

# Fertilizer Use in Southern Missouri

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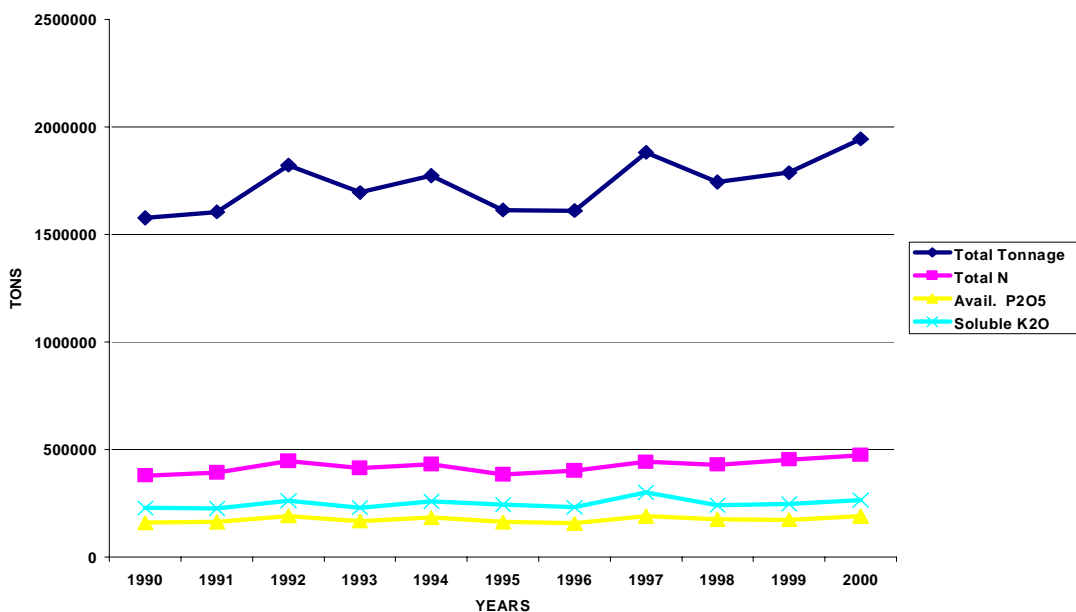
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Fertilizer regulation began in the United States in the late 1870's when Connecticut was the first state to pass legislation regulating fertilizer products in 1876. The regulations were adopted and administered by the Agricultural Experiment Station. Other states seeing the need for similar legislation followed suit, and Missouri adopted its first fertilizer regulations in 1893 which was also administered by the Agricultural Experiment Station. Today fertilizer is still regulated by each individual state with their own specific set of rules and regulations. Coincidentally the first fertilizer products which were regulated were natural organic products such as fish meal, tankage, blood meal, bone meal, and manure.

Section 266.291 of the Missouri fertilizer law contains definitions. Paragraph (3) "Essential plant nutrient" includes any element recognized as being directly required by any plant to complete its life cycle; Paragraph (4) "Fertilizer" includes any organic or inorganic material of natural or synthetic origin which is added to the soil, soil mixtures, or solution to supplement nutrients and is claimed to contain one or more essential plant nutrients. The term "fertilizer" does not include unmanipulated animal and vegetable manure and agricultural liming materials used to reduce soil acidity.

STATE FERTILIZER USE

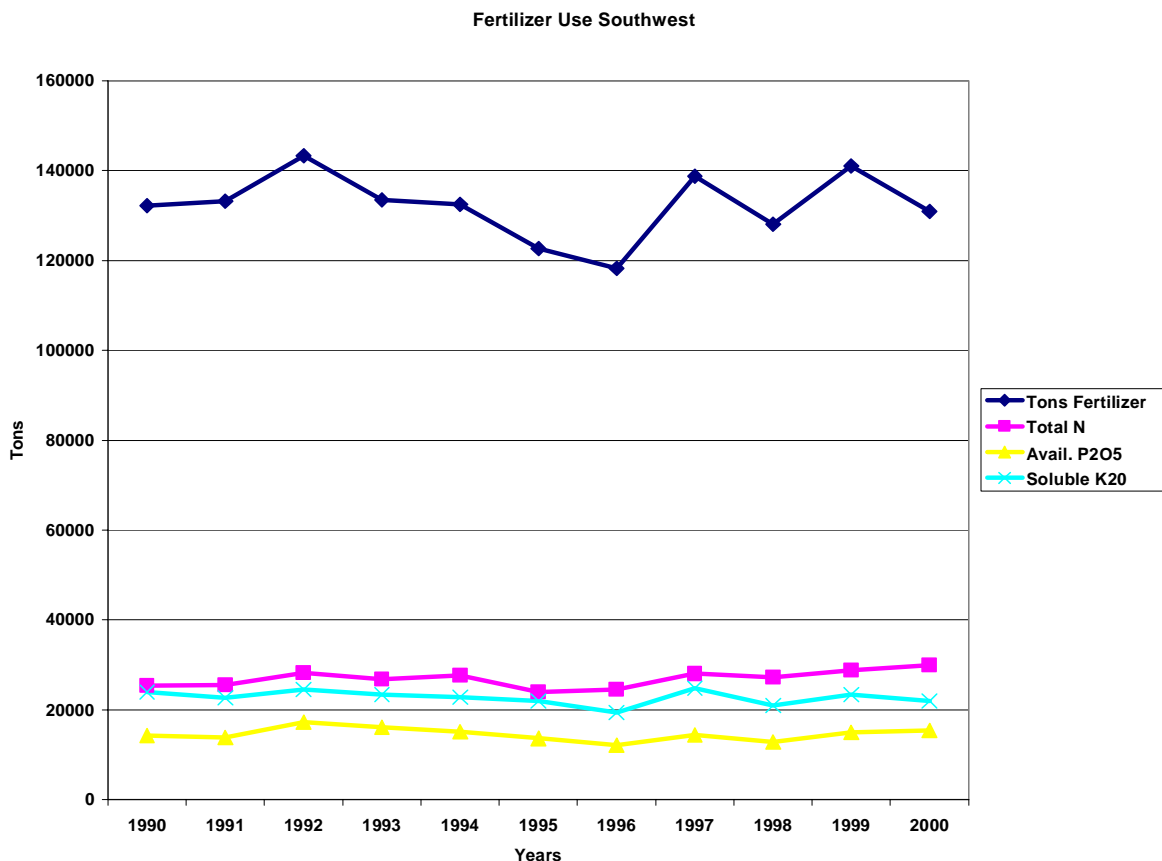


However, a producer can guarantee a manure based product and move it into the fertilizer side of the market.

