

Top Farms and the Effect of Farm Size

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Introduction

As shown in AgManager paper “What Makes a Top Farm? - Overview” (<https://www.agmanager.info/finance-business-planning/research-papers-and-presentations/what-makes-top-farm>), we explain the process of determining which farms are the most profitable over the last 10 years by ranking the net farm income per acre each year. In this earlier paper, we showed that there are clear difference among farms, especially at the top and bottom ends of the rankings. However, in this earlier paper, we did not attempt any analysis of why these differences might be happening. That is the purpose of this paper and the papers in this series to follow.

The purpose of this paper is to examine farm size to see if that might be a factor in explaining why some farms are consistently more profitable than other farms. Most economists would agree that some minimum farm size is needed in order to be profitable. As farms become bigger, they are able they are able to use bigger and potentially more efficient machines and they can purchase inputs in bulk which may result in lower prices. However, this may be counter-balanced by the management required to coordinate a bigger operation.

In this paper, we examine data from the Kansas Farm Management Association (KFMA). The KFMA has been helping farmers since the 1930's and actually has computerized farm records back to the early 1970's. There are currently around 2,500 farms in the KFMA system and in any given year about 1,500 of those farms will have records that are useable for research, teaching, and Extension analysis. This is one of the best systems in the country and the data provided by the KFMA can help answer those questions of farmer profitability.

Methods

As in the earlier paper referenced above, we examine the size question in east, central, and western Kansas. The average 10-year farm ranking for each region was used as the dependent variable in a regression analysis where the number of farm acres is the independent variable. In addition to the regression analysis, we examine the distribution of farm sizes when the farms are put into deciles of profitability rankings.

Results

Figures 1, 2, and 3 show the trendlines predicting average farm ranking from the farm size. Some of the very large farms have been left off the graph to help prevent any farm identification. As can be seen, the trend is mostly flat. In fact, the results show that any slope shown is not significant. In other words, farm size is NOT a factor in determine whether a farm is more profitable than another. There could be other factors interacting with farm size that might be significant in the results but when looked at in isolation, both small and large farms can be more profitable and both small and large farms can be less profitable.

One possible explanation for the lack of farm size significance may be the particular farm sizes in the KFMA program. Figure 4 shows a cumulative distribution for farm sizes in the three regions of Kansas. At any given farm size, the graph shows the percentage of farms that are that size or smaller. As indicated on the graph, only about 10 percent of the KFMA crop farms in central and eastern Kansas are less than 500 acres. Western Kansas only has 10 percent of the farms under 1,000 acres. Thus, most of the farms in the KFMA program may already be at an efficient size.

The rest of the analysis shows the effects of farm size when the farms are grouped into deciles of profitability rankings. Each decile would contain 10 percent of the farms for a region. Figure 5 shows the average farm acres for each region for each decile. Figures 6, 7, and 8 use violin graphs to show the variation among farms within a decile. The width of each group is an indication of the number of farms with that particular farm size. The solid red bar line in each violin is the mean for that group while the dotted red lines are the 25th and 75th percentiles. As the graphs indicate, there is a fairly wide range of farm sizes for each decile of profitability ranking.

Conclusions

This paper examining how farm size affects a farm's profitability rank shows that, by itself, farm size is not an important factor. However there might be interactions with other factors that might be useful to examine in future papers. Based on these results, grain farms should not look solely at getting bigger as a way to help improve overall profitability. It should be noted that all the farm sizes in the KFMA program have the potential to be a top farm. As we will show in future papers, there are some factors that are important to overall farm profitability.

