



DATA VISUALIZATION

WHATS WRONG WITH BEES?

Team D
Tony, Eugen, Vimal, Umut, Milan, Alexandre, Dennis

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What's Wrong with Bees?



1. INTRODUCTION

Interesting Facts About Bees

- Almost 90% of wild plants & 75% of crops depend on pollination
- One out of every three mouthfuls of our food depends on pollinators
- Crops that depend on pollination are 5 times more valuable

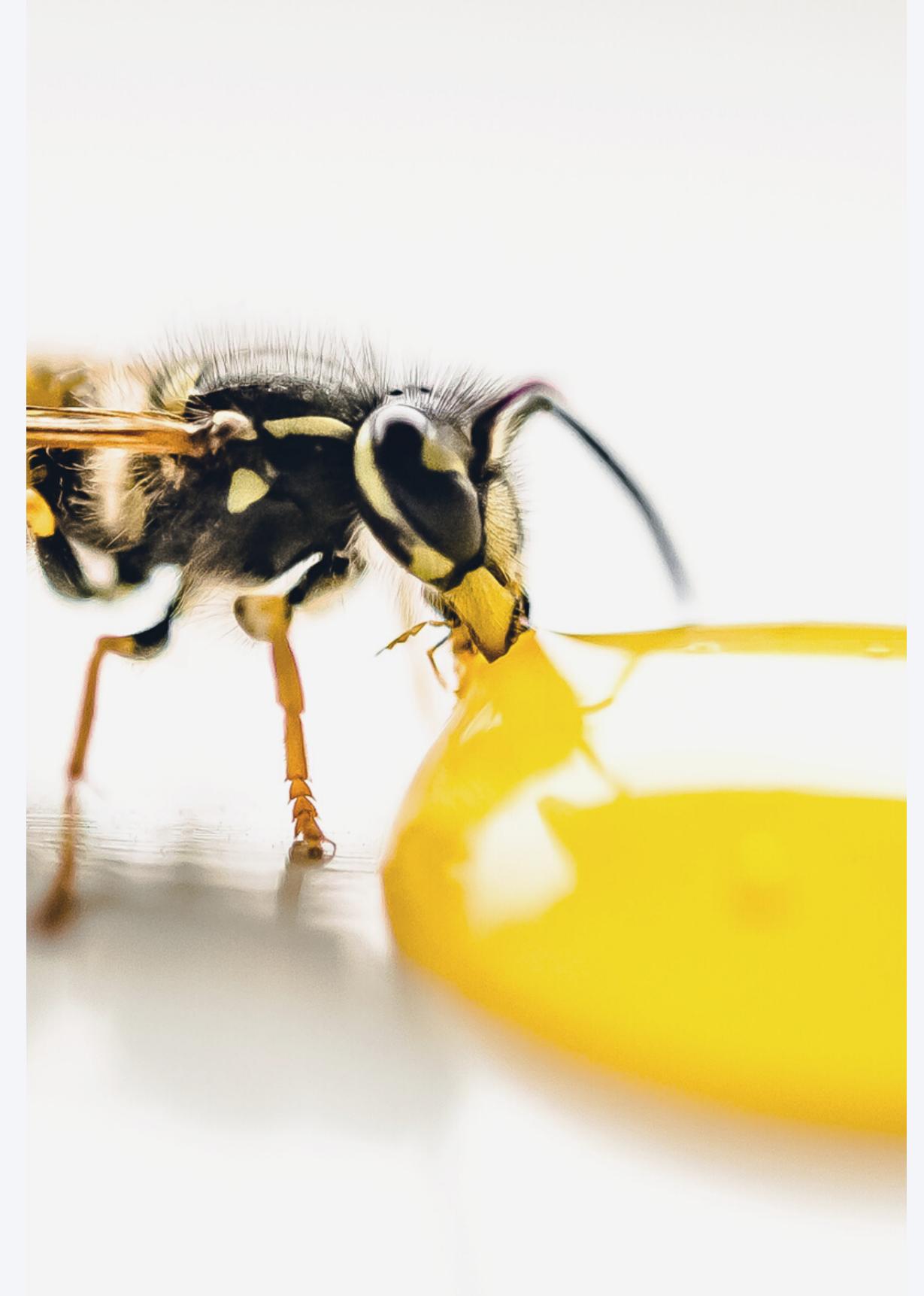
Source: <https://www.wwf.org.uk/learn/fascinating-facts/bees>



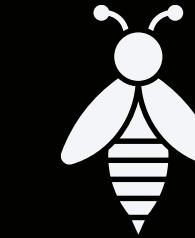
Food for Thought

If we (bees) die, we're taking you with us...

UNKNOWN BEE QUOTE



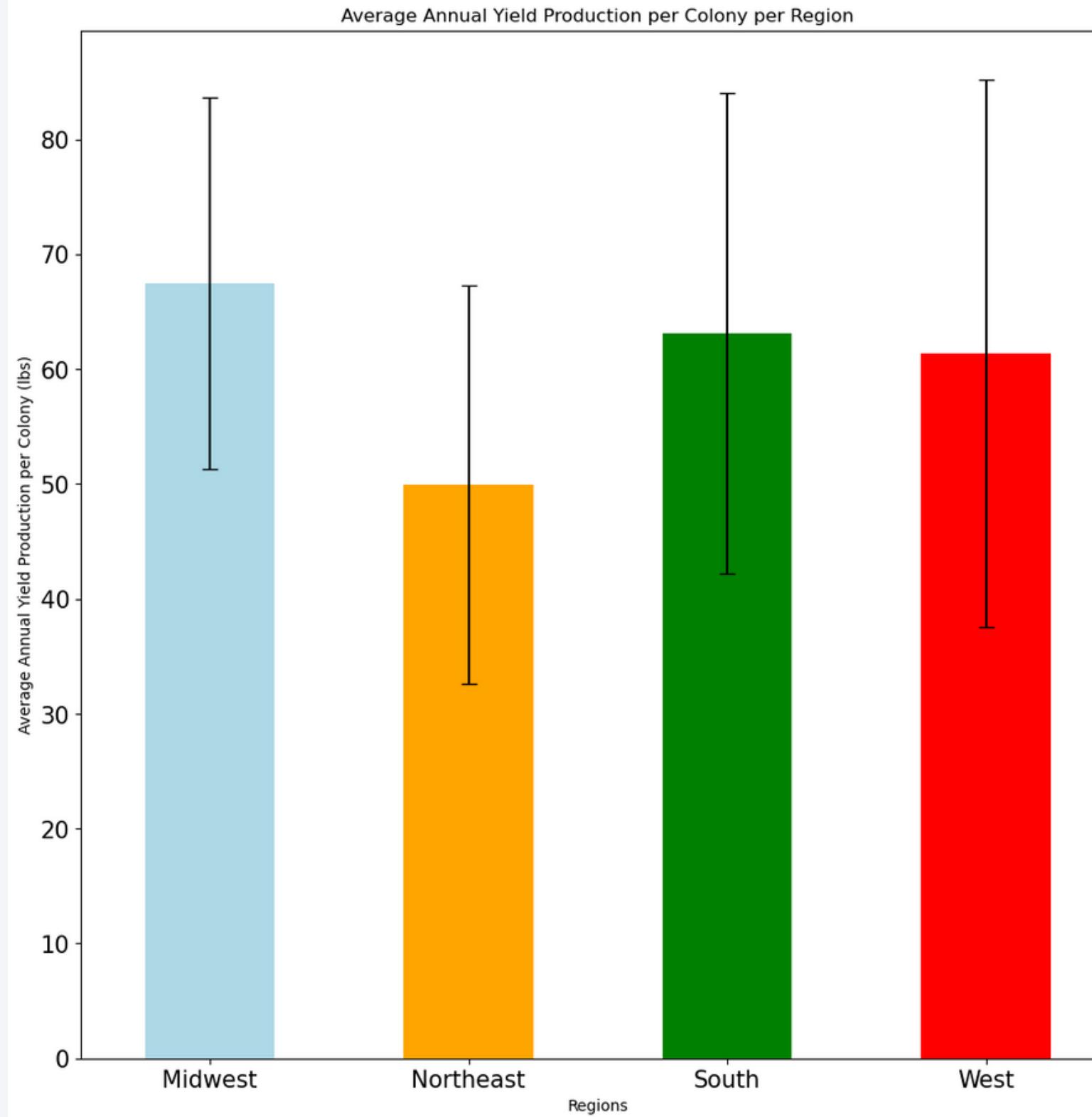
What's Wrong with Bees?



