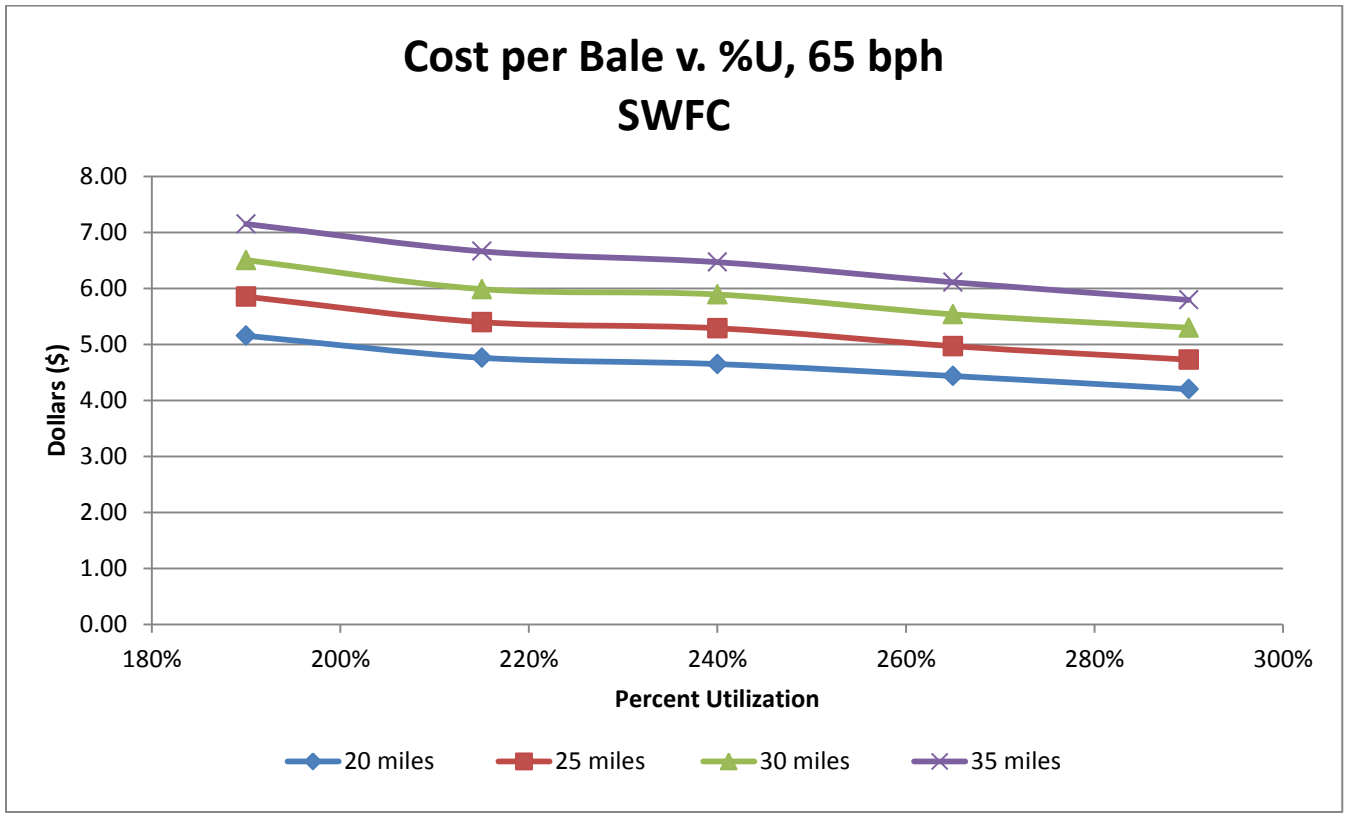

Figure A- 45. Semi-Tractor Trailer cost per load v. percent utilization for a 65 bph gin processing SWFC harvested cotton transporting for 10 hours per day.