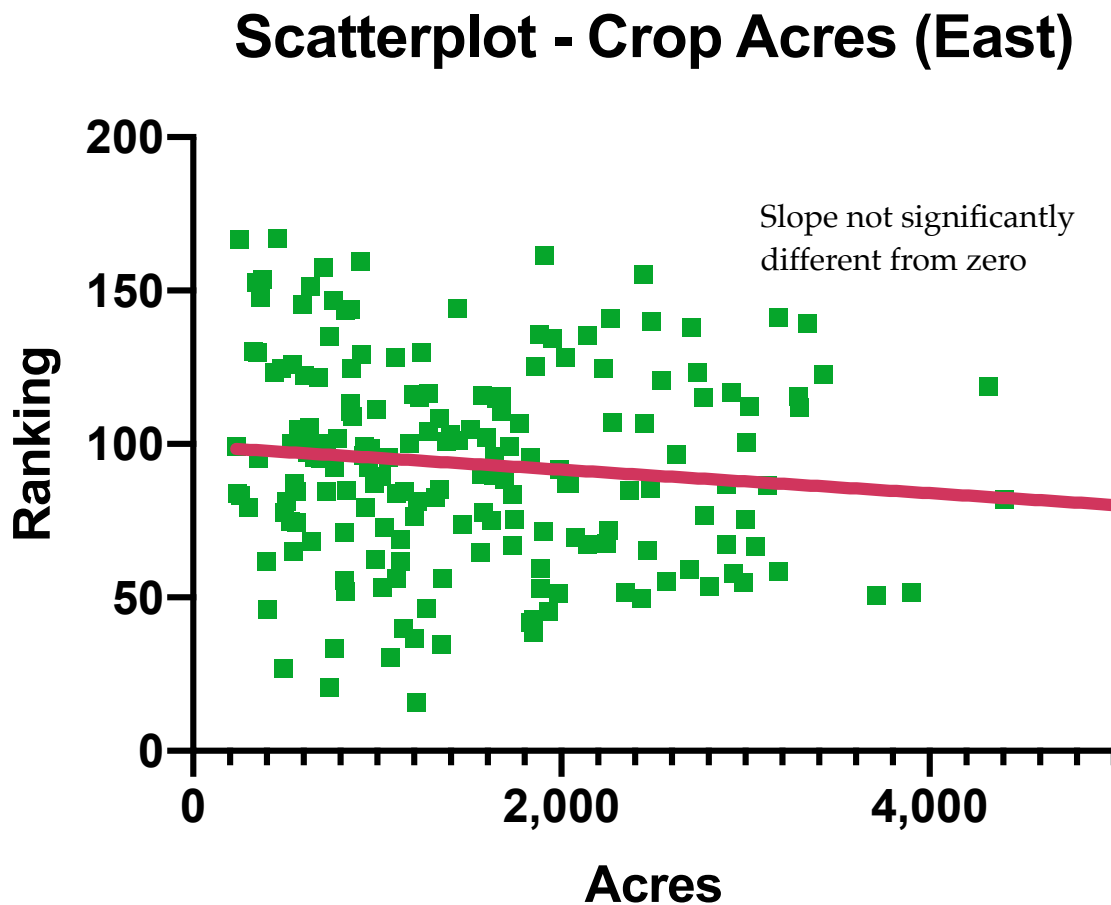


Figure 1. Scatterplot of Farm Ranking by Crop Acres for Eastern Kansas

Scatterplot - Crop Acres (Central)