**WHATS WRONG
WITH THE BEES?**



ANNUAL YIELD PER COLONY



The average yield per colony varies $\sim +/- 25\%$ per colony along the regions

Highest producing region

Midwest

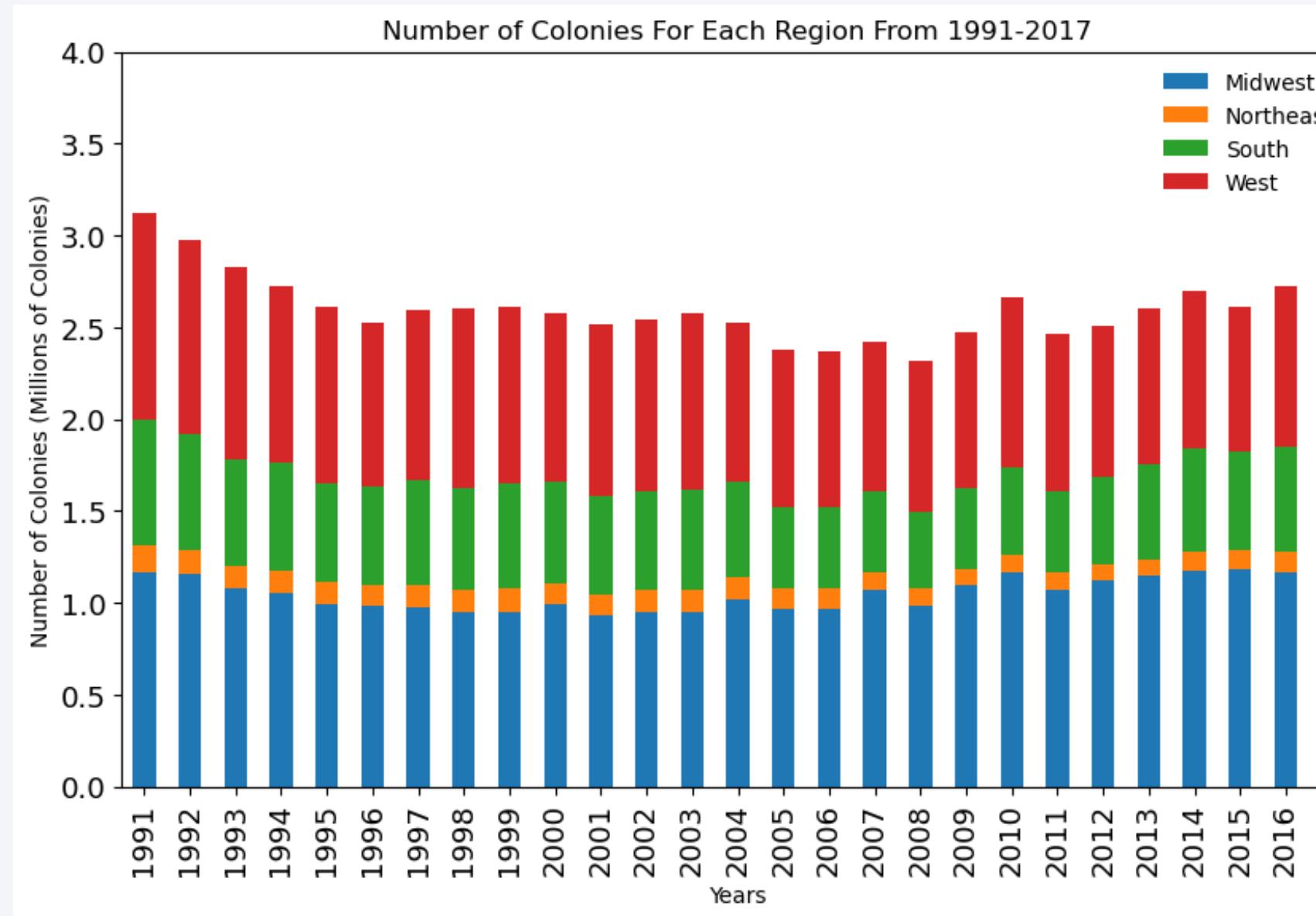
Lowest producing region

Northeast

What is causing these changes in yield and production?



COLONIES ACROSS US REGIONS



MORE BEES IN THE WEST

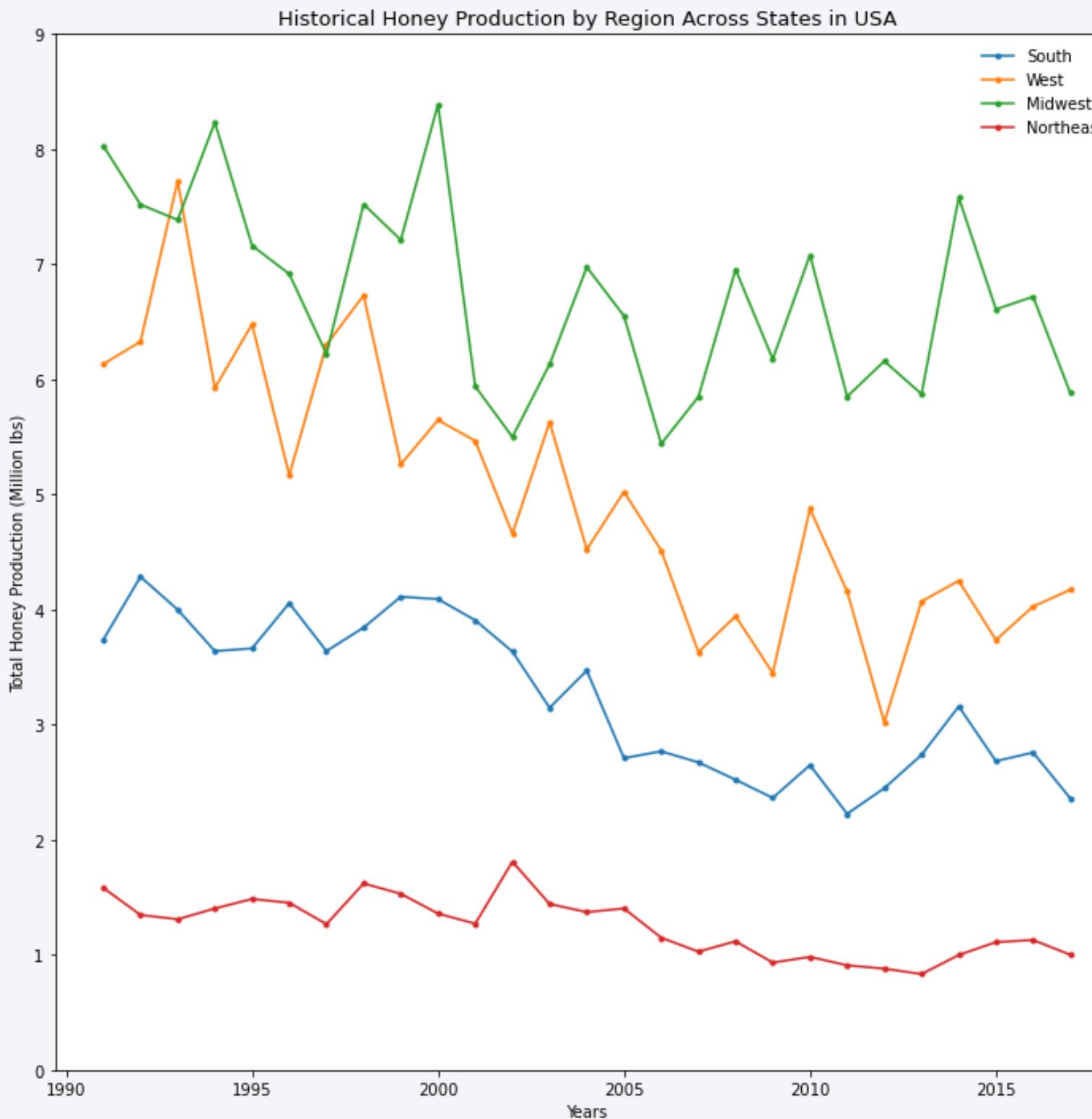
Bee colonies are more present in the West and Midwest

DECREASING TREND

The number of colonies has been fairly consistent but showing a slight decline.



HISTORICAL HONEY PRODUCTION



SLIGHT DOWNWARD TREND

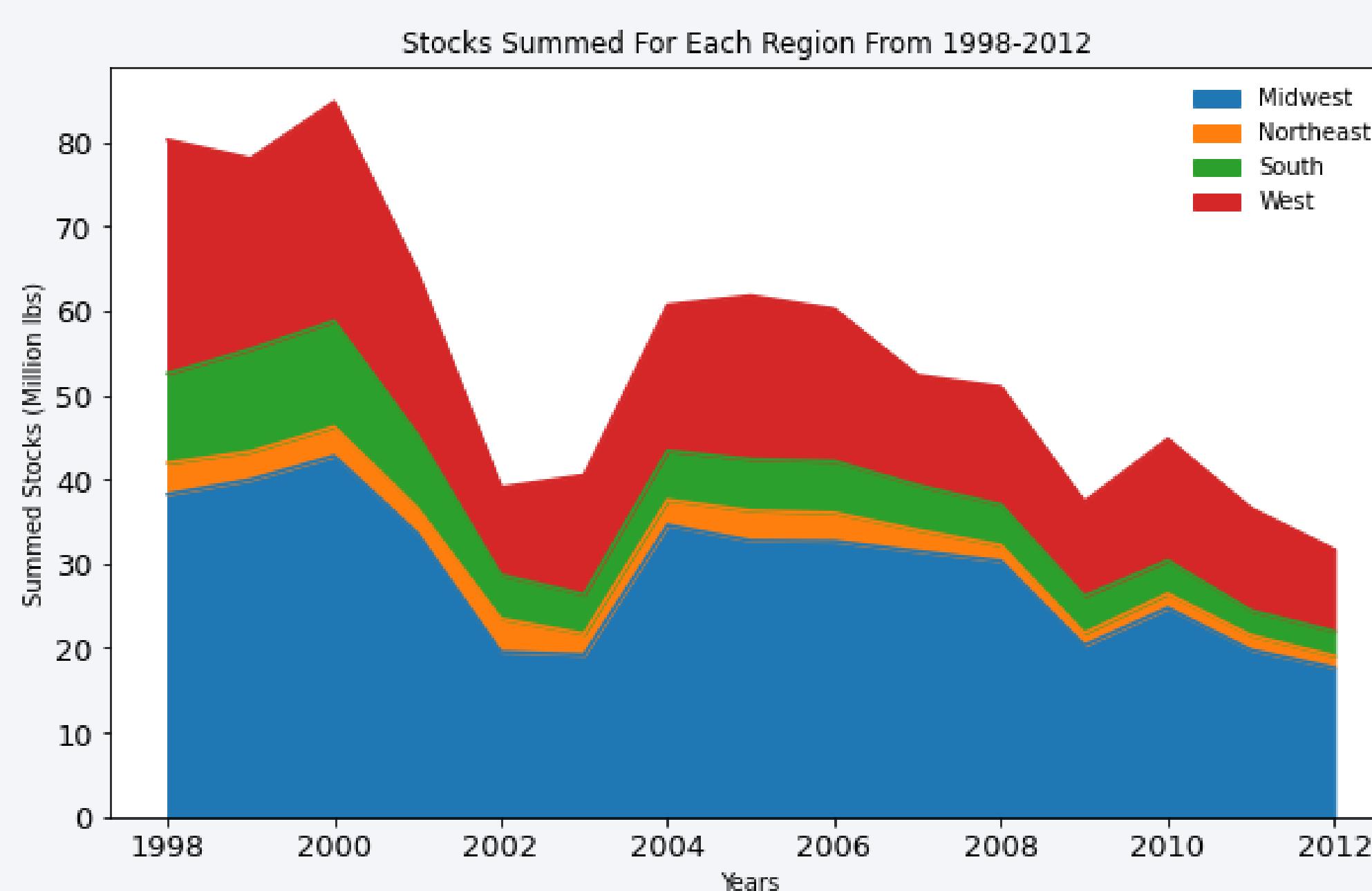
- There is a decrease in honey production in the US
- There are slight increases in some years

MIDWEST IS THE HIGHEST PRODUCER

- What is the Midwest doing differently?
- What are the implications on the agricultural business?