Today all fertilizer products are regulated on the basis of guaranteed analysis. The numbers in the grade statement are actually percentages representing the number of pounds of plant food a purchaser can expect when buying a product. For example: 13-13-13 means that the product should contain 13 pounds of total nitrogen, 13 pounds of available phosphate and 13 pounds of soluble potash per 100 pounds purchased. The balance of the 61 pounds is made up inert ingredients or filler. So, a product that is guaranteed 4-3-2 contains 91 pounds of filler and 9 pounds of actual plant food per 100 pounds of product.

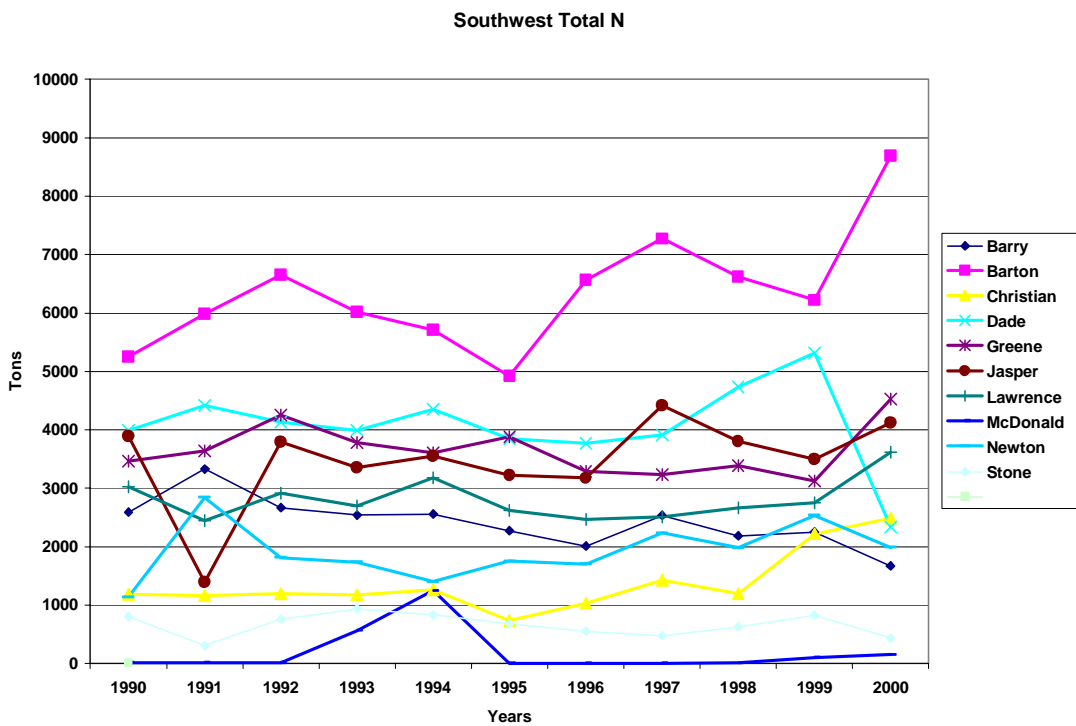
Total fertilizer use in Missouri has trended upward from 1990 through 2000. Total tonnage used throughout the state in 1990 was 1,577,553 tons which was made up of 378,837 tons of Nitrogen, 158,972 tons of available phosphate, and 227,828 tons of soluble potash. 1996 showed an increase in tonnage to 1,611,227 total tons, but a combination of increase and decrease in components, 410,151 tons of Nitrogen, 156,058 tons of available phosphate, and 230,488 tons of soluble potash. The upward trend continued through 2000 with total tonnage 1,945,575 tons comprised of actual plant food: 474,334 tons nitrogen, 190,148 tons of available phosphate and 264,881 tons of soluble potash.

Now looking at the portion of that total which was used in the ten Southwest Missouri Counties of: Barry, Barton, Christian, Dade, Greene, Jasper,