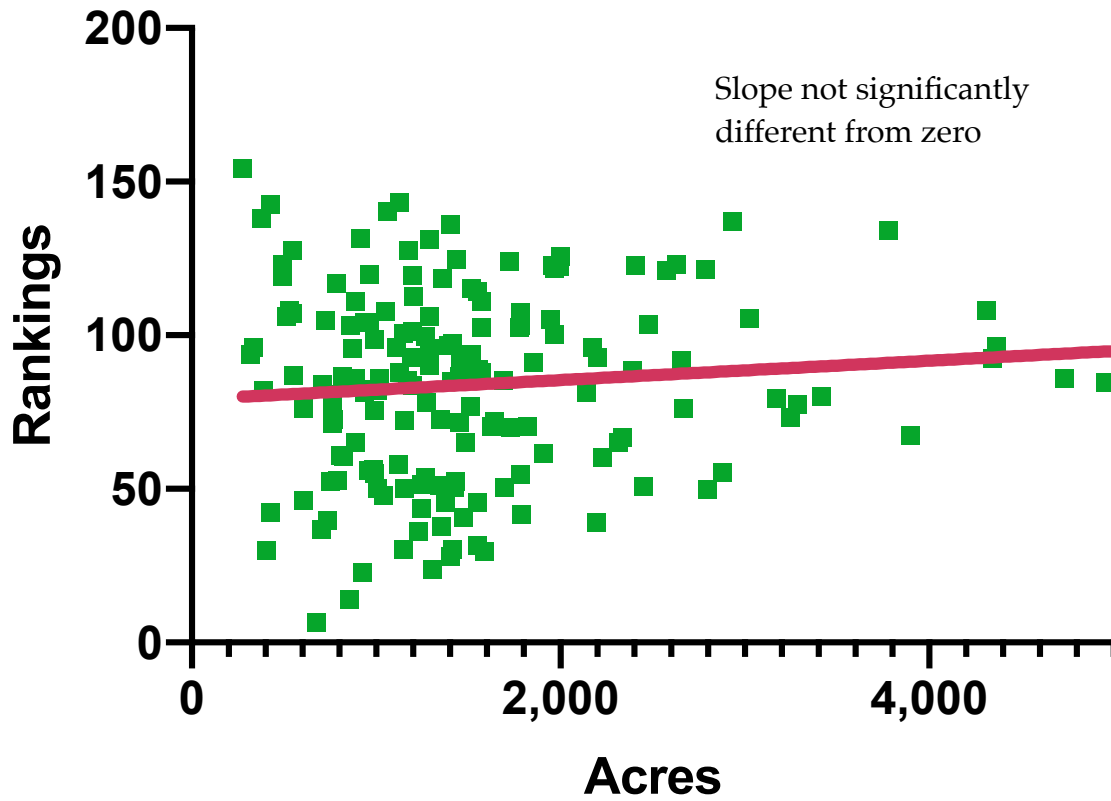


Figure 2. Scatterplot of Farm Ranking by Crop Acres for Central Kansas

Scatterplot - Crop Acres (West)