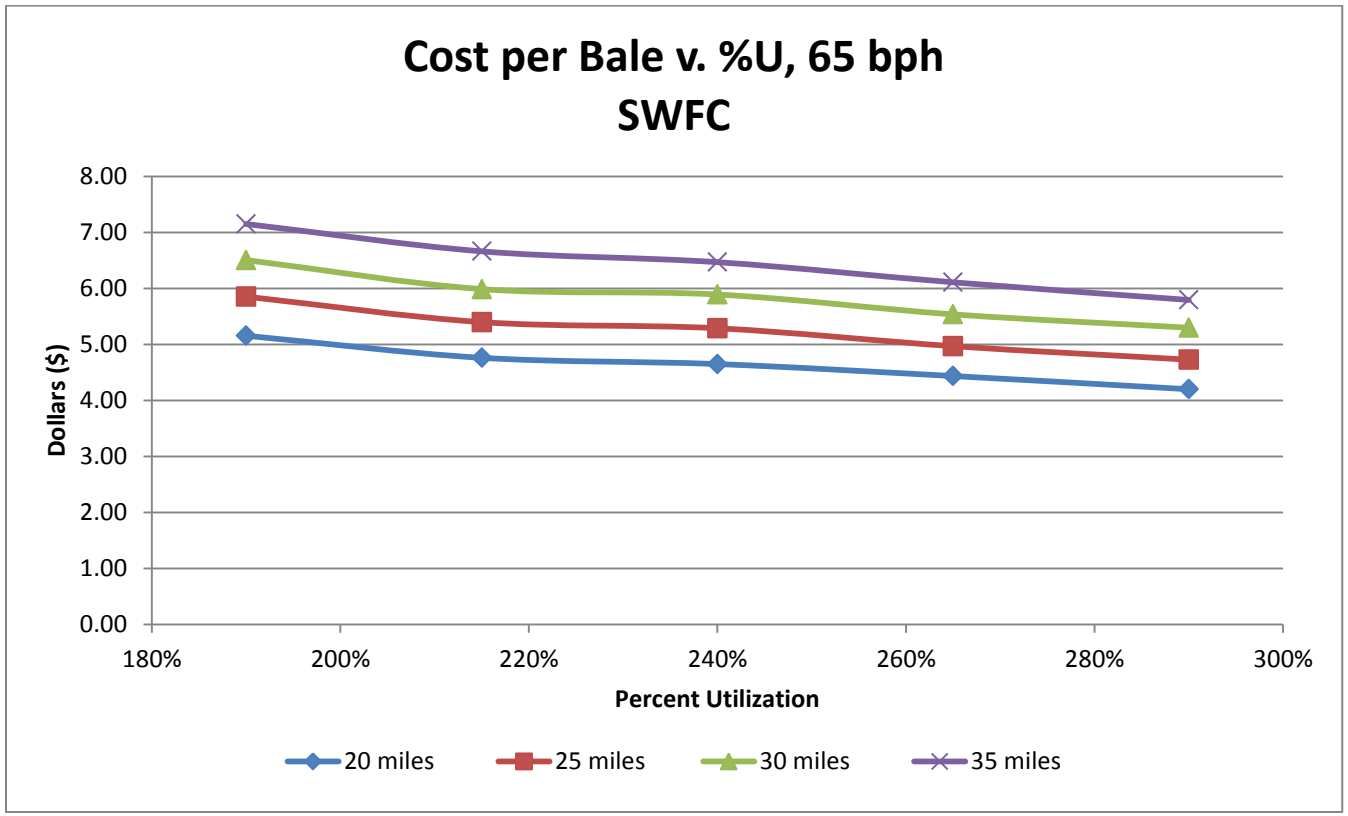

Figure A- 46. Semi-Tractor Trailer cost per load v. percent utilization for a 65 bph gin processing SWFC harvested cotton transporting for 20 hours per day.

Table A- 24. Data table for a 65 bph gin processing SWOFC harvested cotton.