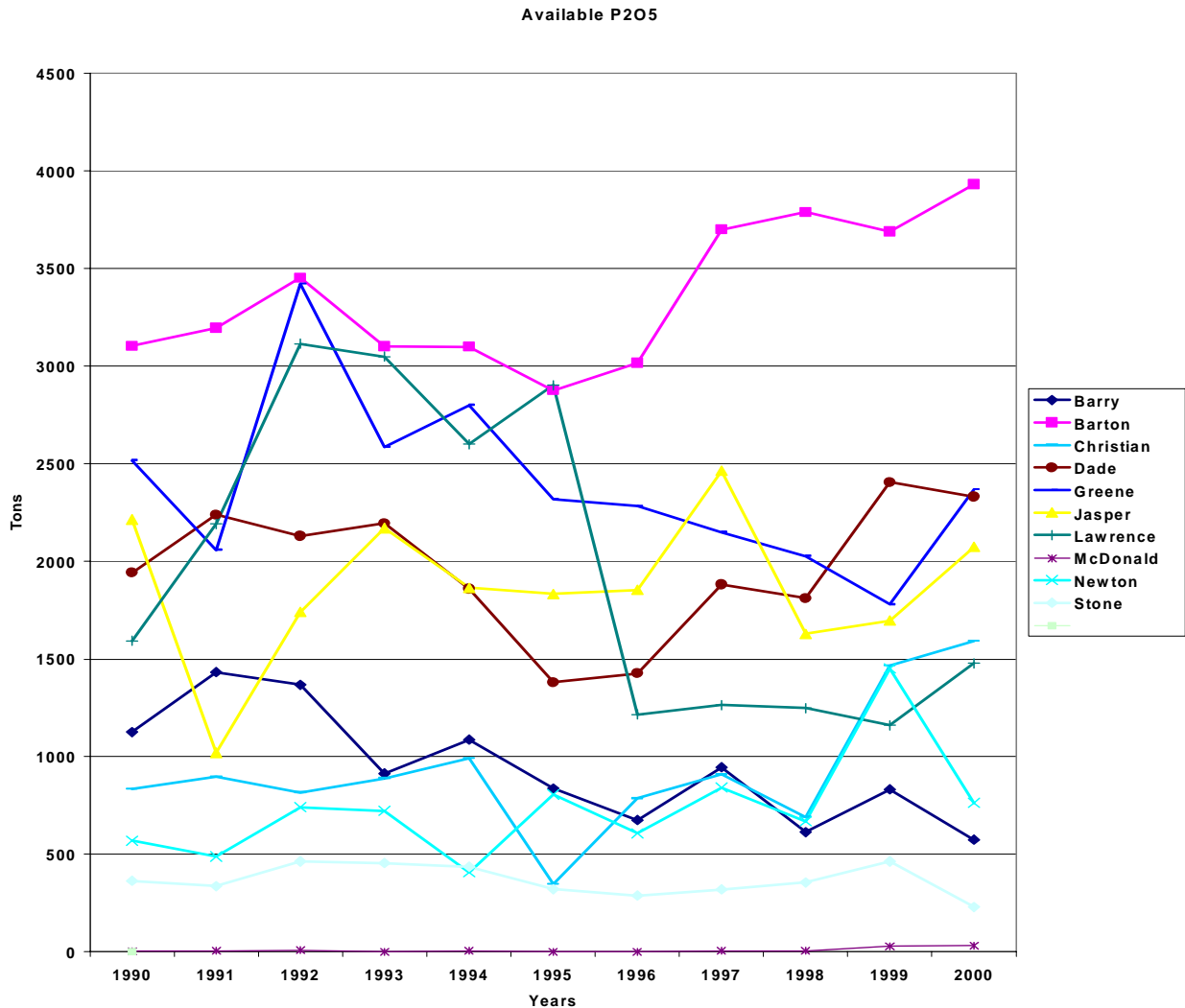


Lawrence, McDonald, Newton and Stone. Total tons of fertilizer used in 1990 was 132,144 tons made up of 25,326 tons of nitrogen, 14,271 tons of available phosphate, and 23,916 tons of soluble potash, as actual plant food. Total tonnage had decreased in 1996 to 118,187 total tons made up of plant food tons: 24,537 tons of nitrogen, 12,153 tons of phosphate, and 19,443 tons of soluble potash. 2000 showed a decrease from the previous year, but a rebound above the 1996 period with 130,913 total fertilizer tons made up of plant food tons: 30,003 tons of nitrogen, 15,375 tons of available phosphate and 21,949 tons of potash.

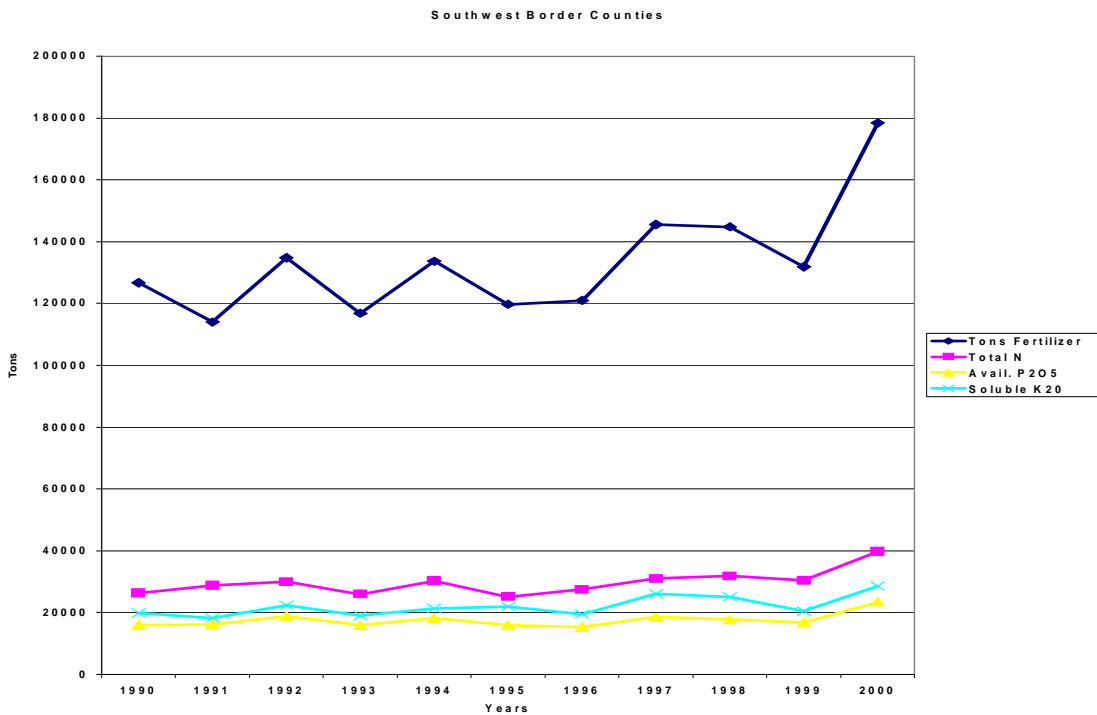
Putting these composite data under closer scrutiny and looking specifically each counties contribution, one sees that several counties have radically changed their nitrogen use patterns. For example the counties of Barton, Christian, Greene, Jasper, and Lawrence have trended for increased use. The counties of Barry, Dade, McDonald, Newton, and Stone have demonstrated level or decreasing trends. Barton County has shown the most rapid increase while Dade has shown a similar rapid decrease. Historically, plant food nitrogen consumption fluctuations have been closely tied to cattle prices and the need for additional pasture.



