What Makes A Top Farm? - Overview

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Introduction

Farming is a complicated business that can be difficult to analyze. Farmers operate in an environment where they have very little control over the prices they receive and where their production is often dictated by what happens with the weather. Farming is capital intense and profitability is often limited. In addition, because farmers can use cash accounting to run their businesses, farmers with really good and detailed records are not commonplace. Thus, when questions are raised about what makes a profitable farm or what makes one farm more profitable than another, these can be difficult to answer.

Fortunately, there are associations like the Kansas Farm Management Association (KFMA) that can help answer these type of questions about farm profitability. 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.

The purpose of this series of papers in AgManager is to explore possible explanations of why one farm is more profitable than another farm in order to provide advice that can help all farms improve their overall profitability. In this introductory paper, we will discuss the methods used and how we determined which were the top farms for analysis. In papers to follow, we will examine various aspects of the farm to determine how each of these factors affects farm profitability.

Methods

There are many factors that make comparing farm profitability difficult. Because weather can greatly affect farm profitability in any given year, a multi-year framework is needed. In addition, net farm income by itself is probably not a good way to judge farms as larger farmers tend to have higher profits in good years. Comparing a beef farm to a grain farm is also a difficult comparison. Finally the rainfall across Kansas varies greatly from east to west further complicating an analysis.

In these papers, a 10-year panel data set of non-irrigated grain farms is used for analysis. A total of 398 farms fit this definition. A 10-year panel means that KFMA has useable farm records from 2008 through 2017. By using 10 years of data, weather effects should average out so that one wet or dry year does not throw off the analysis. Also, a panel design means that farms do not move into or out of the analysis. We are thus only making comparisons about a continuous set of farms. Farms were further divided into east Kansas, central Kansas, and west Kansas to control for rainfall differences across the state.

To control for farm size differences, net income per acre was calculated. This is simply the total net farm income divided by the total number of crop acres. Thus, a 1,000 acre farm can be compared to a 2,000 acre farm. Farm size will still be used as a possible explanation of profitability differences but it will be as how farm size affects the net per acre.

The next step was to determine those farms that were the "best" so that we can start to explore the characteristics of those farms. An overall farm ranking was used to determine the "best" farms. In each year, the net income per acre was calculated and then each farm was ranked from 1 to the total number of farms in a region (East=186 farms, Central=167 farms, West=45 farms). This was done for all 10 years. Next, for each farm, the average of the farm rankings was calculated. This mean rank was then used to place the farm into one of 10 deciles. Those farms in decile 1 would be considered to be the "best" farms because they consistently ranked higher than their peers. Another approach to the analysis could have been to use the overall average of net income per acre. However, one good or bad year could skew the results if this approach had been used. By using the mean of the yearly farm rankings, we know where a farm stands relative to its peers over a 10-year horizon.

Results

Figure 1 shows the frequency distribution of the 10-year mean rankings for the 186 farms in the Eastern region. The graph appears to be somewhat normally distributed and is an indication that some farms do consistently perform better than other farms. For example, only 1 or 2 percent of the farms have a mean yearly ranking around 15. At the other extreme of the graph, 2 or 3 percent of the farms have a mean ranking of 165. The biggest percentage of the farms have a mean ranking of 90 (rough in the middle of the number of farms). If there were no differences among farms then we would expect all the farms to have the same average ranking (i.e., there would be one bin that contained all the farms and each farm would have the same mean). Farms in the middle range either consistently rank in the middle of the pack each year or they have enough variation where a good year is offset by a bad year resulting in an average in the middle

of all farms. The frequency distributions for the other two regions are similar to the eastern region.

Figures 2, 3, and 4 are included for comparison and are based on the rankings within a specific year. The overall mean ranking is NOT used in these three figures. These figures represent data where the net income is ranked in each year and then the decile for that specific year is calculated. The deciles in these figures are not composed of the same farms each year. These figures are included to show the wide variation in net income each year. As these show, in any given year, the bottom 10 percent of farms for that year lose money. This includes the more profitable years early in the figures. The ninth decile tends to break even in profitable years but this group is not profitable in bad years.

If the same set of farms were in the bottom decile each year (of figures 2, 3, and 4), then it is doubtful these farms would still be viable operations. Fortunately, there is some movement of farms among the decile rankings. These results are shown in Figures 5, 6, and 7. In these figures, the 10-year mean of farm rankings is used to calculate the deciles and then the net per acre per year is calculated. In Figures 5, 6, and 7, the deciles DO represent the same set of farms each year. Now it can be seen that the bottom deciles of farms have at least broken even for many of the years. In the east and central Kansas regions, the bottom decile of farms did not become unprofitable until 2014. Decile 10 became unprofitable in 2013 in the western region.

While the higher ranked decile groups tended to earn higher profits in most years, that is not always true. Especially among the middle deciles, there is variation among which group is ranked highest each year. The western region especially shows a lot of variation. Group 8, for example, had the highest net per acre in 2011 but had the lowest net per acre in 2013 and 2014.