ANNUAL HONEY STOCKS PER REGION



STOCKS HAVE BEEN
DECREASING...

- The supply-demand balance is not in favor of the supply side in the recent years

What is happening to
the bees?

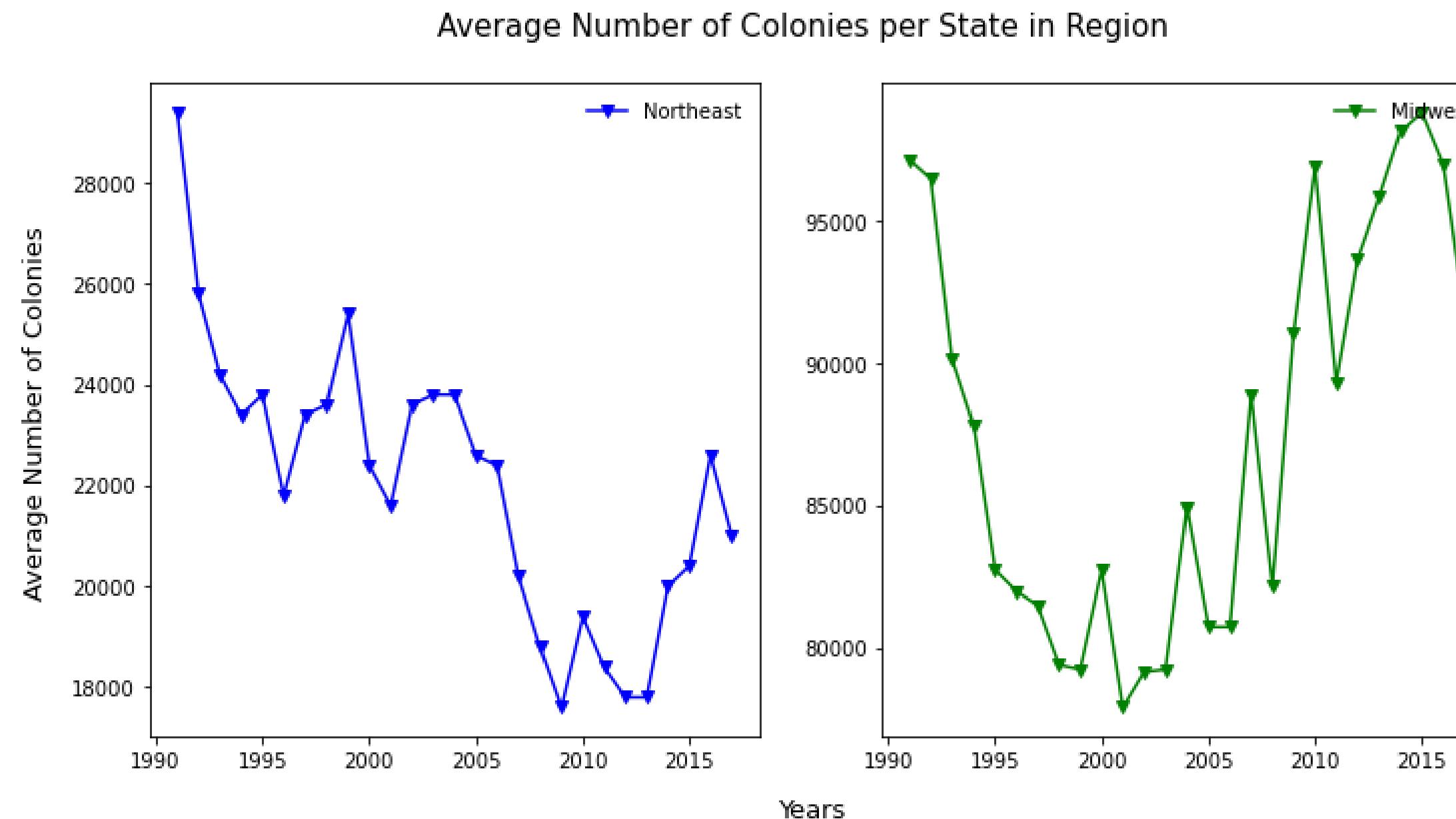


A DECREASING TREND...

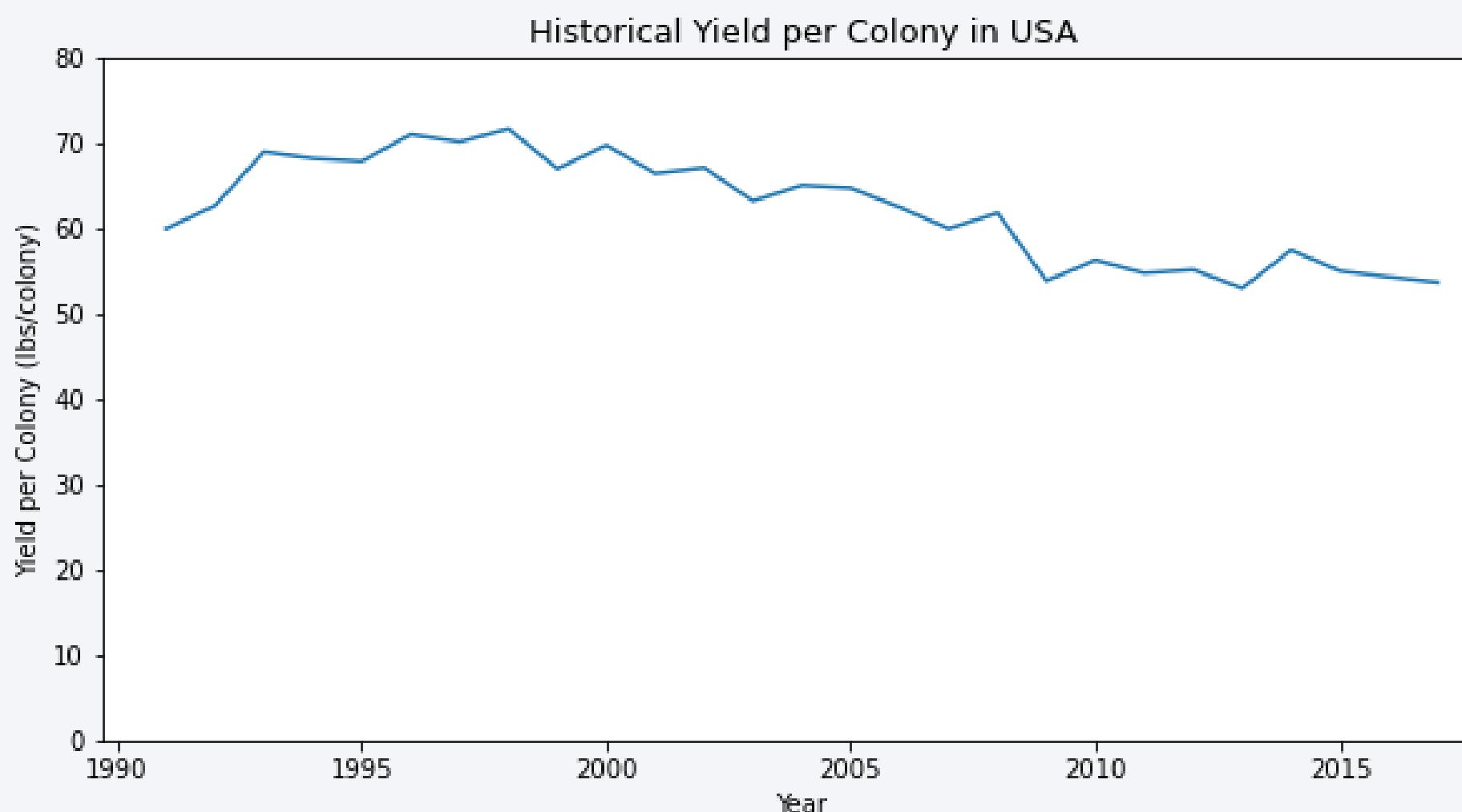
The total number of colonies from both the highest producing and lowest producing regions show that the decrease is not isolated to a region or area, but is across both coasts of the US

THAT CAN BE DANGEROUS...

Both regions have been decreasing consistently. We believe that honey bees are being affected by unseen forces, such as weather changes and the use of pesticides across the United States.