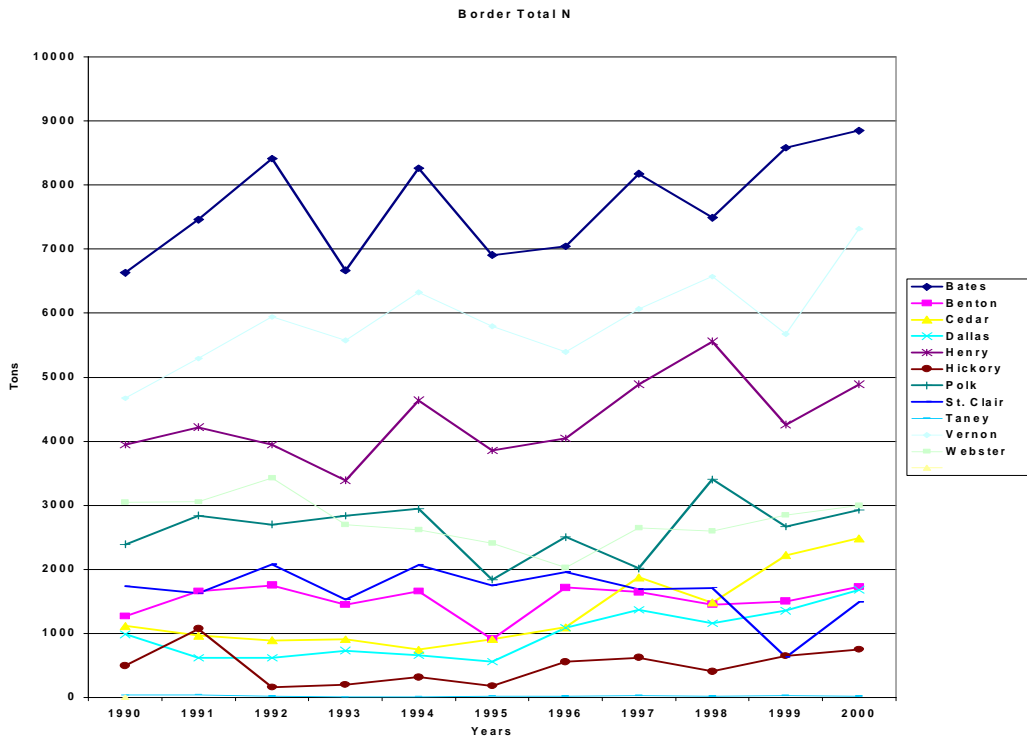
Now looking at the phosphate component contributed by each county indicates six of the ten counties have shown a decrease in plant food phosphate consumption by Barry, Greene, Lawrence, McDonald, Newton, and Stone, with Lawrence County showing the most rapid drop in consumption. Barton, Christian, Dade and Jasper have shown a trend for increased usage of plant food phosphate.



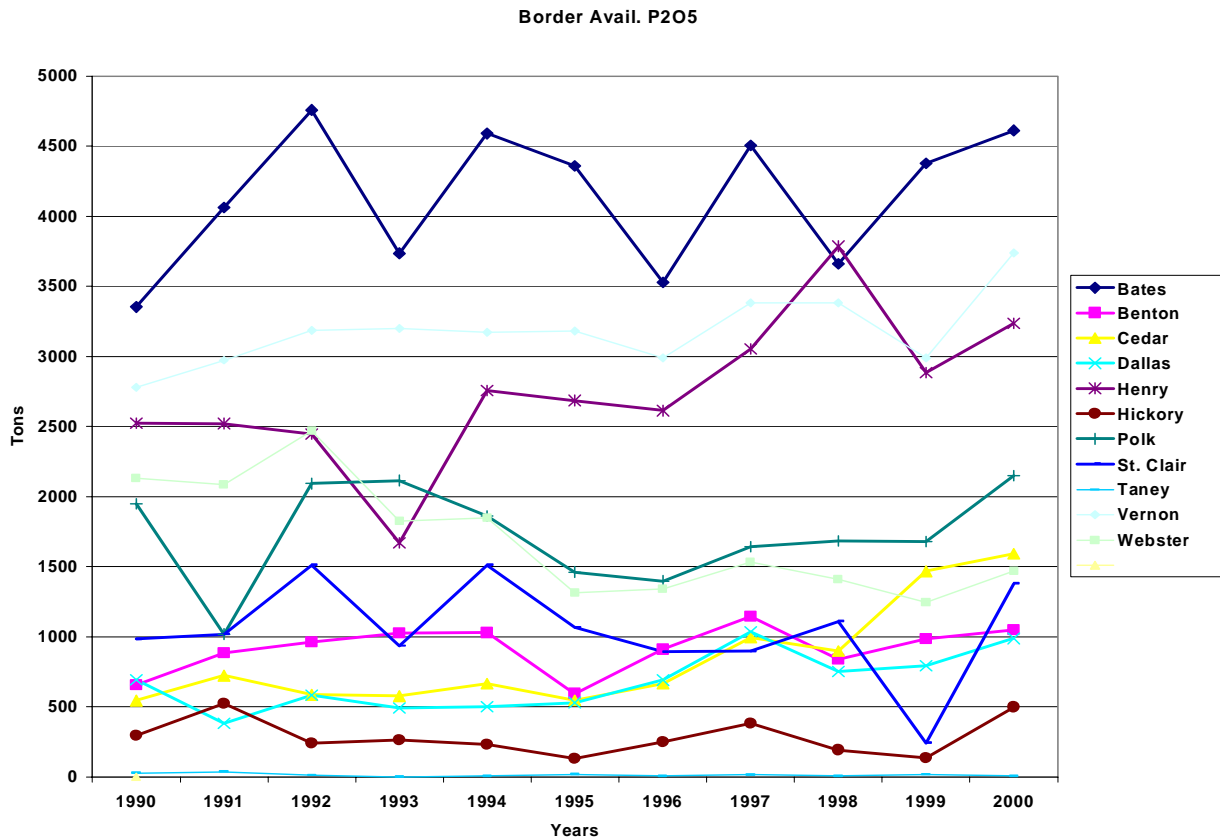
Moving our focus to the surrounding ten counties, which immediately abut the ten Southwestern Counties. These ten are Bates, Benton, Cedar, Dallas, Henry, Hickory, Polk, St. Clair, Taney, Vernon, and Webster. Total fertilizer tonnage in these counties although somewhat saw like has generally increased. Tonnage used in 1990 was 126,712 total tons made up of actual plant food tonnage of 26,299 total nitrogen, 15,590 available phosphate, and 19,904 soluble potash. 1996 had a slight decrease in total tonnage reported at 120,979 made up of actual plant food tonnage of 27,341 total nitrogen, 15,293 available phosphate, and 19,550 soluble potash. 2000 reported a substantial increase with total tonnage of 178,334 tons comprised of 39,771 total nitrogen plant food, 23,491 available phosphate, and 28,644 soluble potash. The trend toward increase available phosphate use could provide an economic opportunity for a manure based product with a relatively close market.