Figures 8, 9, and 10 are violin graphs intended to show the variation among yearly ranking for each decile group (decile groups that are based on the 10-year average). The width of each group is an indication of the number of farms with that ranking where wider on the graph represents more farms. For example, group 1 from eastern Kansas has the majority of the farms with yearly ranking from 1 to 50. The mean ranking for this group is 25 (the blue bar on group 1). Still, there were a couple of years where a farm had a ranking above 100. Group 10 had a mean ranking around 160 but also had a few years and farms closer to a ranking of 100. The middle groups show a wide variation. Group 5 and 6 show that farms in these groups had some years where that farm was ranked in the top and other years where the ranking was at the bottom. This wide variation among the middle deciles probably means that a comparison of just the

middle deciles will be unrevealing. However, the large differences between the top and bottom deciles is an indication that there are real difference between these farm groups.

Finally Figure 10 shows the overall averages of net income per acre for all the deciles. Currently only group 10 has a 10-year average where the net income per acre is negative. The top farms in eastern Kansas have shown a $200 per acre profit on average for the last 10 years. However, the initial years of this 10-year panel were very profitable so future analysis of these farms may show less profitability.

Conclusions

This initial paper shows how the farms were ranked and how net income per acre was calculated. We have shown that there is a difference in profitability between the top performing farms and the bottom. Other papers in this series will examine various factors of production to see if they affect farm profitability. We plan to publish this series every week or so over the next several months.