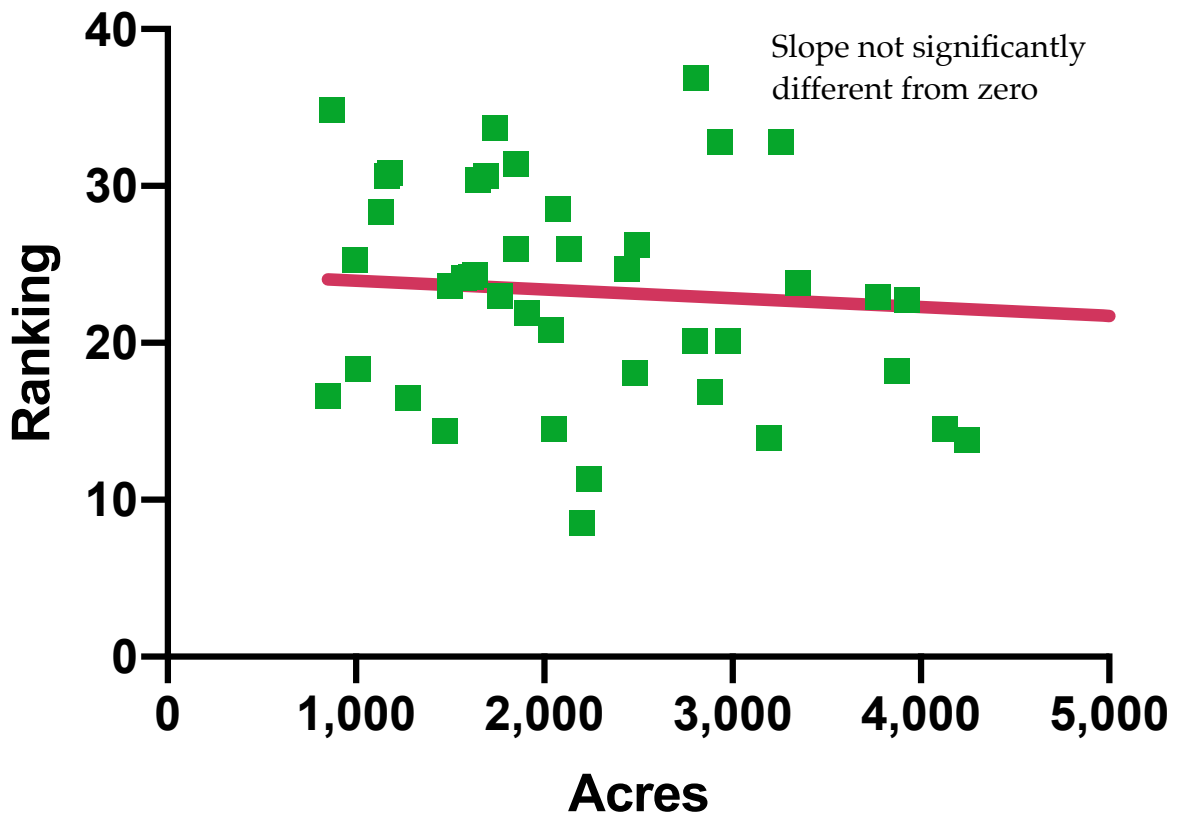


Figure 3. Scatterplot of Farm Ranking by Crop Acres for Western Kansas

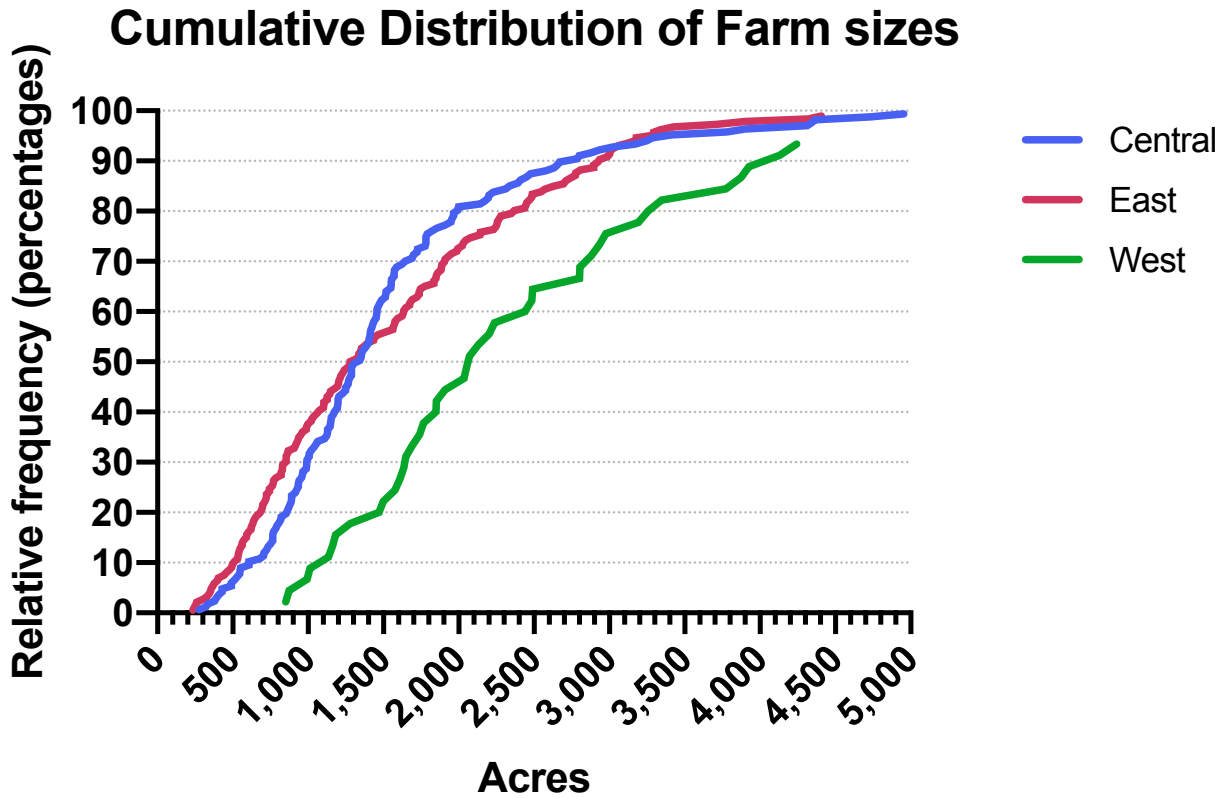


Figure 4. Cumulative Distribution of Farm Sizes by Region