TEST #	Gin Rating	% U	Average Distance	Harvester Type	Time Available to Transport	Cost per Bale	Cost per Load	Fixed cost per Load	Transport Time per Season	Variable Cost (Driving)	Variable Cost (loading)	Trucks Needed
921	65	190%	20	SWFC	10	6.17	98.45	62.21	76.02	1.24	11.49	2.87
922	65	190%	20	SWFC	20	4.76	77.81	41.49	74.14	1.24	11.48	1.42
923	65	190%	25	SWFC	10	7.00	111.07	68.66	75.99	1.24	11.43	3.37
924	65	190%	25	SWFC	20	5.38	86.84	44.35	75.48	1.24	11.45	1.69
925	65	190%	30	SWFC	10	7.89	124.80	76.12	75.99	1.24	11.51	3.81
926	65	190%	30	SWFC	20	6.04	97.01	48.24	75.73	1.24	11.51	1.90
927	65	190%	35	SWFC	10	8.69	138.70	83.81	75.96	1.24	11.47	4.28
928	65	190%	35	SWFC	20	6.66	105.91	50.98	75.94	1.24	11.55	2.15
929	65	215%	20	SWFC	10	5.71	90.92	54.71	86.00	1.24	11.45	2.95
930	65	215%	20	SWFC	20	4.48	72.36	36.00	84.50	1.24	11.52	1.47
931	65	215%	25	SWFC	10	6.48	103.34	60.97	86.04	1.24	11.46	3.35
932	65	215%	25	SWFC	20	5.09	81.99	39.43	85.48	1.24	11.50	1.68
933	65	215%	30	SWFC	10	7.36	115.85	67.13	86.05	1.24	11.44	3.89
934	65	215%	30	SWFC	20	5.70	90.96	42.17	85.80	1.24	11.47	1.90
935	65	215%	35	SWFC	10	8.08	127.87	73.06	86.02	1.24	11.42	4.31
936	65	215%	35	SWFC	20	6.23	99.41	44.70	85.99	1.23	11.51	2.17
937	65	240%	20	SWFC	10	5.59	88.75	52.47	96.01	1.24	11.48	2.95
938	65	240%	20	SWFC	20	4.44	72.18	35.84	94.41	1.24	11.49	1.46
939	65	240%	25	SWFC	10	6.35	101.05	58.47	95.99	1.24	11.48	3.35
940	65	240%	25	SWFC	20	5.02	81.10	38.73	95.29	1.24	11.45	1.67
941	65	240%	30	SWFC	10	7.12	113.01	64.27	95.96	1.24	11.46	3.81
942	65	240%	30	SWFC	20	5.60	90.43	41.70	95.77	1.24	11.47	1.87
943	65	240%	35	SWFC	10	7.80	124.34	69.61	95.95	1.24	11.44	4.32
944	65	240%	35	SWFC	20	6.21	98.79	43.98	95.95	1.24	11.46	2.14
945	65	265%	20	SWFC	10	5.30	84.09	47.84	106.04	1.24	11.45	2.89
946	65	265%	20	SWFC	20	4.27	69.36	32.93	103.67	1.24	11.54	1.44
947	65	265%	25	SWFC	10	5.98	95.11	52.68	106.05	1.24	11.47	3.38
948	65	265%	25	SWFC	20	4.79	77.41	35.08	105.23	1.23	11.46	1.69
949	65	265%	30	SWFC	10	6.68	106.65	58.01	106.02	1.24	11.53	3.84
950	65	265%	30	SWFC	20	5.40	86.06	37.55	105.76	1.23	11.47	1.92
951	65	265%	35	SWFC	10	7.46	118.02	63.08	106.04	1.24	11.49	4.29
952	65	265%	35	SWFC	20	5.95	94.92	39.92	105.97	1.24	11.56	2.15
953	65	290%	20	SWFC	10	5.02	79.73	43.50	115.99	1.24	11.46	2.91
954	65	290%	20	SWFC	20	4.09	66.59	30.26	113.70	1.24	11.50	1.44
955	65	290%	25	SWFC	10	5.75	91.17	48.60	115.98	1.24	11.52	3.34
956	65	290%	25	SWFC	20	4.62	74.61	32.26	115.09	1.23	11.48	1.67
957	65	290%	30	SWFC	10	6.33	101.37	52.68	115.98	1.24	11.51	3.80
958	65	290%	30	SWFC	20	5.17	83.09	34.42	115.69	1.24	11.47	1.91
959	65	290%	35	SWFC	10	7.09	112.06	57.27	115.94	1.24	11.50	4.35
960	65	290%	35	SWFC	20	5.68	90.89	36.12	115.99	1.24	11.49	2.14