Histogram of East KS - Distribution of Farm Rankings
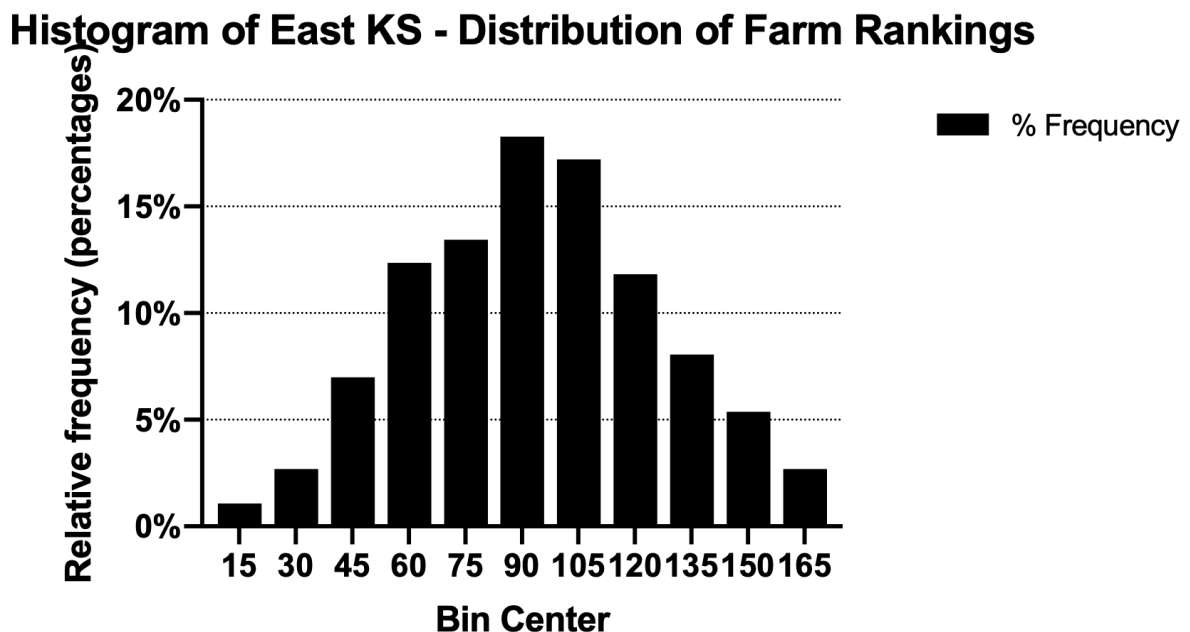
Figure 1. Histogram of Farm Rankings for East KS
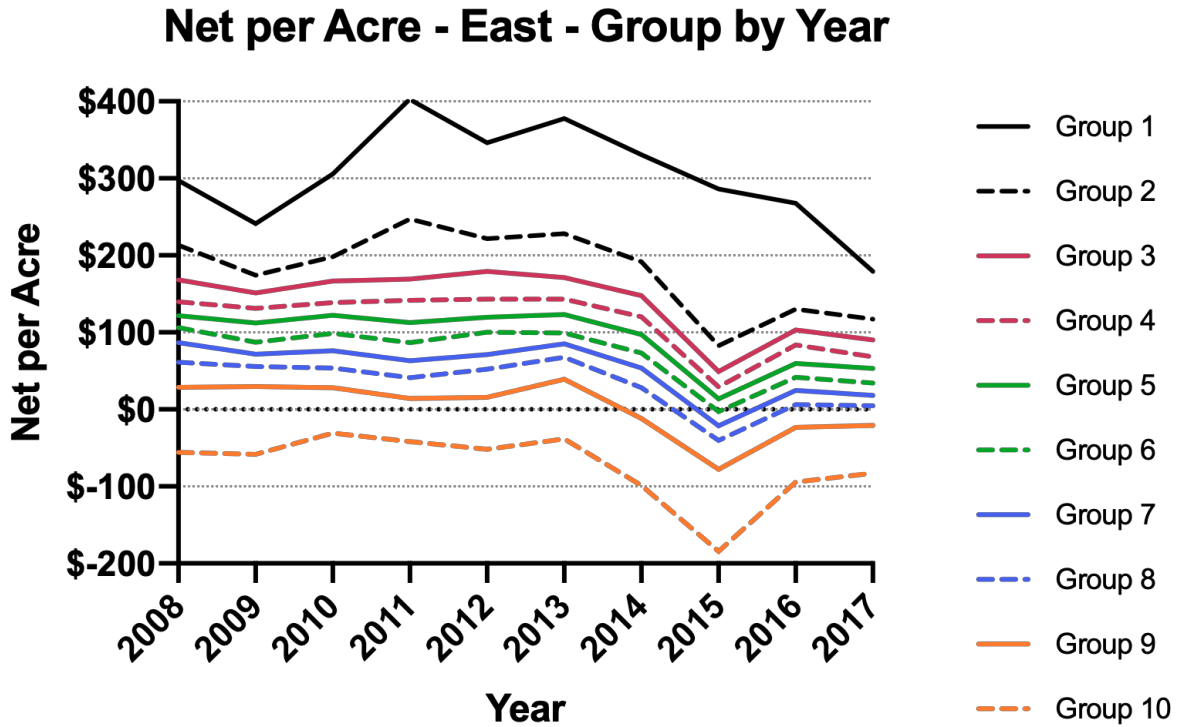
Figure 2. Deciles for Net per Acre, East KS: Each Year Independent
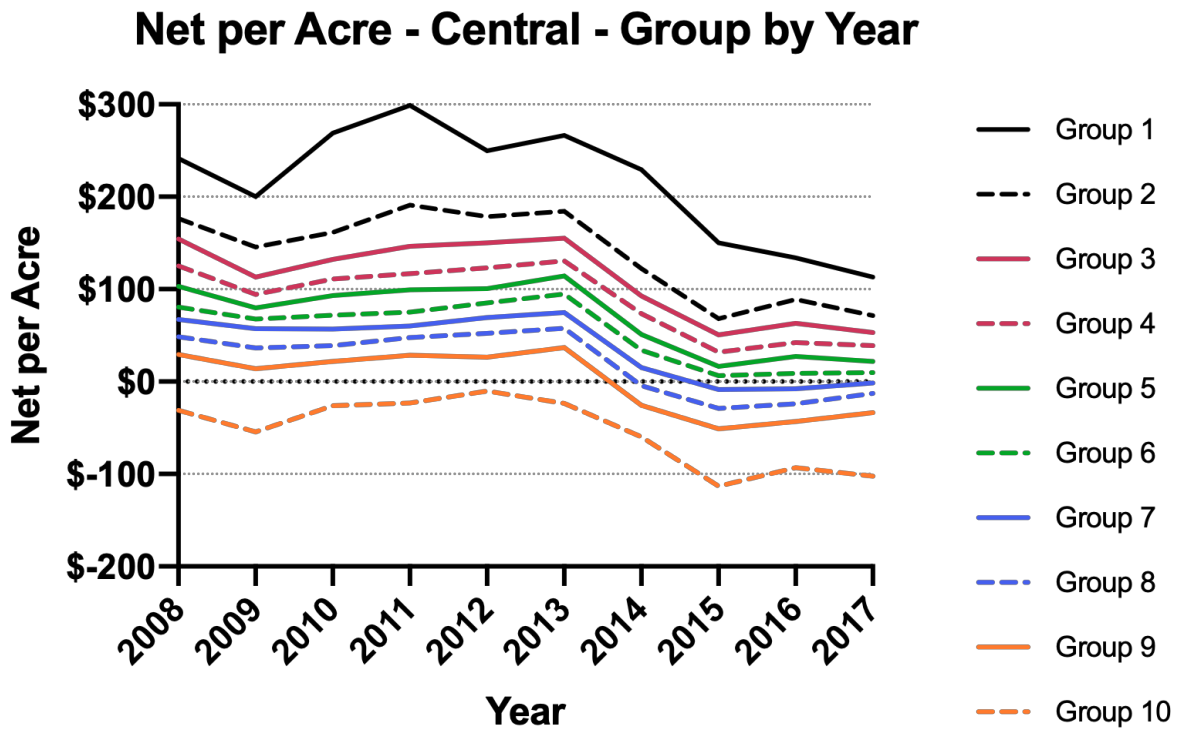
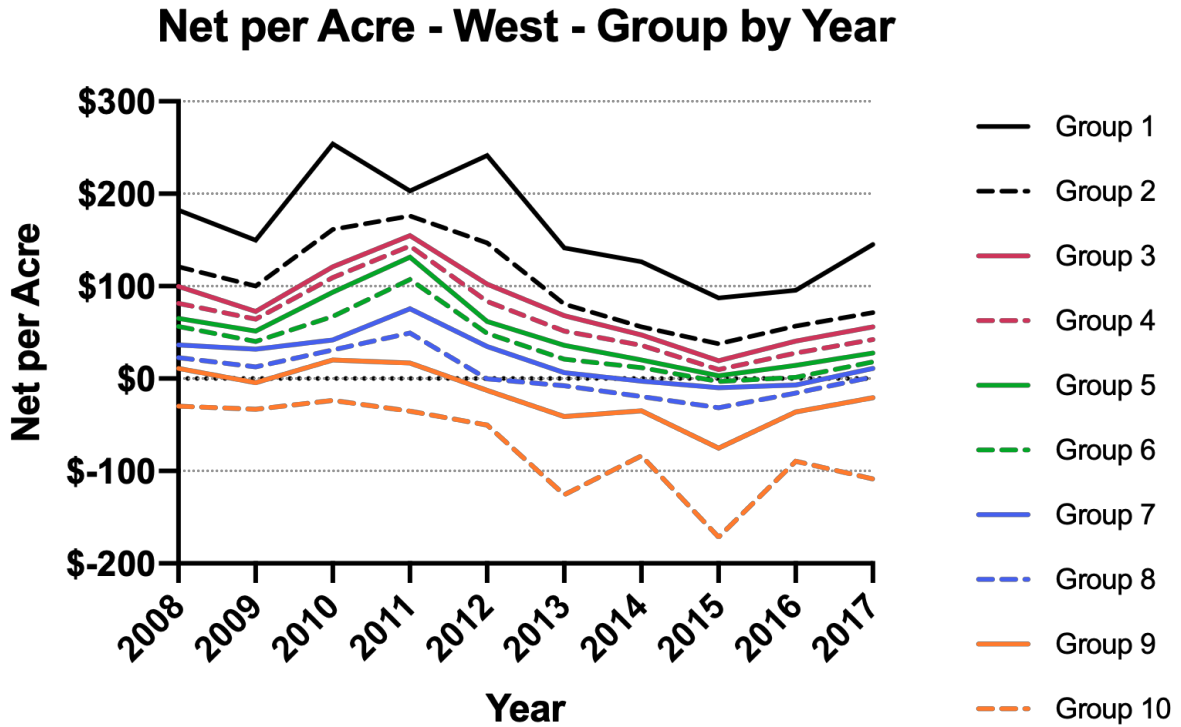**Figure 3.** Deciles for Net per Acre, Central KS: Each Year Independent