Ave Crop Acres by Decile

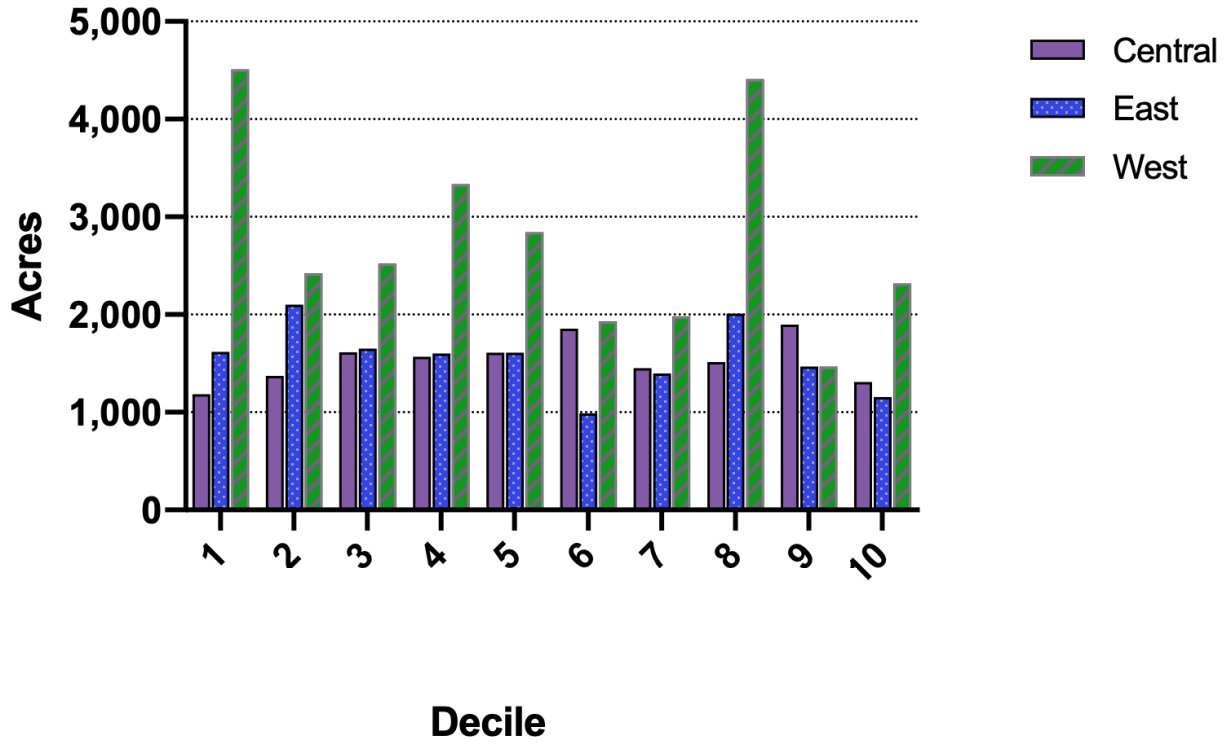


Figure 5. Average Crop Acres by Profitability Decile for Central, East, and Western Kansas

Violin Plot of Crop Acres by Decile (East)