HISTORICAL YIELD PER COLONY



21% DECREASE OF THE YIELD

21% (from 70lbs to below 50lbs)
decrease in total yield per colony

ECONOMIC AND ECOLOGICAL IMPACTS

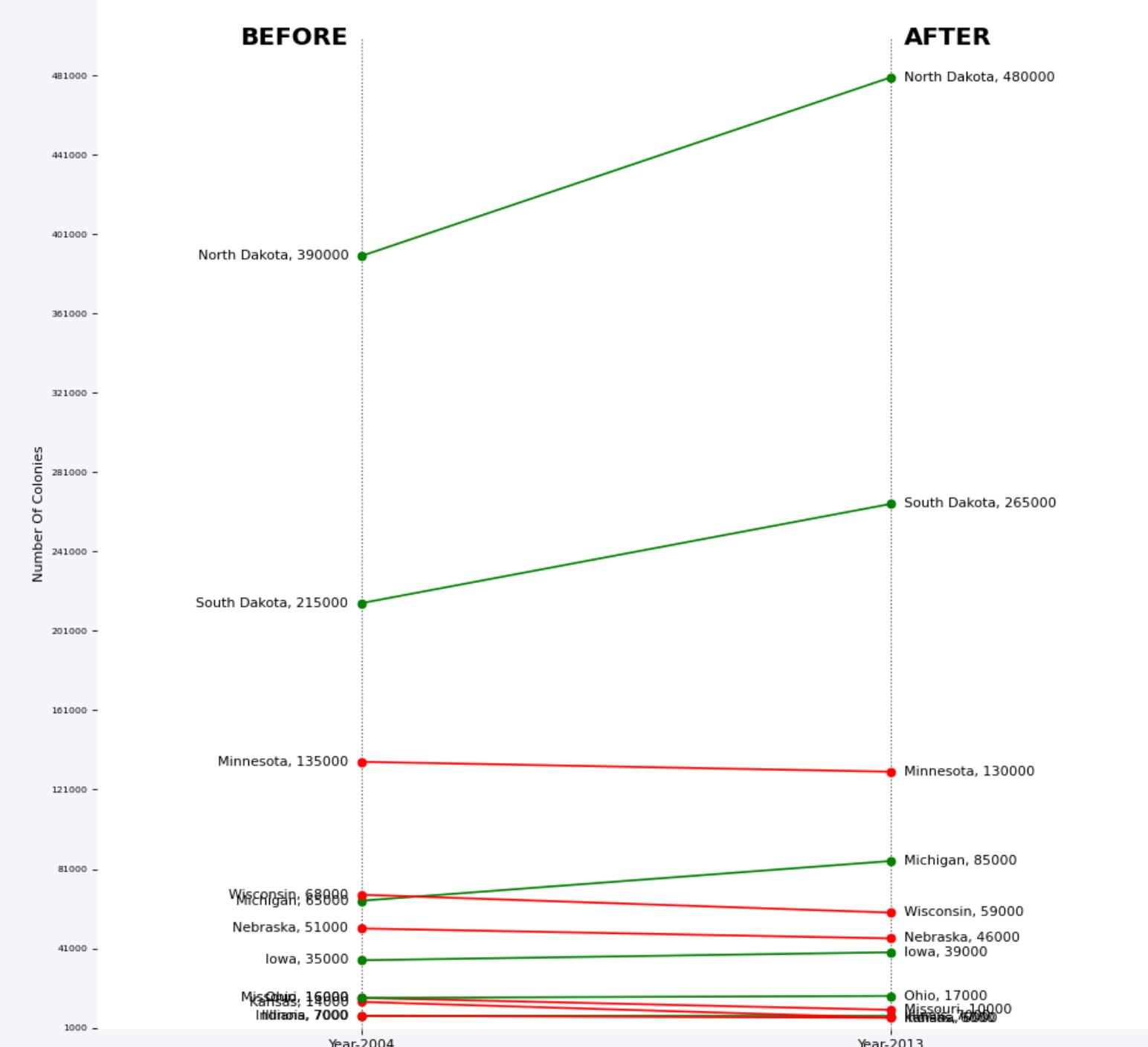
If the number of colonies and the yield continue to decrease, honey prices will skyrocket. Yet, there are greater implications of decrease of bees

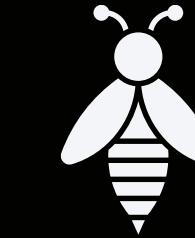
CHANGES OF MIDWESTERN STATES

TWO LEADING STATES

In the midwest, as a whole all states have been decreasing in the number of colonies, with the exception of the Dakotas. However, it seems that the decreases have been very slight which would show a general increase in the region

Slopechart: Comparing Number of Colonies between 2004 vs 2013

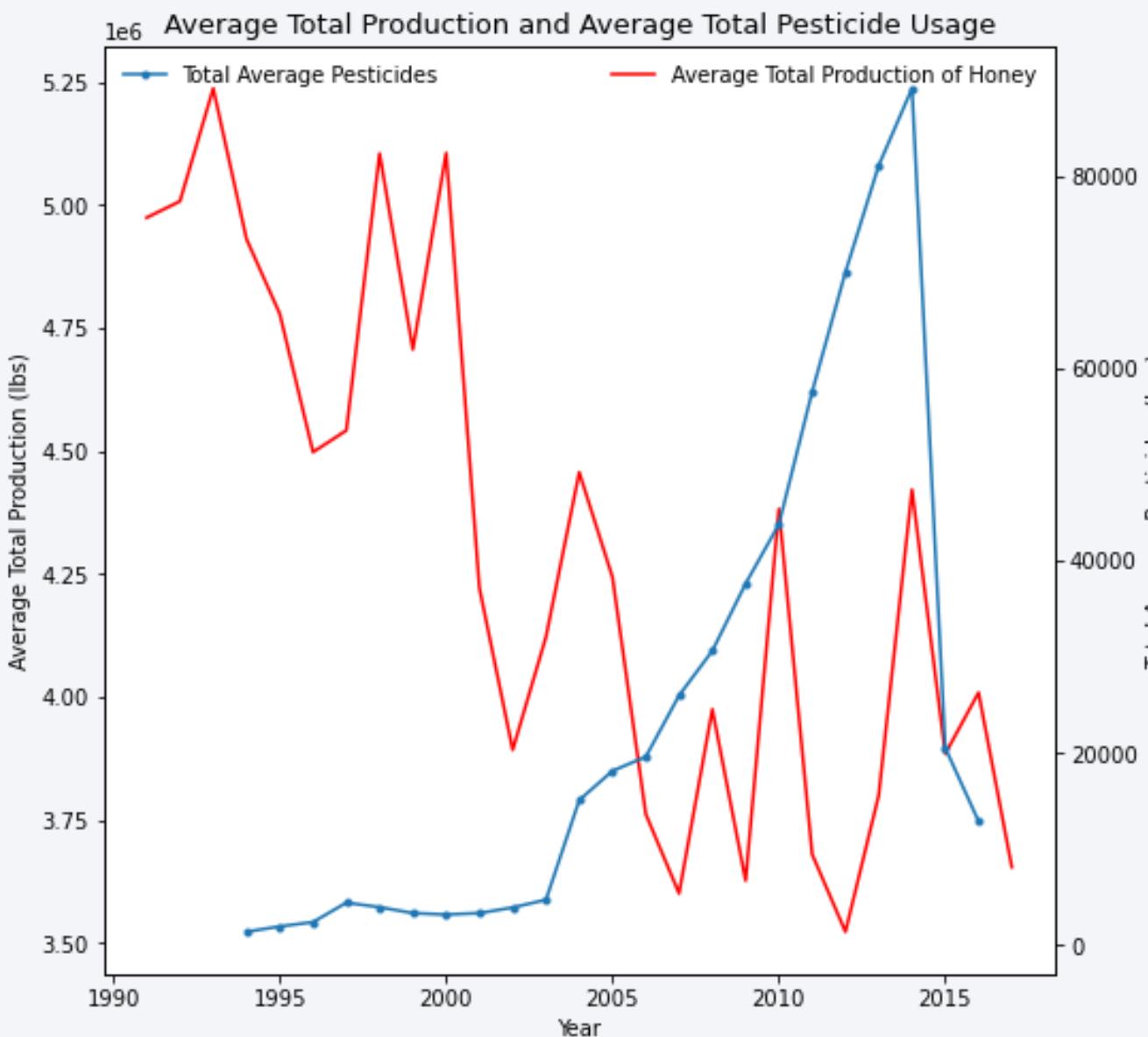




EFFECT OF PESTICIDES ON BEES AND CROPS



PRODUCTION OF HONEY AGAINST TOTAL AVERAGE PESTICIDES



DECREASE IN PRODUCTION

The average production dropped massively in 2003, to recover slightly afterwards and fluctuating around an average Total Production Value of 4.0

DUE TO INCREASE IN PESTICIDES

The introduction of pesticides in year 2004 onwards had an implication in the drop of the Average total production. However, it might not be the only reason behind the drop of the average production.

AND VICE-VERSA

The drop of pesticide usage in 2015 had a slight correlation with production slight increase to 4.08