Figure 4. Deciles for Net per Acre, West KS: Each Year Independent
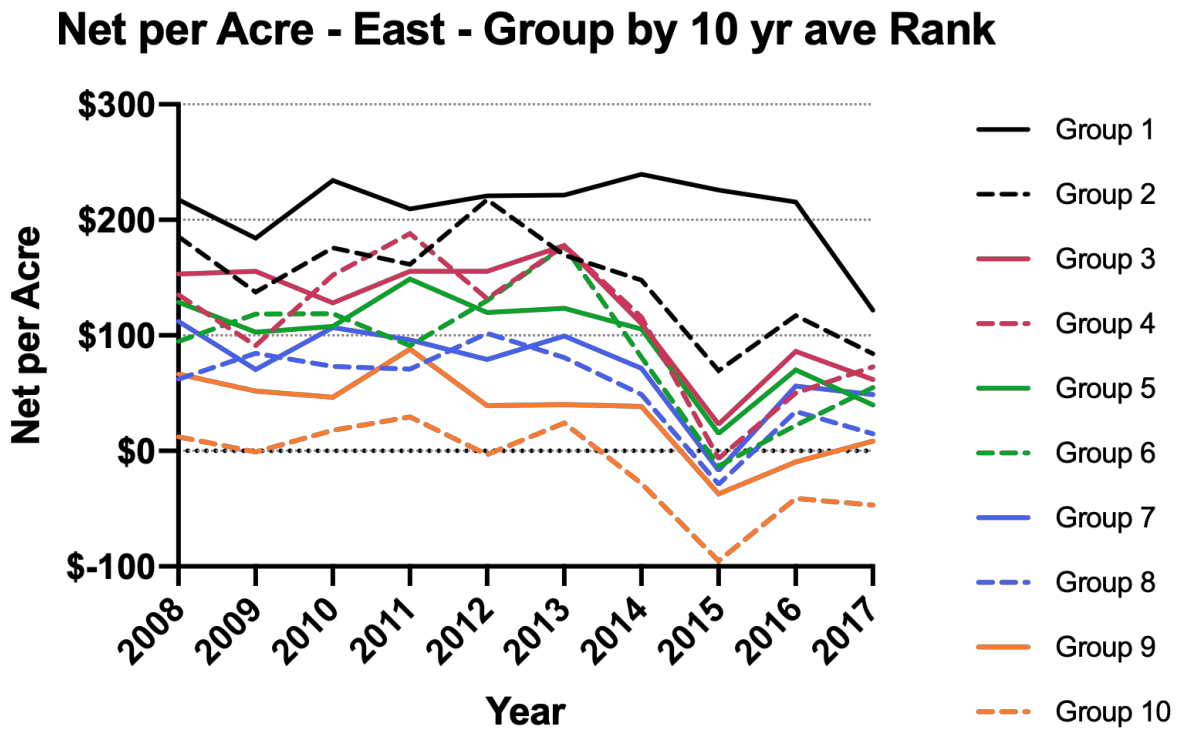