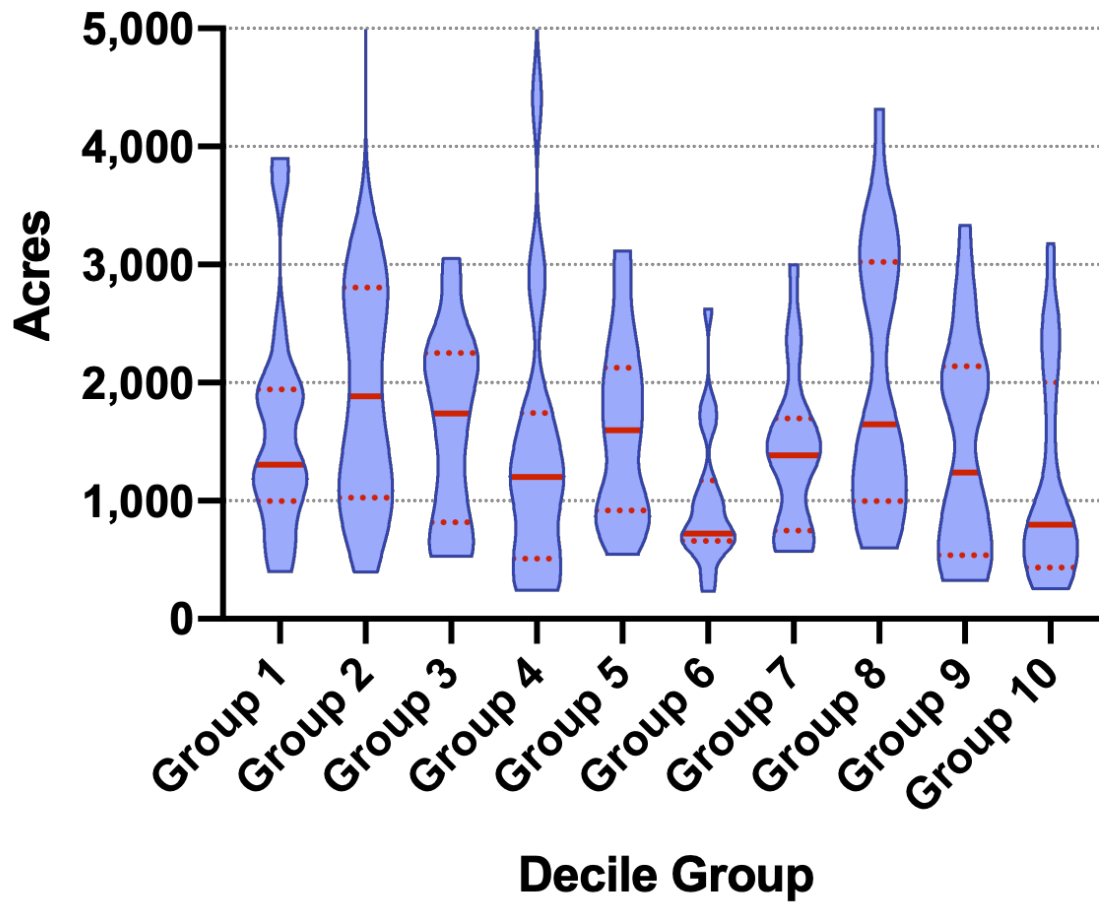


Figure 6. Violin Plot of the Distribution of Crop Acres for Each Profitability Decile (East)

Violin Plot of Crop Acres by Decile (Central)