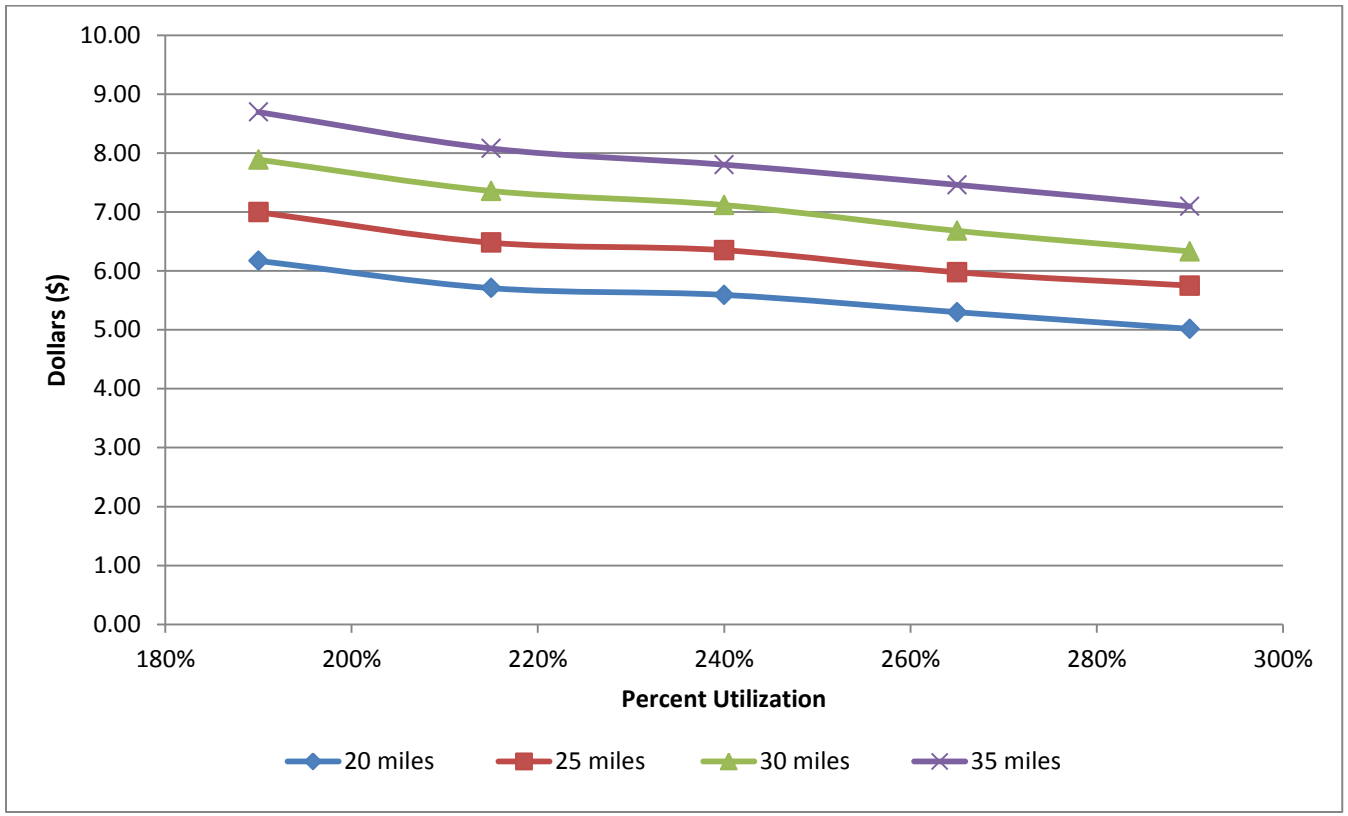

Figure A- 47. Semi-Tractor Trailer cost per load v. percent utilization for a 65 bph gin processing SWOFC harvested cotton transporting for 10 hours per day.