Figure 5. Deciles for Net per Acre, East KS: 10 Yr Means

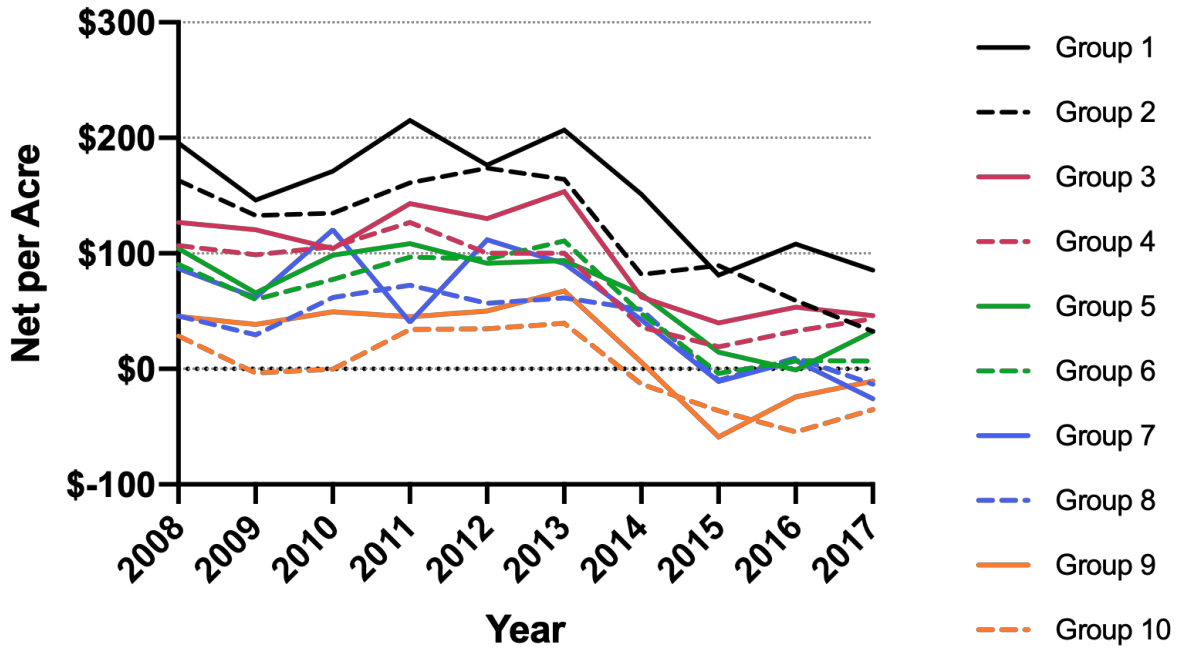# Net per Acre - Central - Group by 10 yr ave Rank