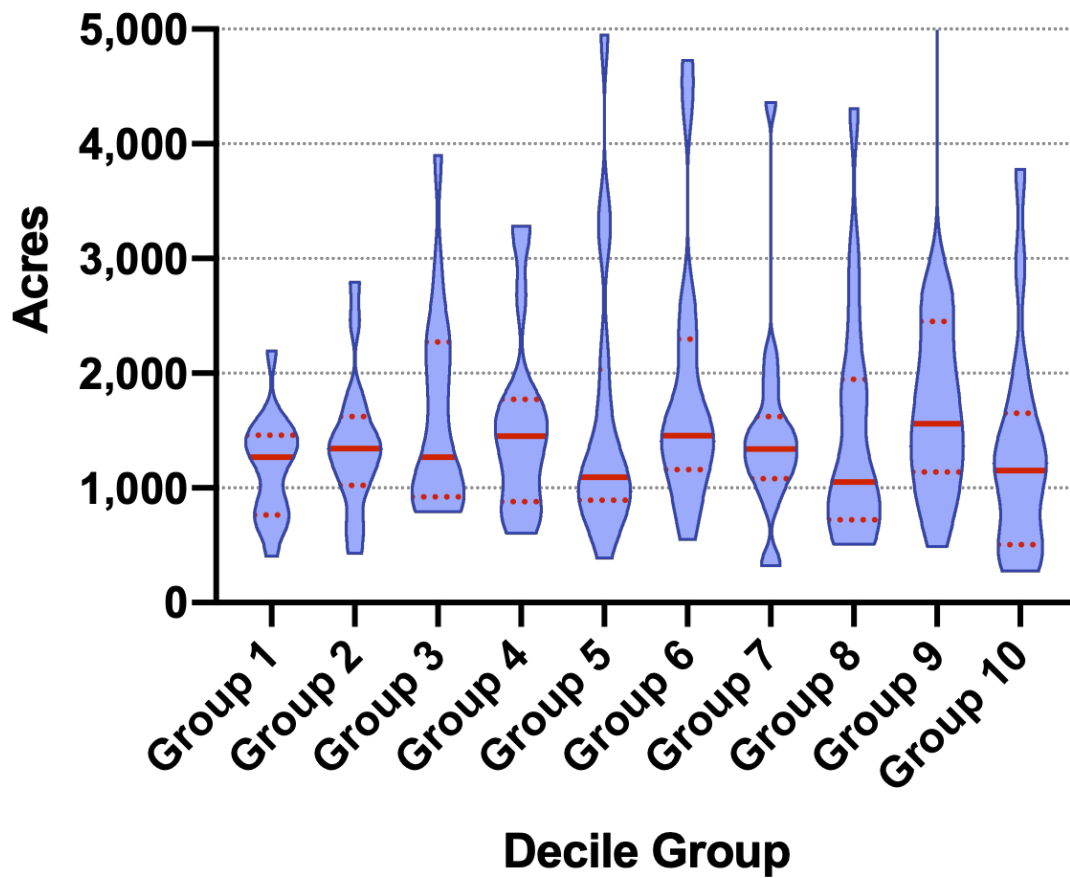


Figure 7. Violin Plot of the Distribution of Crop Acres for Each Profitability Decile (Central)

Violin Plot of Crop Acres by Decile (West)

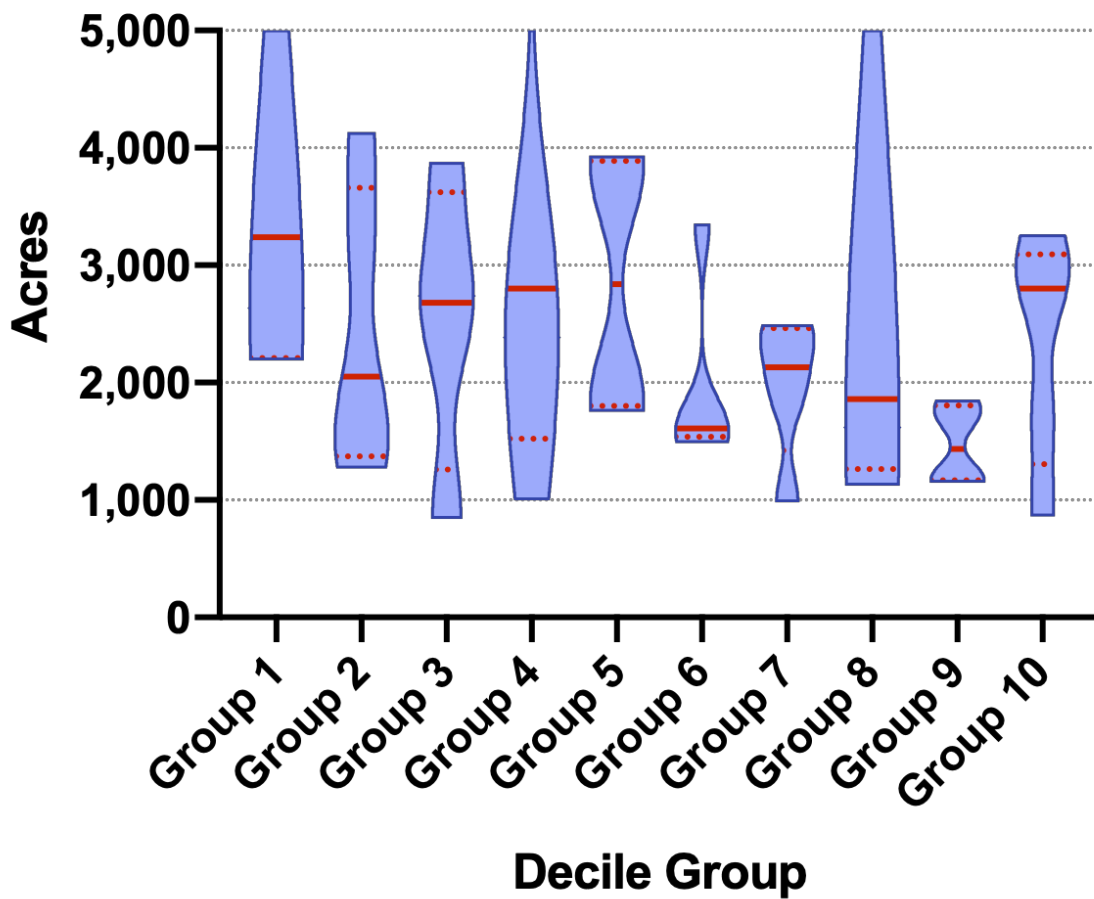


Figure 8. Violin Plot of the Distribution of Crop Acres for Each Profitability Decile (West)

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