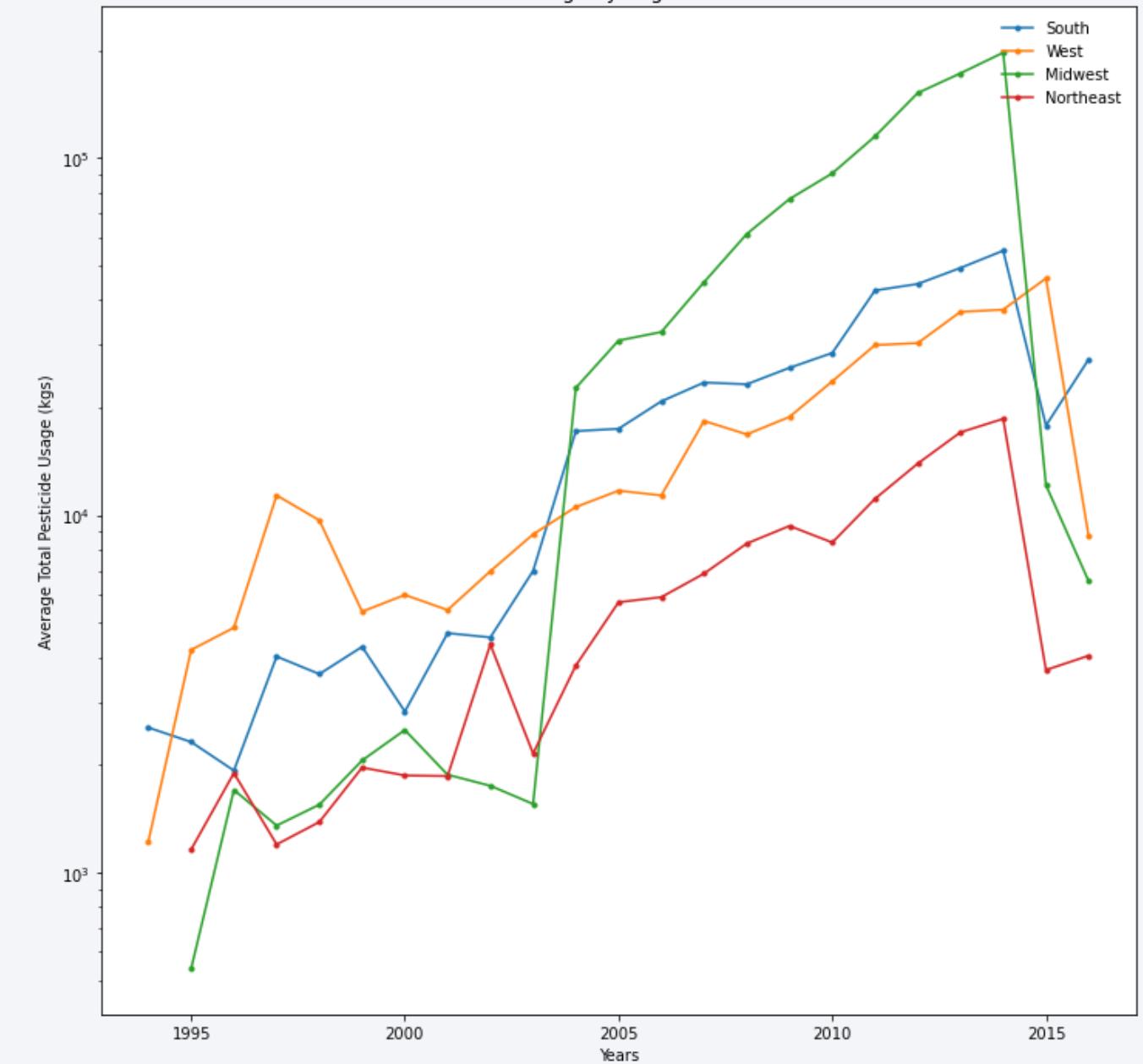
INFLECTION IN PESTICIDES USAGE

Year 2003 and onward marked an increase of Pesticide usage in all the regions.

Midwest had the highest increase of pesticide usage increase compared to the other regions.

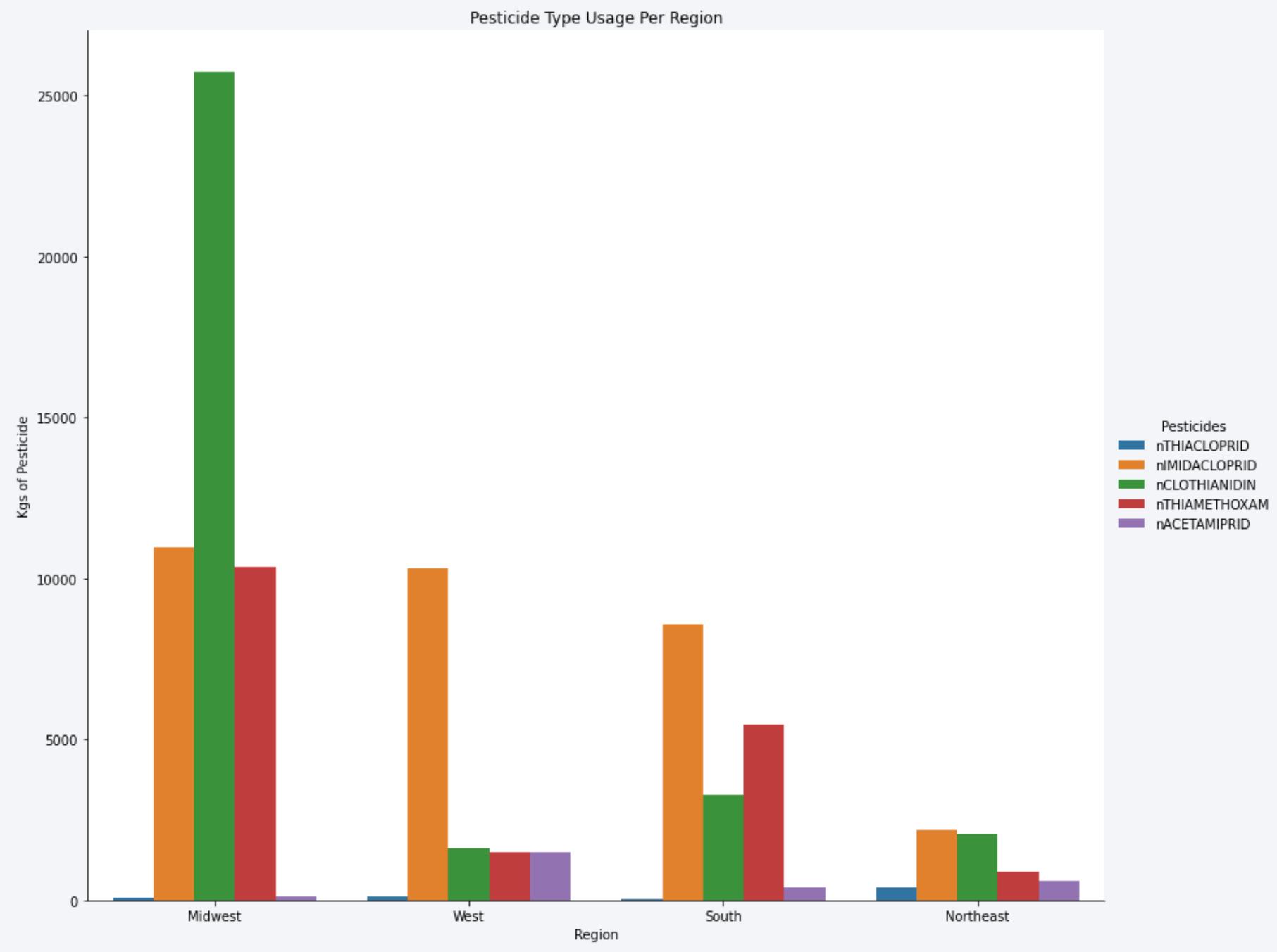
The Pesticide trend started in 2003 up until 2014 where all the regions showed a similar usage trend. The drop of pesticide usage was marked in year 2014, where all regions decreased massively their pesticide usage pattern.

Historical Pesticide Usage by Region Across States in USA



PESTICIDES USAGE

UNEQUAL USAGE AMONG STATES



Effect of Pesticides on Bees and Crops

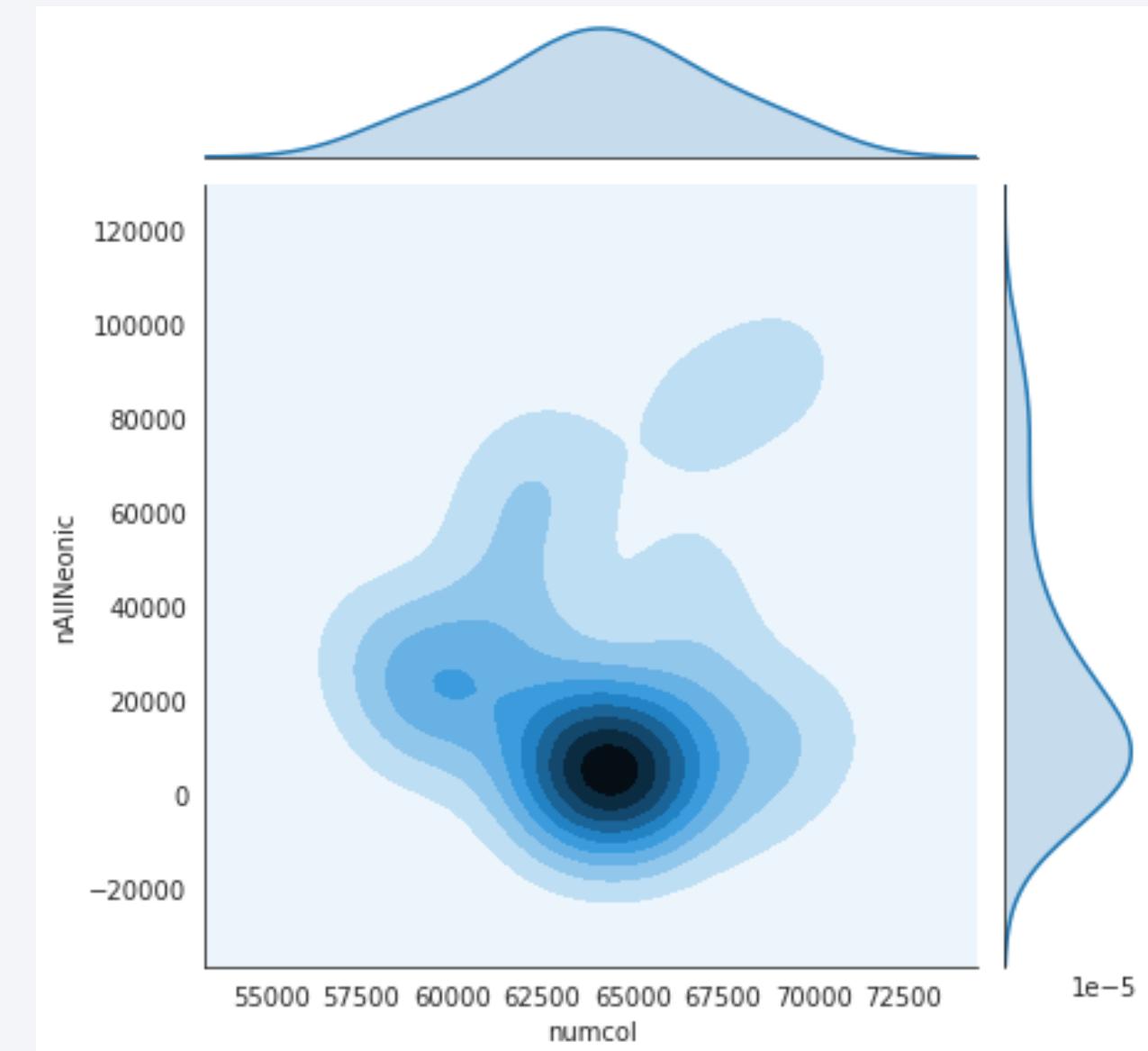


PESTICIDE USE ON NUMBER OF COLONIES

MORE BEES WITH LESS POLLINATION

There are more colonies present when there are less pesticides, however there seems to be a small section of outliers that have a large number of colonies when there is a large quantity of pesticides.