Figure 6. Deciles for Net per Acre, Central KS: 10 Yr Means
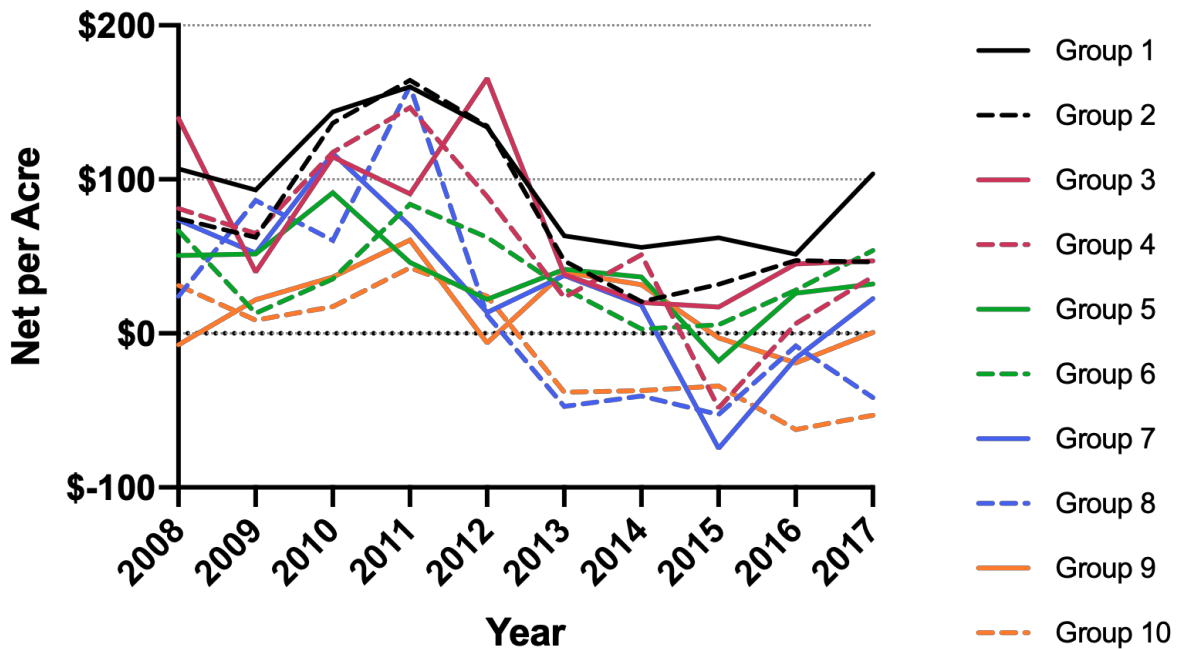
Net per Acre - West - Group by 10 yr ave Rank