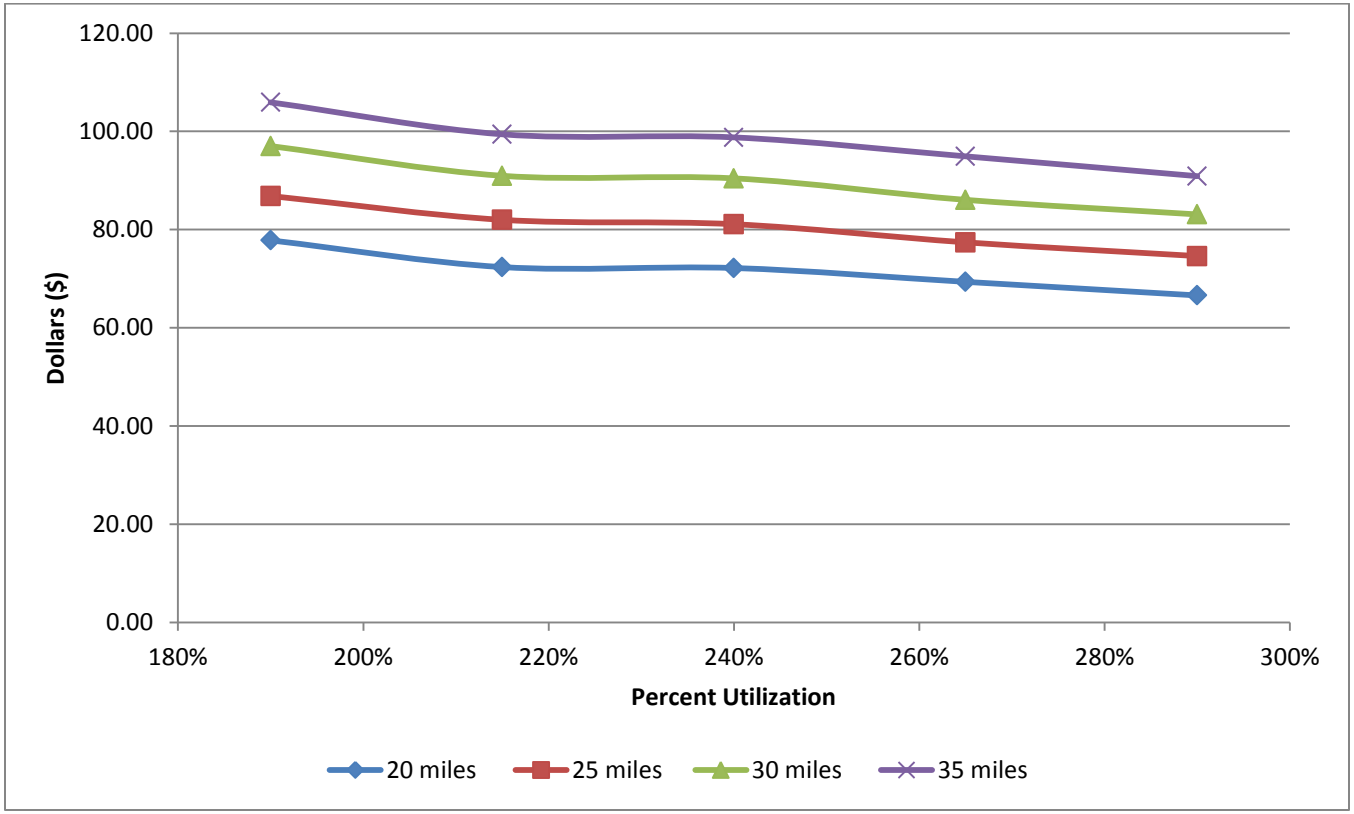

Figure A- 48. Semi-Tractor Trailer cost per load v. percent utilization for a 65 bph gin processing SWOFC harvested cotton transporting for 20 hours per day.