One hypothesis for this weird trend is that beekeepers create more hives or perform "hive splits" due to the low number of bees available and decreased yield/efficiency

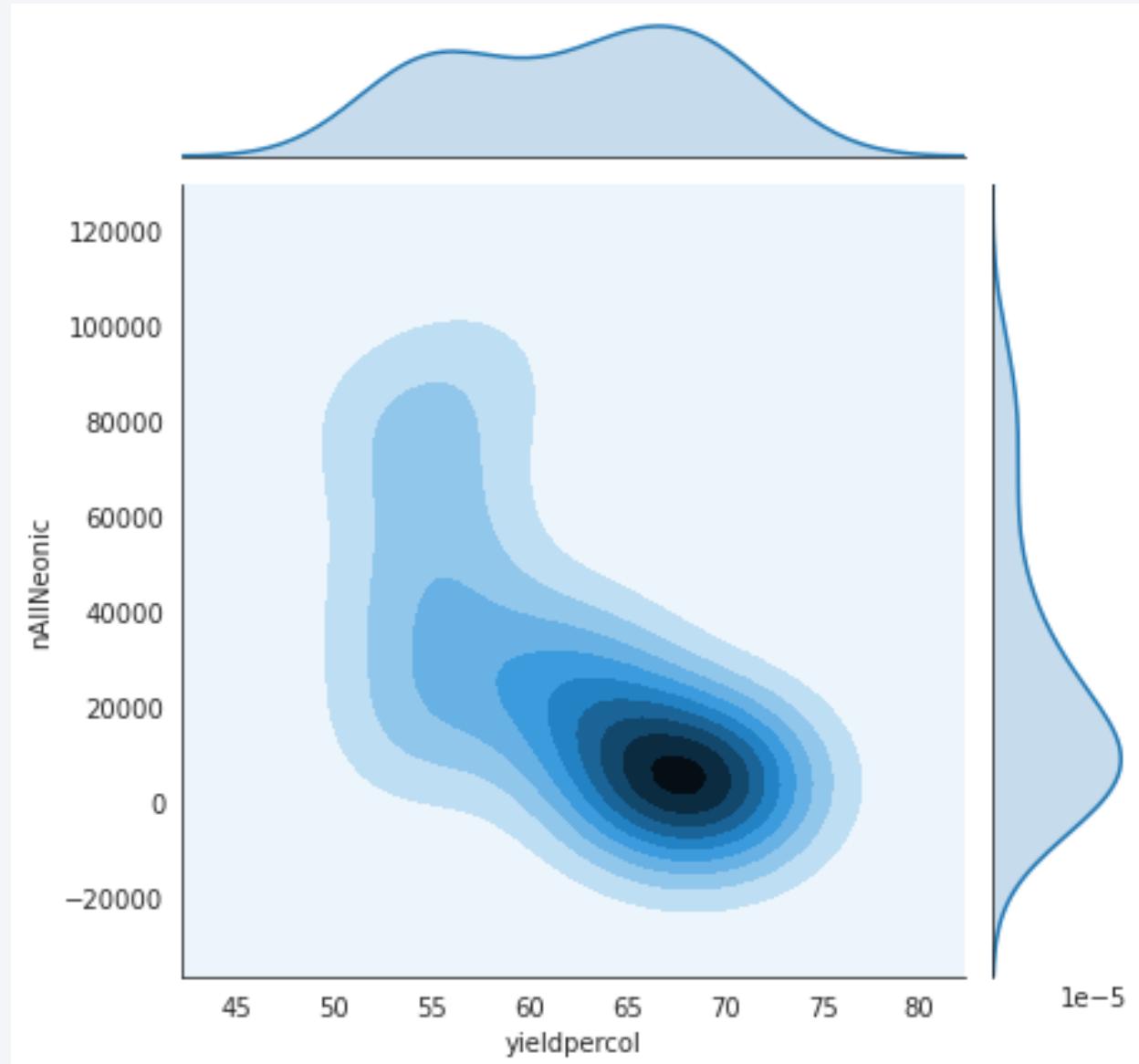


PESTICIDE USE ON YIELD OF COLONIES

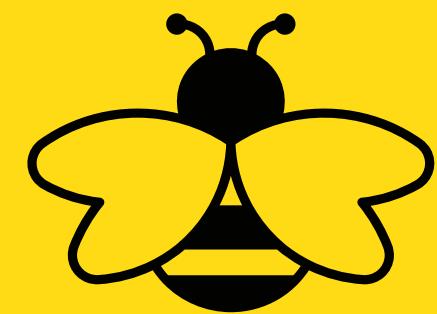
**LESS PESTICIDES ALLOWS HIGHER HONEY
YIELDS**

As part of the theory, it seems that there is a larger yield of honey when there are less pesticides present, which seems to hold true.

Bad for the bees and the honey production, but we believe that it is also bad for the fruit production



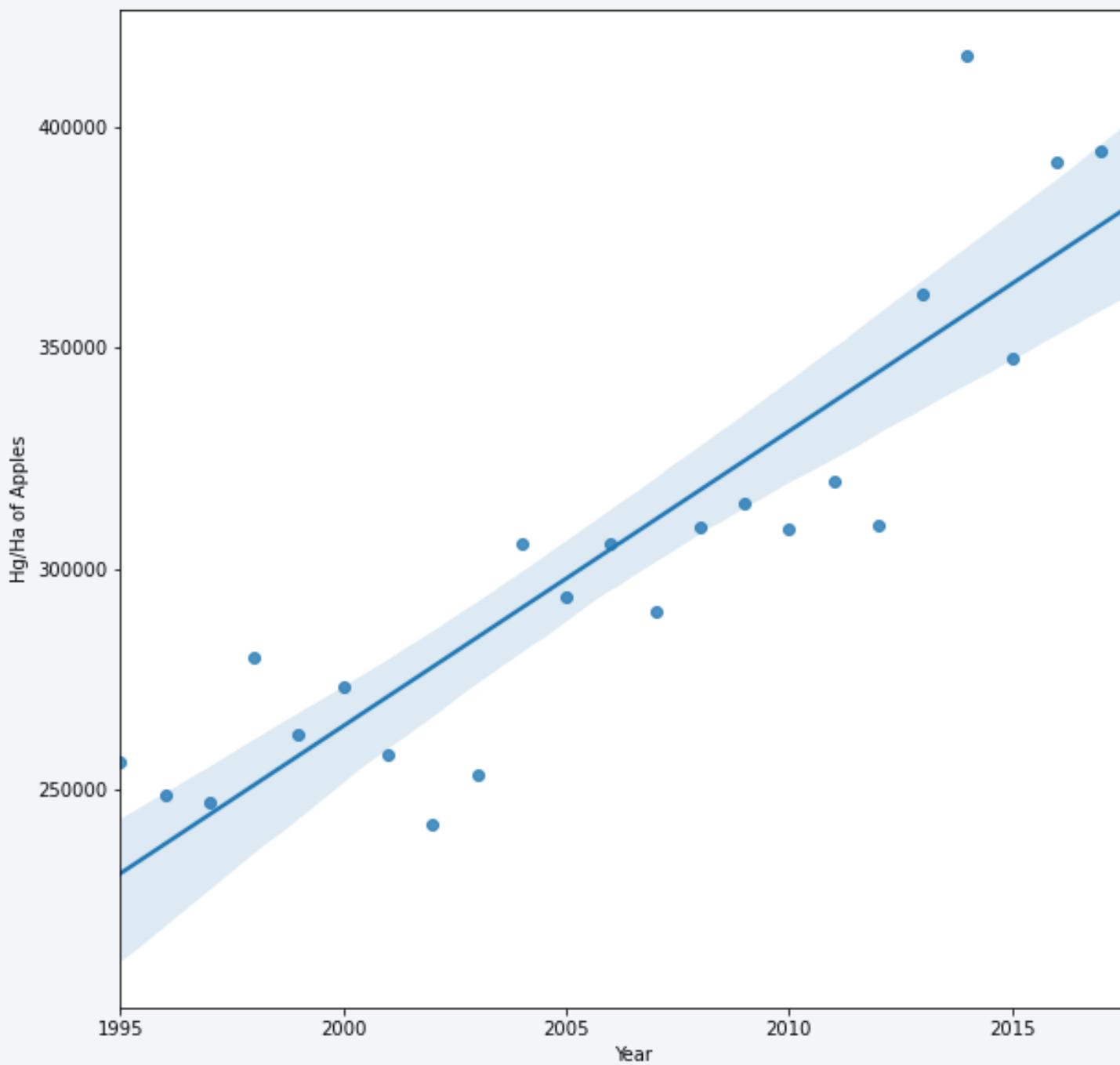
CROPS



Apples, blueberries, and especially almonds are highly dependent on the pollination from honeybees and other animals.