Figure 7. Deciles for Net per Acre, West KS: 10 Yr Means

Yearly Farm Rankings by Decile - East
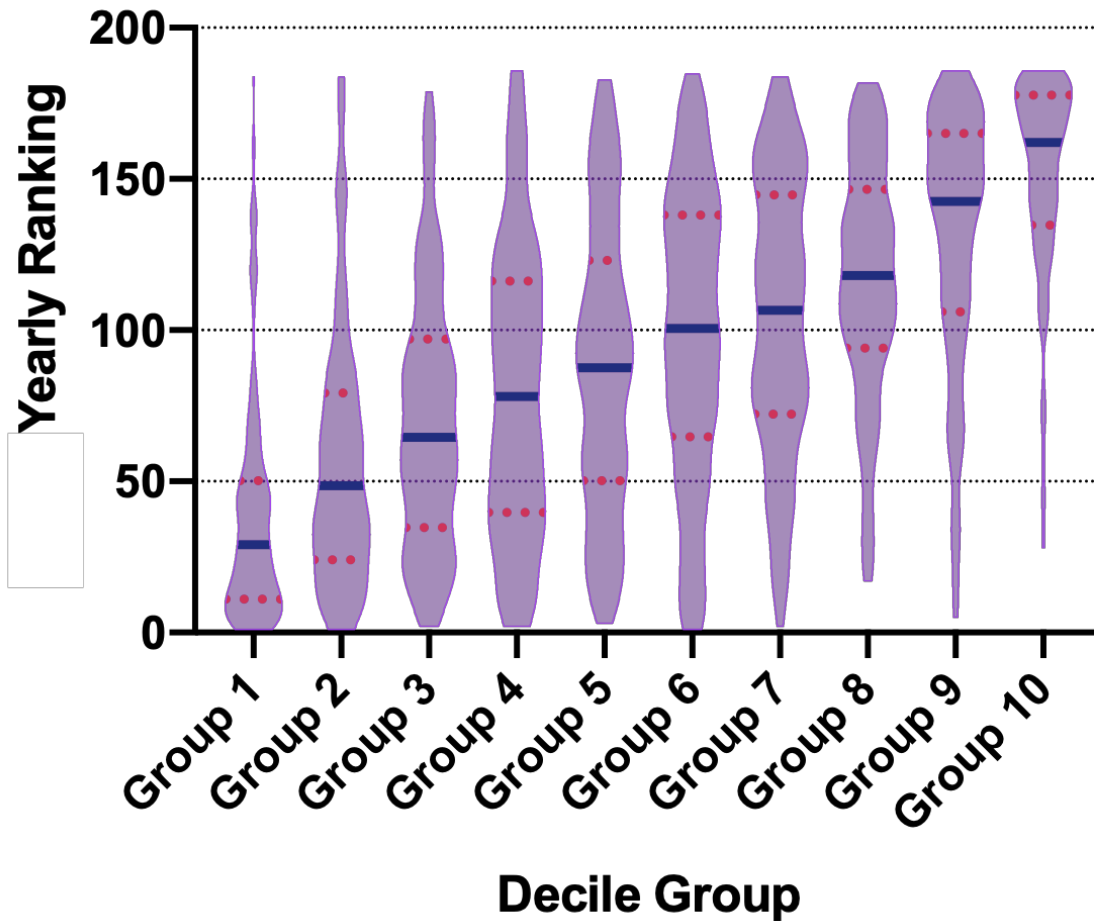
Figure 8. Distribution of Farm Rankings by Decile Group for East KS
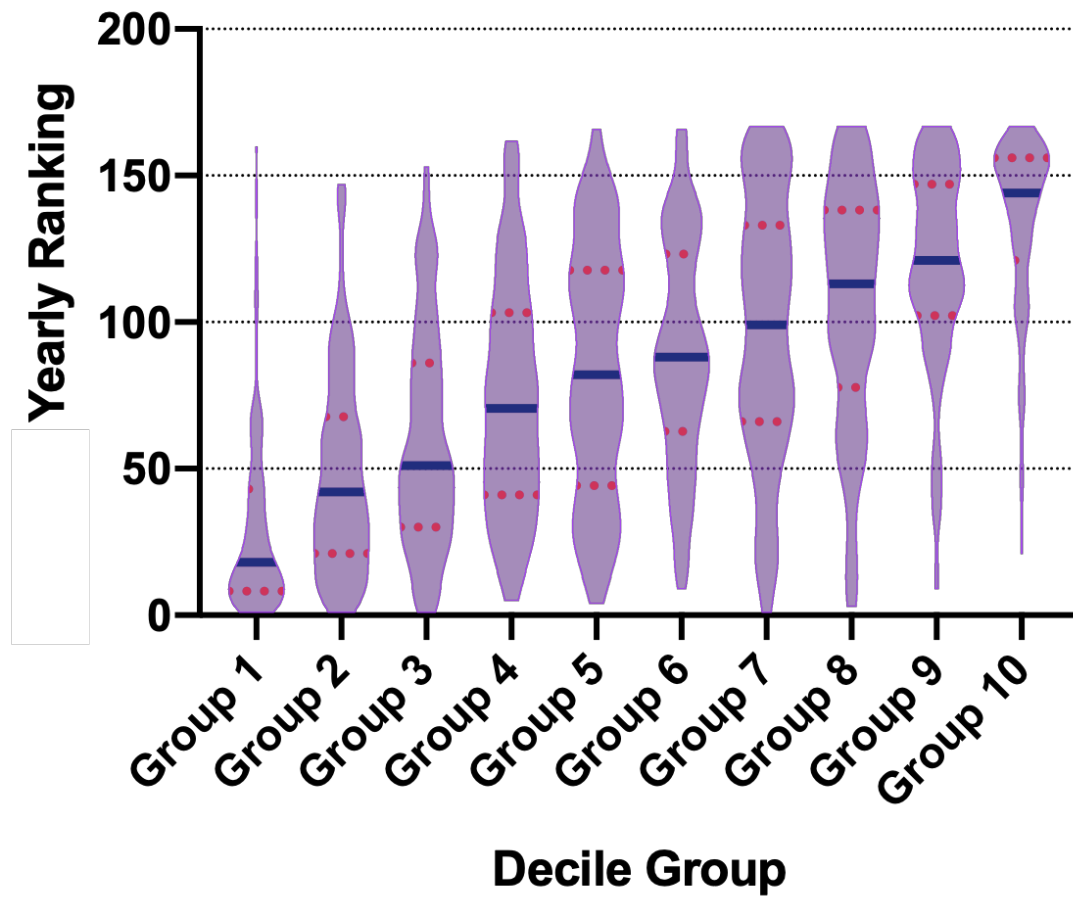
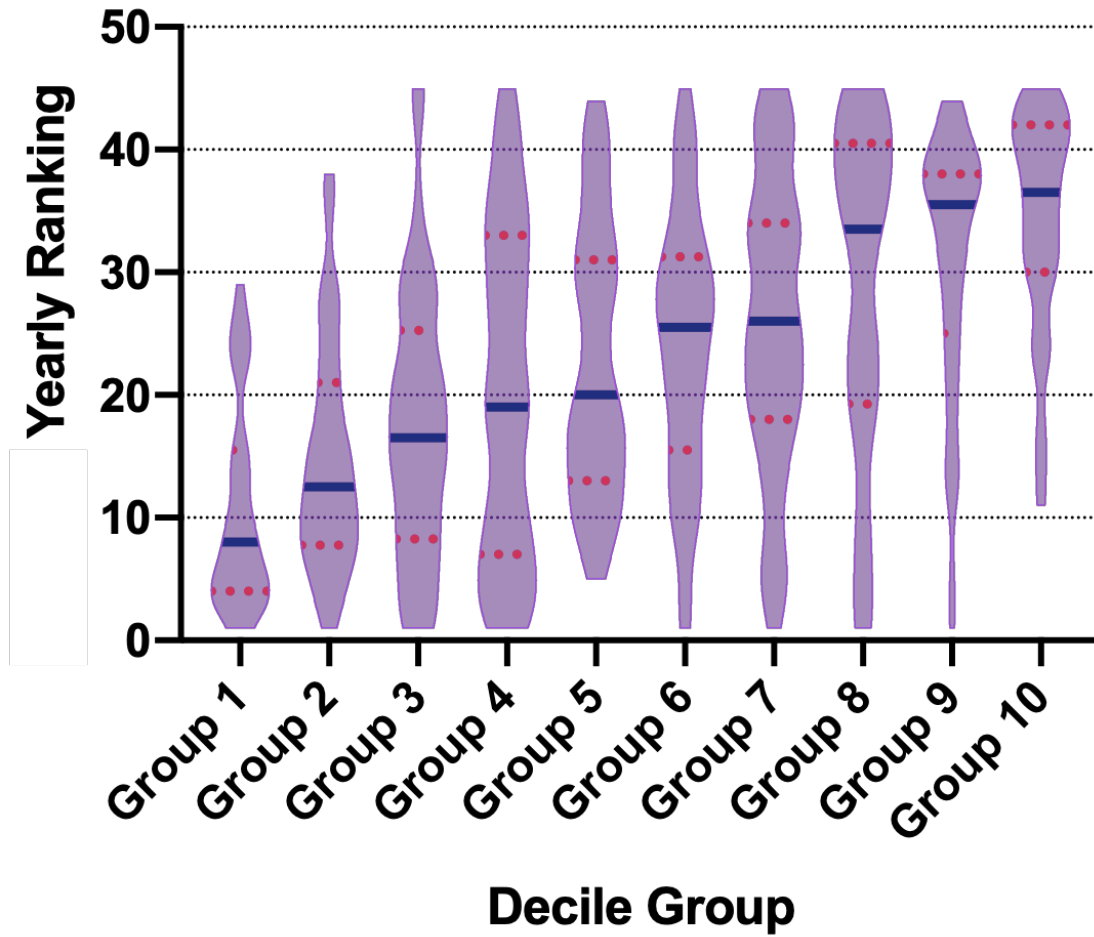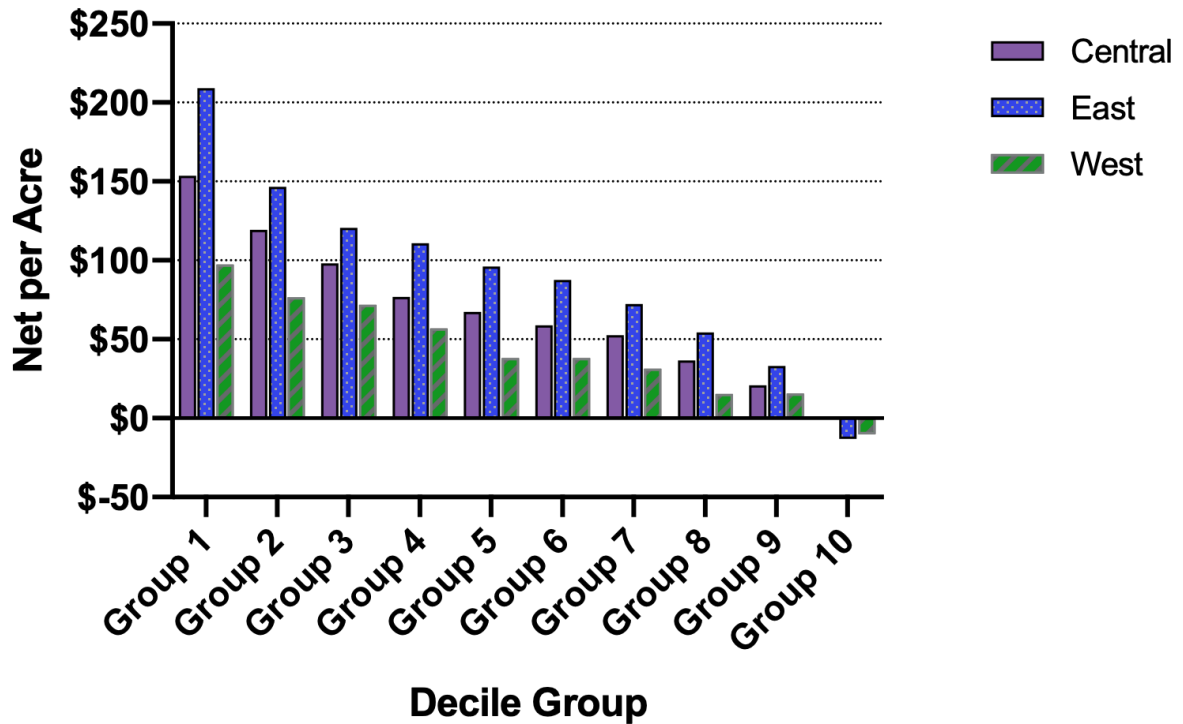**Figure 9.** Distribution of Farm Rankings by Decile Group for Central KS

Figure 10. Distribution of Farm Rankings by Decile Group for East KS

Ave Net per Ac by Decile

Figure 11. Average of 10-Year Net Income per Ac for Each Decile Group and Area

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