Examining the various components that make up the composite graph, total nitrogen use has increased steadily with only a few minor set backs. An in-depth view of each of the counties total consumption can be seen in this chart. Bates County is the leading consumer followed by Vernon and Henry Counties. During the 11 year period reviewed, only Taney and Polk Counties decreased in nitrogen consumption.



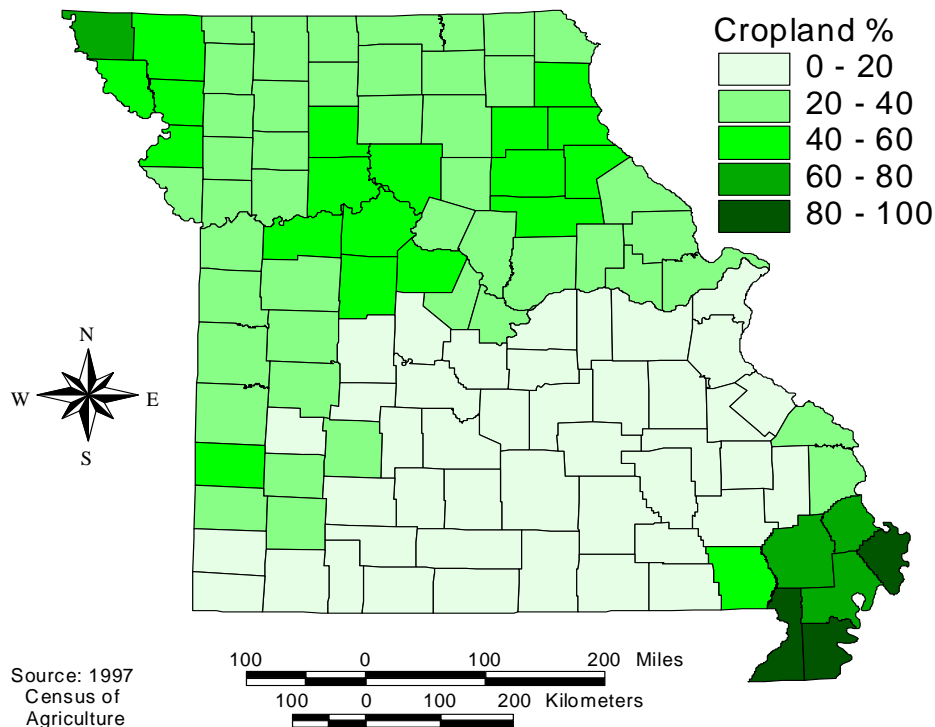
Trends in available phosphate use in these counties are as follows. As demonstrated by the following graph, all of the counties have shown increased consumption of available phosphate products with the Taney being the single exception. The leading Counties were once again Bates, Vernon and Henry.





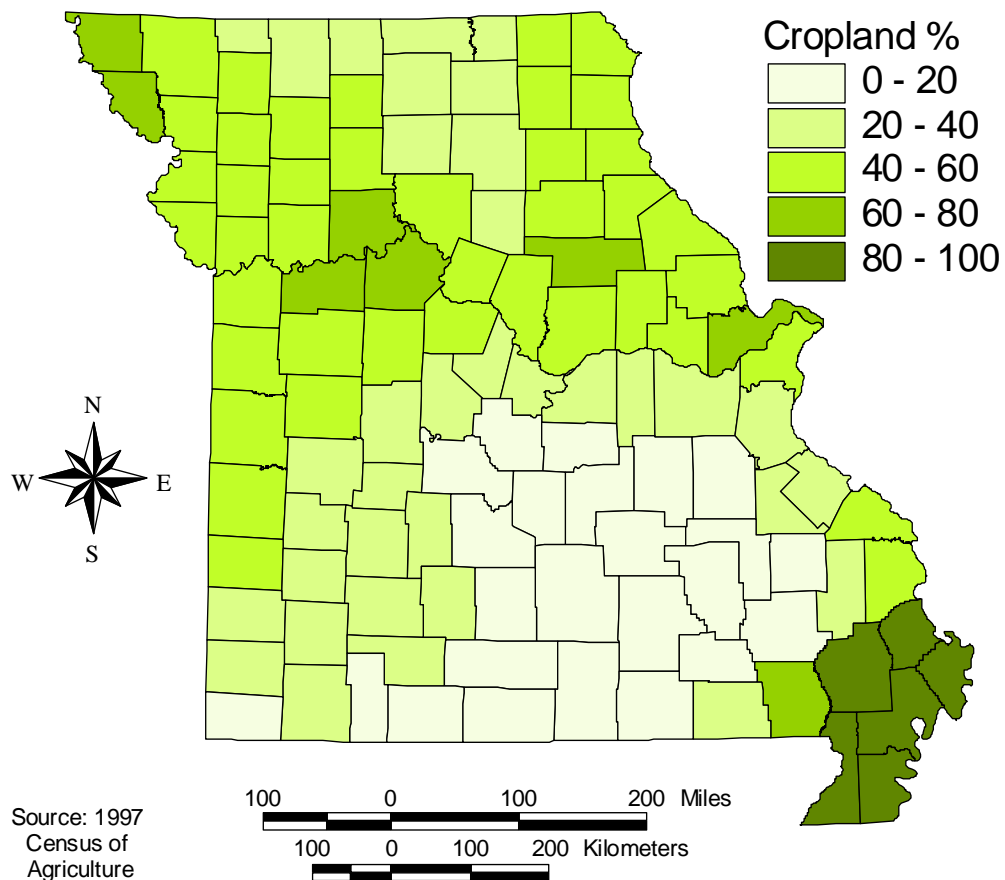
Shifting our focus from reported use, to areas of the use within the state. As one can see from this map, most of the harvested cropland in the state is concentrated in the areas North of the Missouri River and in the Southeast Bootheel area. Most of the counties north of the Missouri contain between 20 and 40% harvested cropland with the Bootheel having as much as 80% harvested cropland. While the counties of Southwest Missouri have from 0 to 20% harvested cropland, the exceptions being Barton, Dade, Jasper and Lawrence which harvest from 20 to 40% of the cropland. This is significant because harvested grain crops are a very good method of removing excess phosphorus from the system.