Upwards trends for apple production





PRODUCTION OF APPLES AGAINST TOTAL AVERAGE PESTICIDES

THE COLOR OF THE BUBBLE

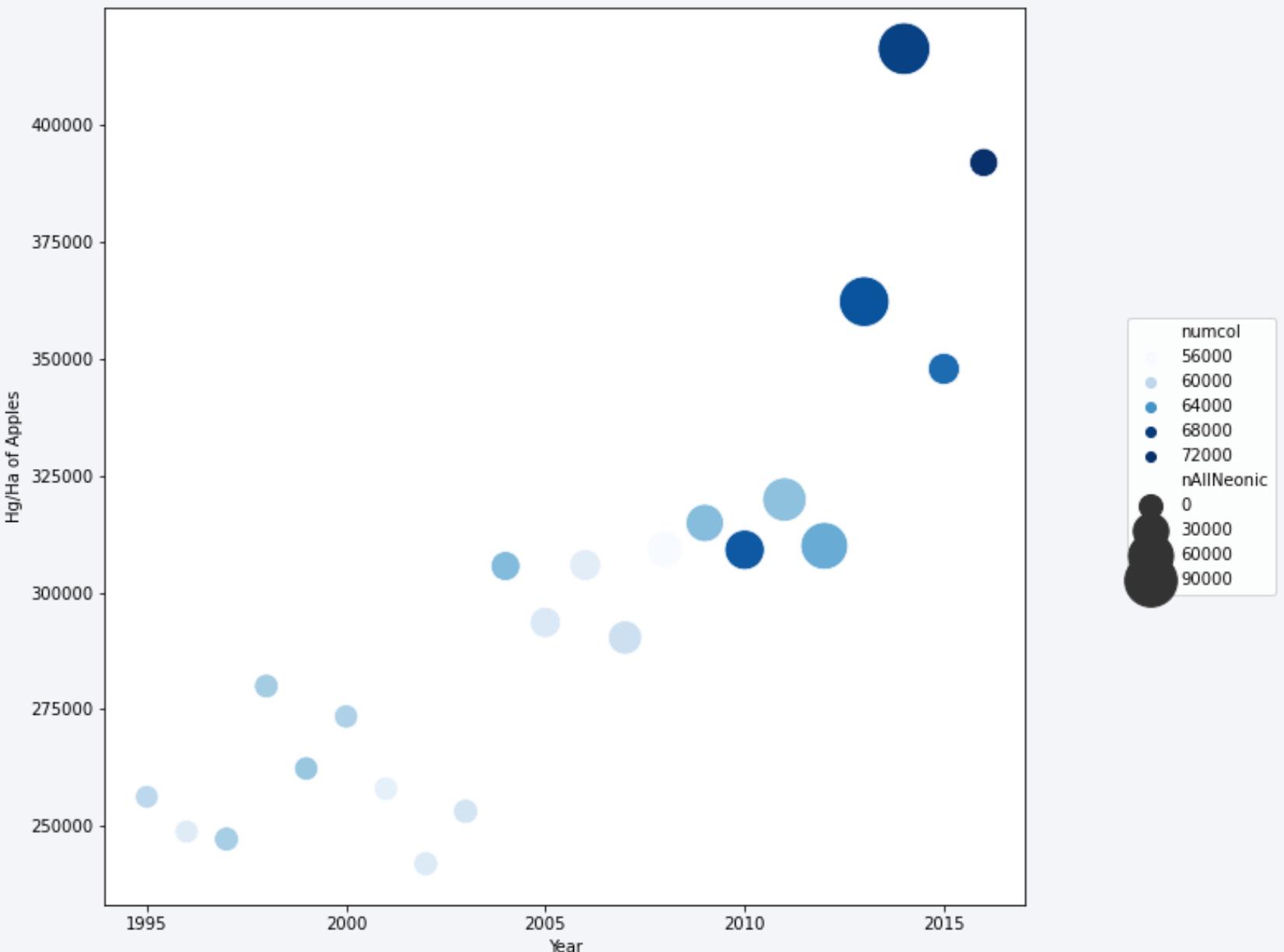
- The color denotes the number of bee colonies present in the year
- The number of bee colonies has actually been increasing

THE SIZE OF THE BUBBLE

- The size of the bubble references the amount of pesticides being used
- The total number of pesticide has been growing over time