## Harvested Cropland (% of County Area)



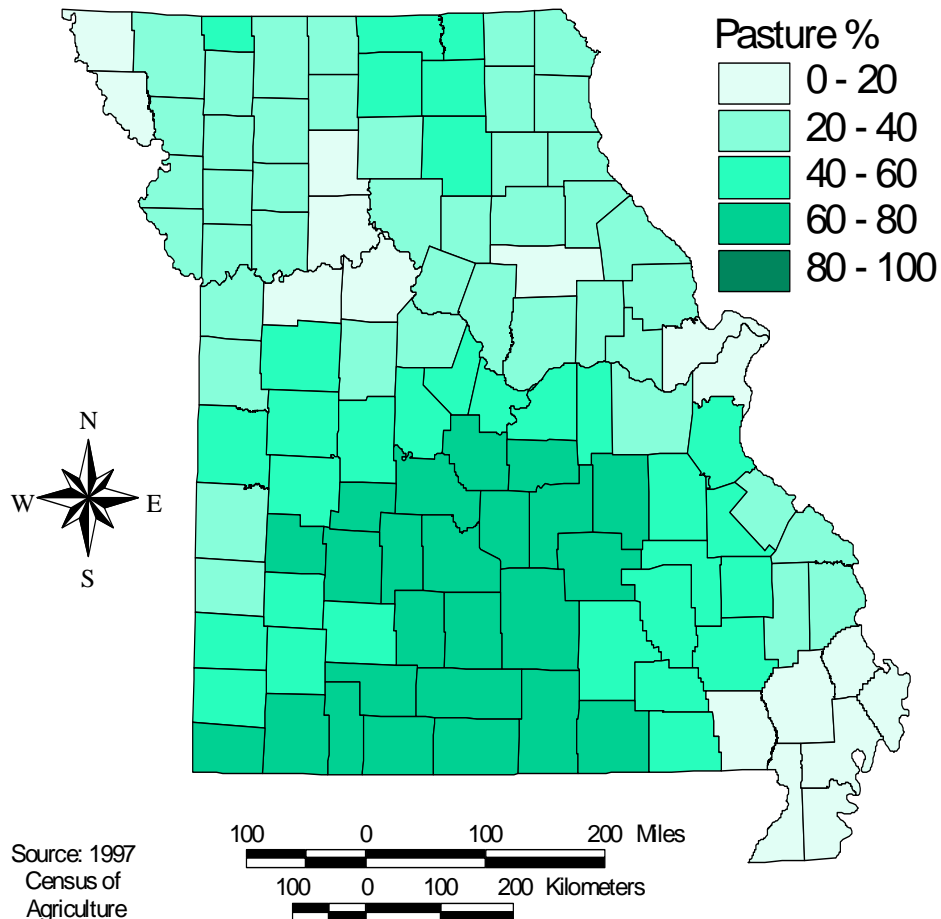
Another view of the state agricultural lands show that once again the grain producing areas of the state as percent of harvested farmland are most heavily concentrated in the area more or less bordering the Missouri and Mississippi Rivers. Barton County is the exception in Southwest Missouri with between 40 and 60% of the farmland dedicated to crop production. While Barry, Christian, Jasper, Lawrence, and Newton Counties have between 20 and 40% of the agricultural land dedicated to crop production.

## Harvested Cropland (% of Farmland)



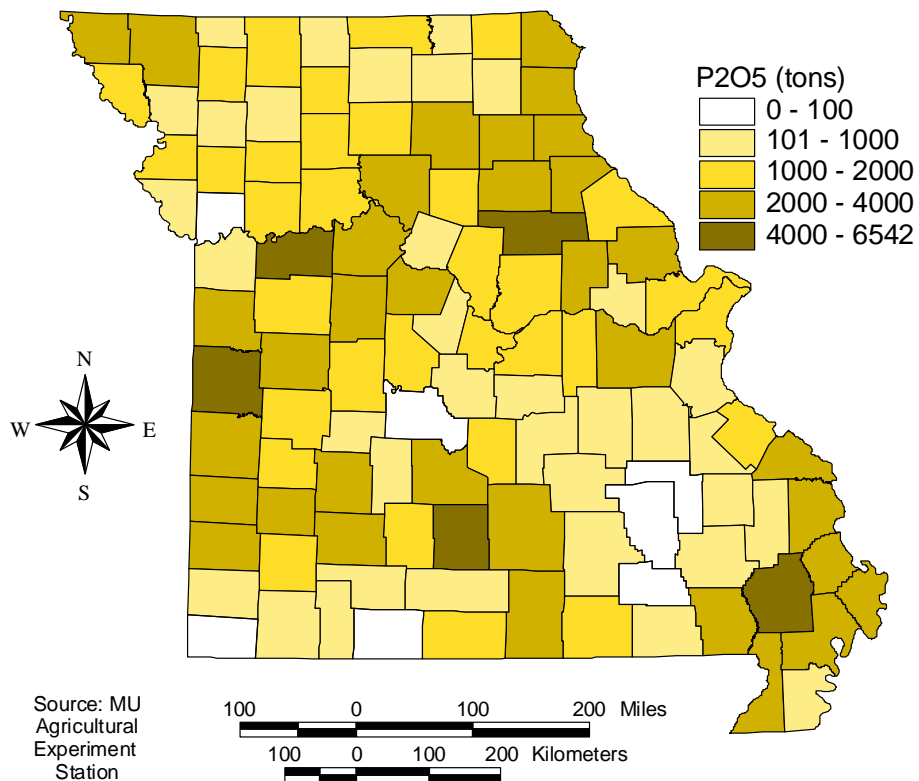
In another view of farmland utilization, one sees that most of counties of Southwest are primarily used for grazing. Barton County again is the exception with only 20-40% of the land used for pasture. Whereas, Dade, Greene, Jasper, Lawrence and Newton are currently at 40 - 60% and Barry, Christian, McDonald, Stone and Taney are 60 - 80% pasture land. This is significant because most of the phosphate applied to such land is recycled back to the land through the cattle.

## Pasture lands (% of Farmland)



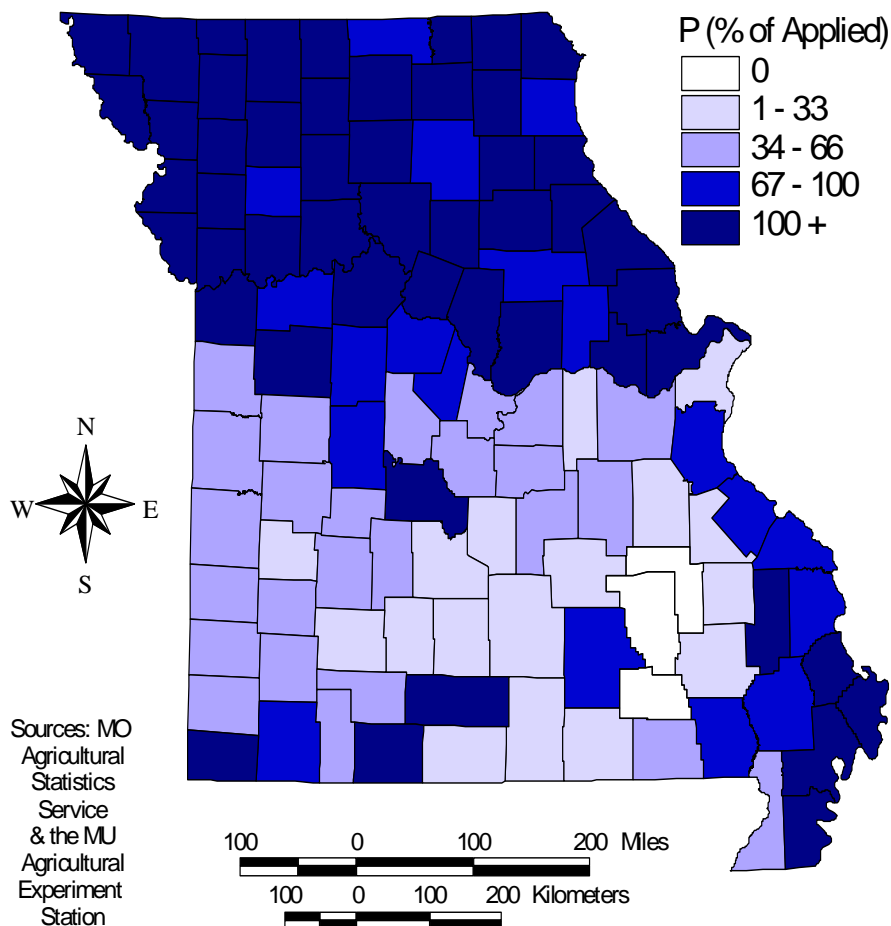
Based on data supplied by fertilizer manufacturers who either supply fertilizer into the state or provide bulk blends going to farmers, this map shows the relative distribution of Available Phosphate as it was applied throughout the state in 2000. 15,375 tons of available ( $P_2O_5$ ) was applied to Southwest Missouri which contained 6,765 tons of Total phosphorus, in approximately 33,424 tons of product assuming 46% product content.

## Available $P_2O_5$ (tons) Applied 2000



One can estimate the phosphorus removal by crops by combining data collected by Mo Ag Statistics Service and applied tonnage reported by the Missouri Ag Experiment Station to demonstrate a harvest efficiency of approximately 49% of the applied total phosphorus or 3,198 tons. It appeared that in 2000 only McDonald County effectively removed all of the applied total phosphorus, but from previous data, that was only 31 tons of available ( $P_2O_5$ ) or 13.64 tons total P. While Barry County removed more than 67% of the applied P. The remaining counties harvested between 34 and 66% of the applied total P because of the recycling effects of grazing.