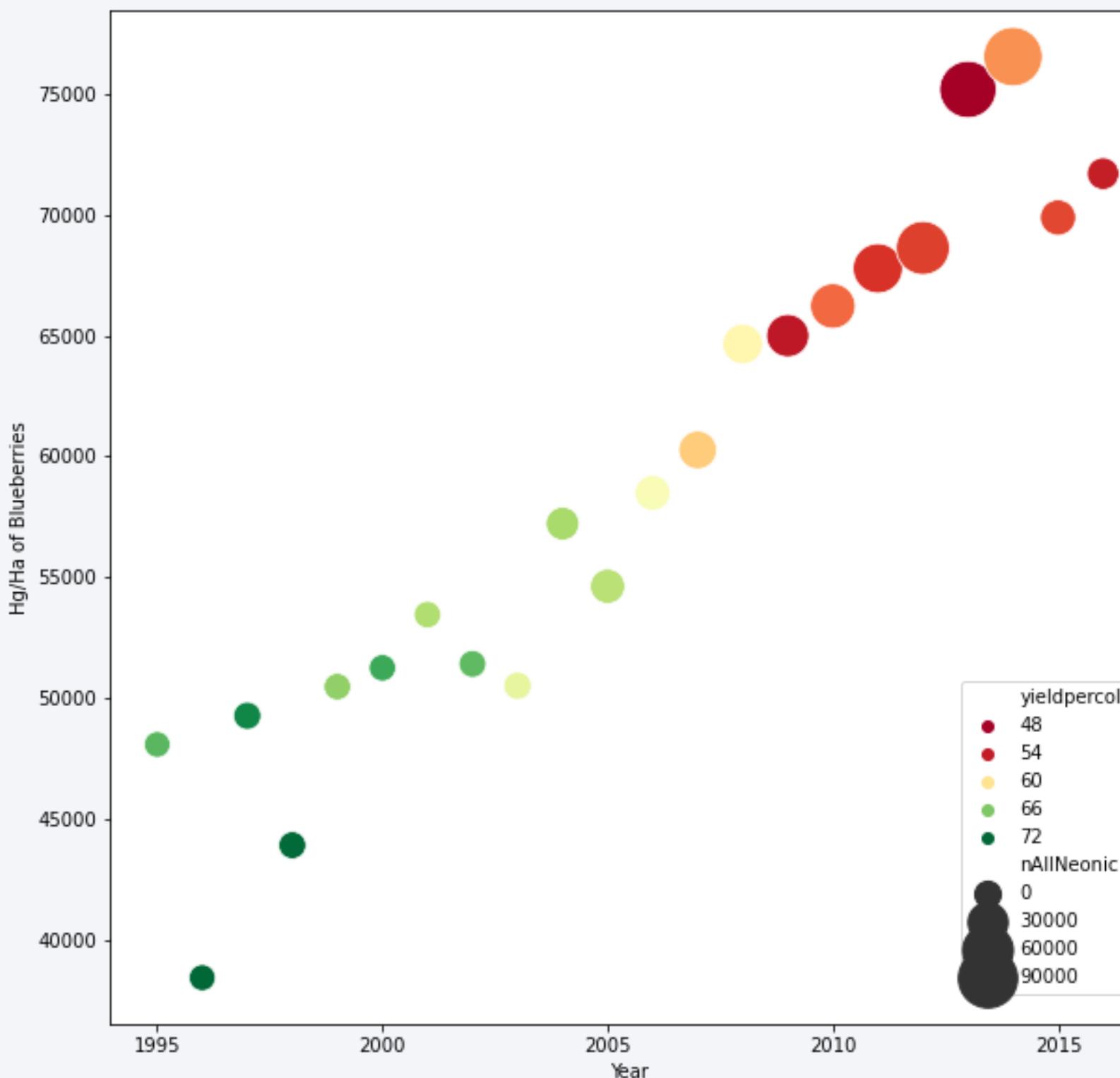
THE POSITION OF THE BUBBLE

- The chart shows the yield of apples being produced on an annual basis





PRODUCTION OF BLUEBERRIES AGAINST TOTAL AVERAGE PESTICIDES

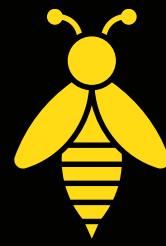


LESS YIELD

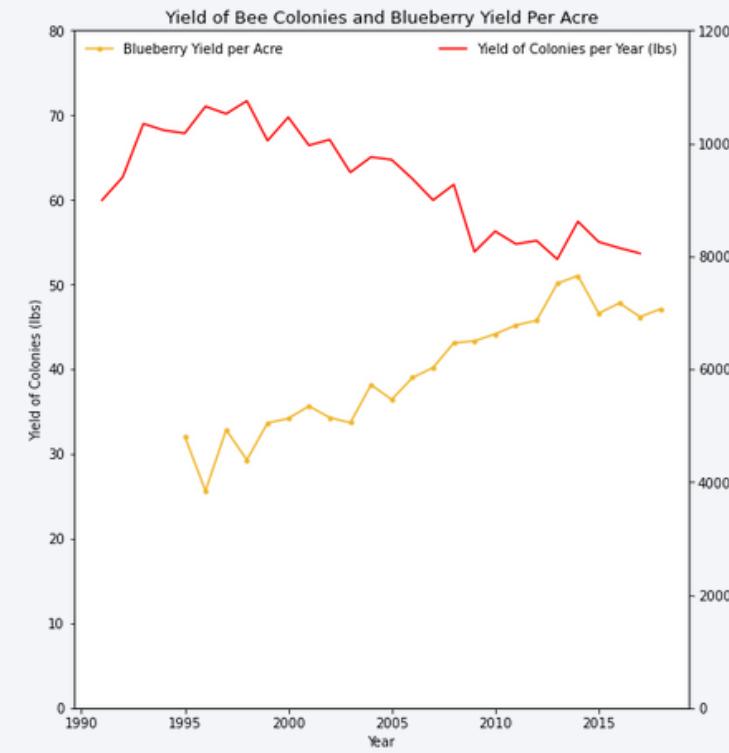
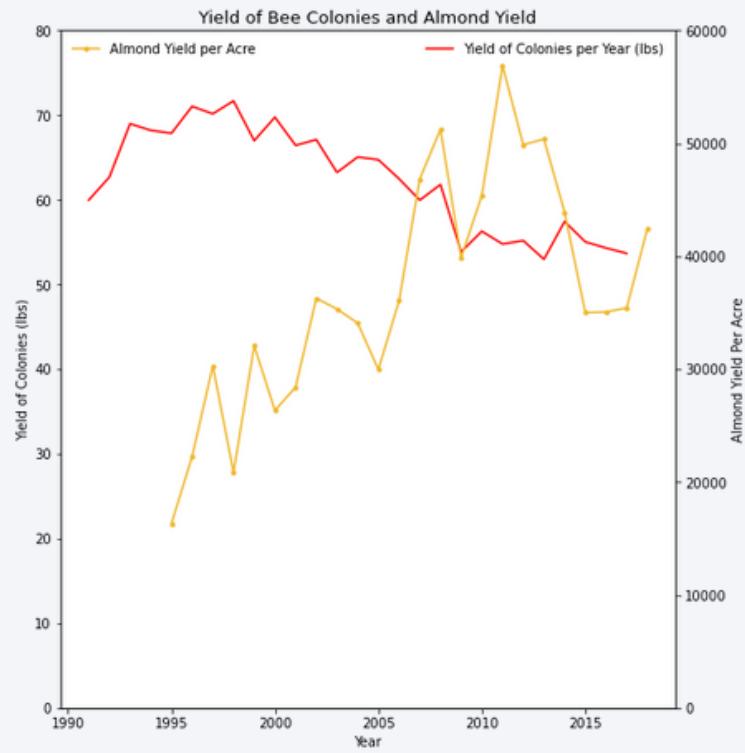
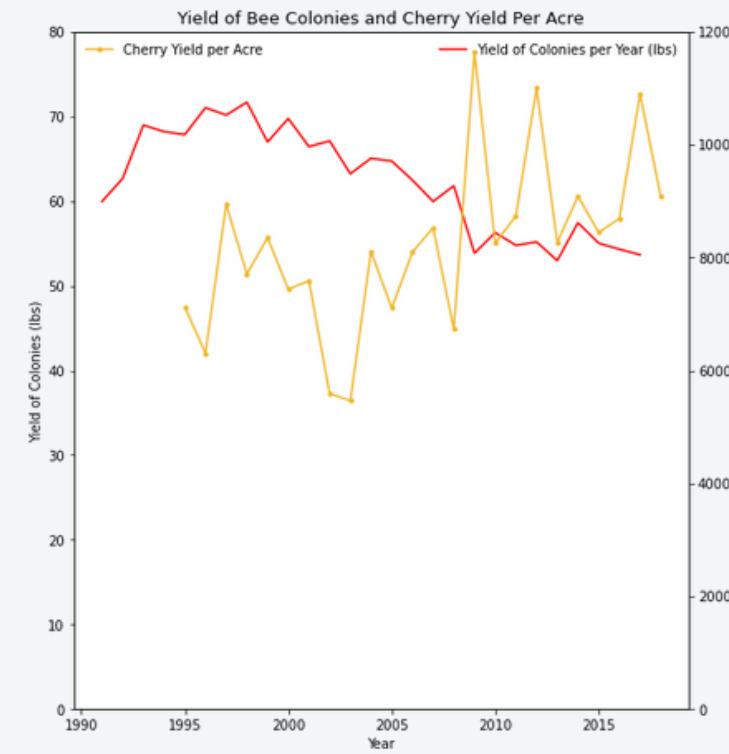
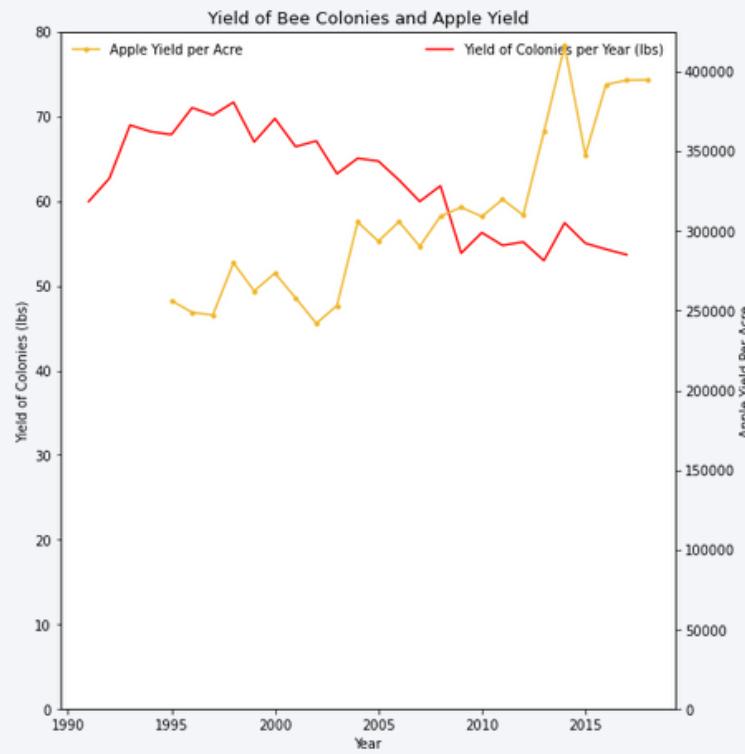
- It shows a stark difference as of 2006 between yield of colonies
- It shows that the more pesticides being used (which are larger circles), the less yield the bees have

THAT IS COMPENSATED THROUGH MORE BEES

- An increased use of pesticides essentially decreases honey yield
- To compensate honeybee keepers must therefore create more beehives



HONEY YIELD WITH CROP YIELD



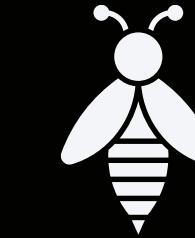
Honey Yield Decrease

Honey yield per colony has dropped 21%

Crop Yield Increase

Apple yield increased by 60%
Cherries yield increased by 28%
Almonds yield increased by 180%
Blueberries yield increased by 40%

Contrary To Our Hypothesis!



EFFECT OF TEMPERATURES ON BEES

TEMPERATURES, PESTICIDES AND YIELD



RAISING TEMPERATURES

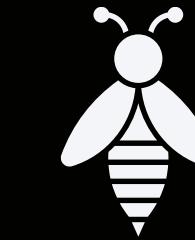
Across all the US States, the global temperatures are rising, which can also have an impact on bees.

RAISING PESTICIDES

The increase in pesticides and their negative impact on bees is further impacting this negative trend.

DECREASING YIELD

Both elements are factors that lead to decreasing yield by colony.

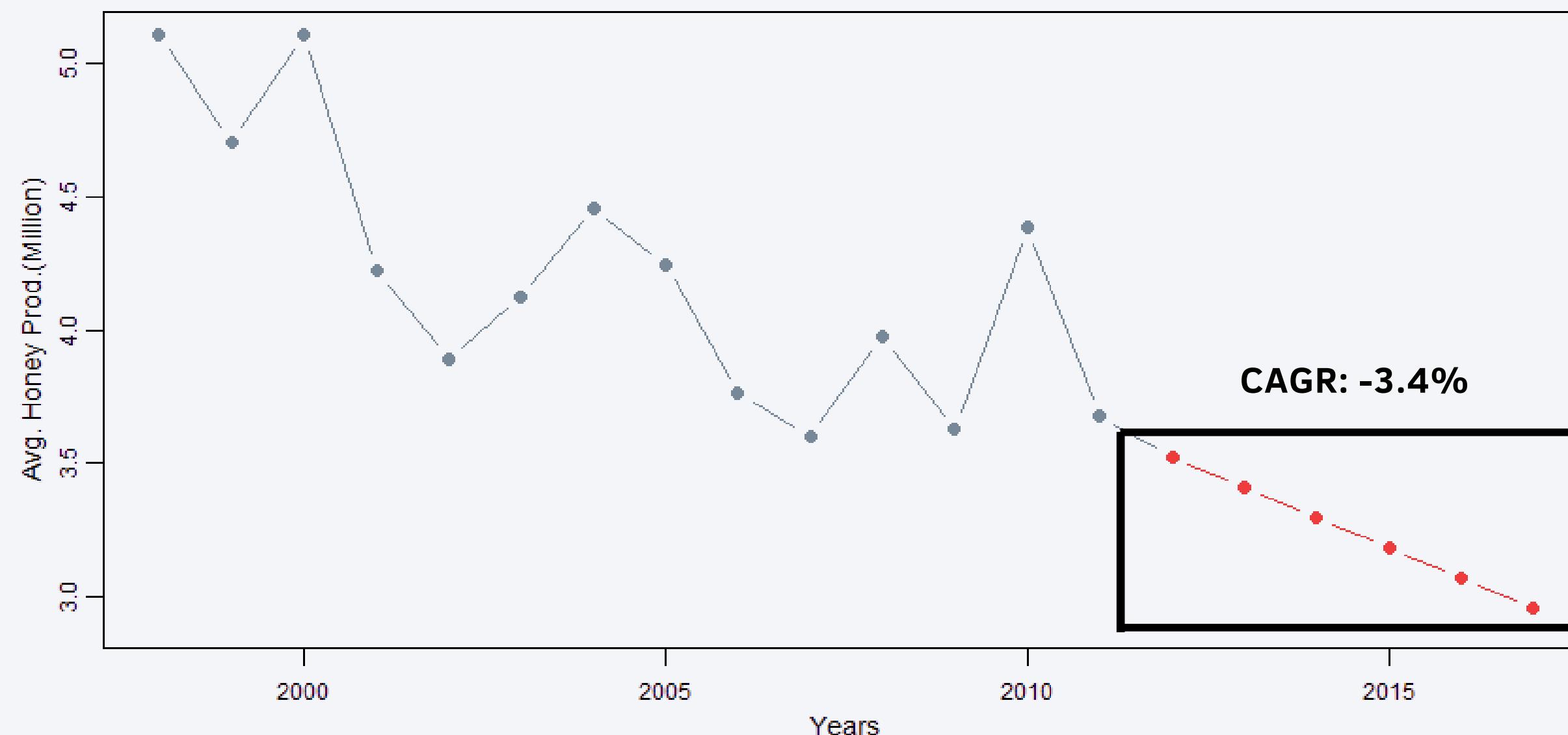


OUR FORECAST

LOOKING TO THE FUTURE...



Average Honey Production Realization & 5-Year Forecast in USA



CONCLUSION

- Honey bees are being effected by both pesticides and temperature
- This leads to a lower honey production yield
- The higher number of colonies is most likely due to beekeepers performing hive splits
- This will have impact financially on impact of honey and ecologically
- Further investigation and actions should be taken by policy makers to stop this trend