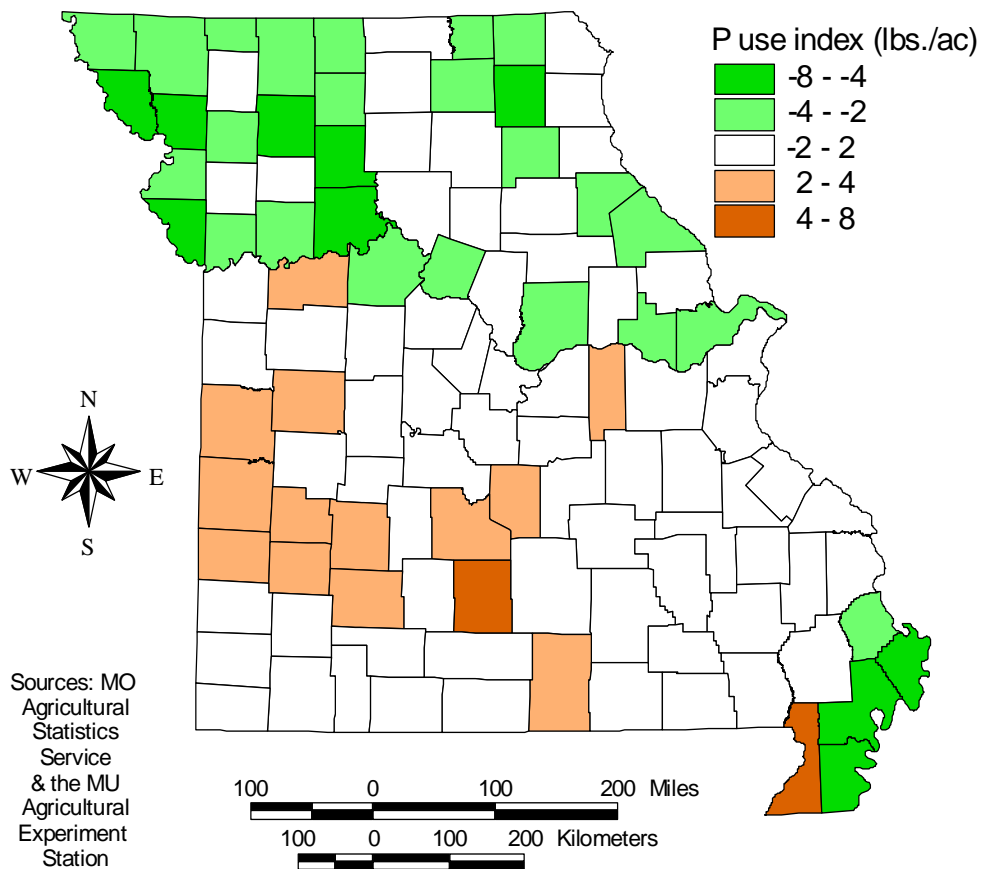
## Phosphorus Harvested in Crops (% of Applied) 2000



Combining data from the 1997 Census of Agriculture and MU Agricultural Experiment Station demonstrates that heavy grain producing counties in the North are essentially mining total P through grain harvest, while the counties of Southwest Missouri are demonstrating essentially a net slow positive gain. The one anomaly on this map is Wright County which contains several fertilizer dealers who distribute throughout several counties, but because of the reporting process all of the tonnage is credited to the single county.

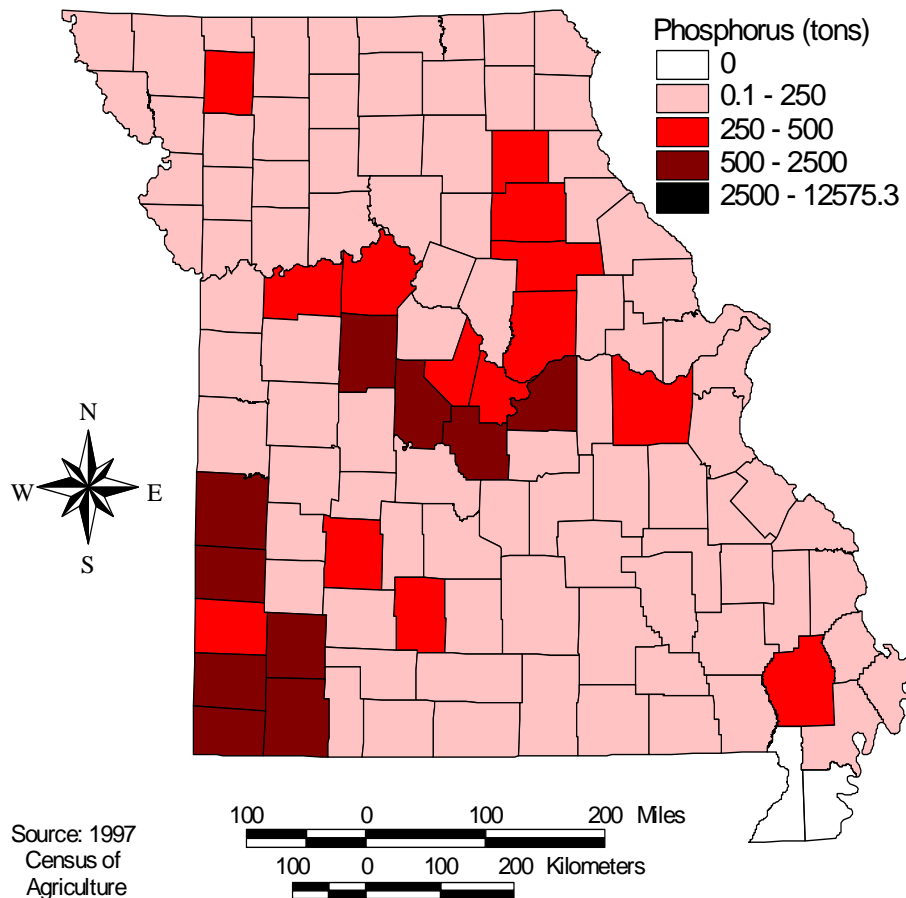
## Phosphorus Use 2000

$[(P_{app1} * 0.44) - P_{harv}]/co\ ac$



Concentrated livestock production in Southwest Missouri produces approximately 6,461 tons of total P which is the equivalent of 14,684 tons of available ( $P_2O_5$ ), contained in approximately 489,467 tons of manure, assuming 3% ( $P_2O_5$ ) manure content.

## Phosphorus (tons) in Manure



## Conclusions

1. Fertilizer Use in Southwest Missouri appears stable or decreasing.
2. Fertilizer use in the bordering counties appears to be increasing.
3. There could be a demand for a manure based product in other areas of the state if it met several criteria:
  - A. No Odor
  - B. Competitively priced with traditional phosphate sources
  - C. Sized to integrate into a blending operation
  - D. Concentrated to minimize bulkiness of application rates
  - E. High Crush Strength to withstand the blending operation