

## Introduction

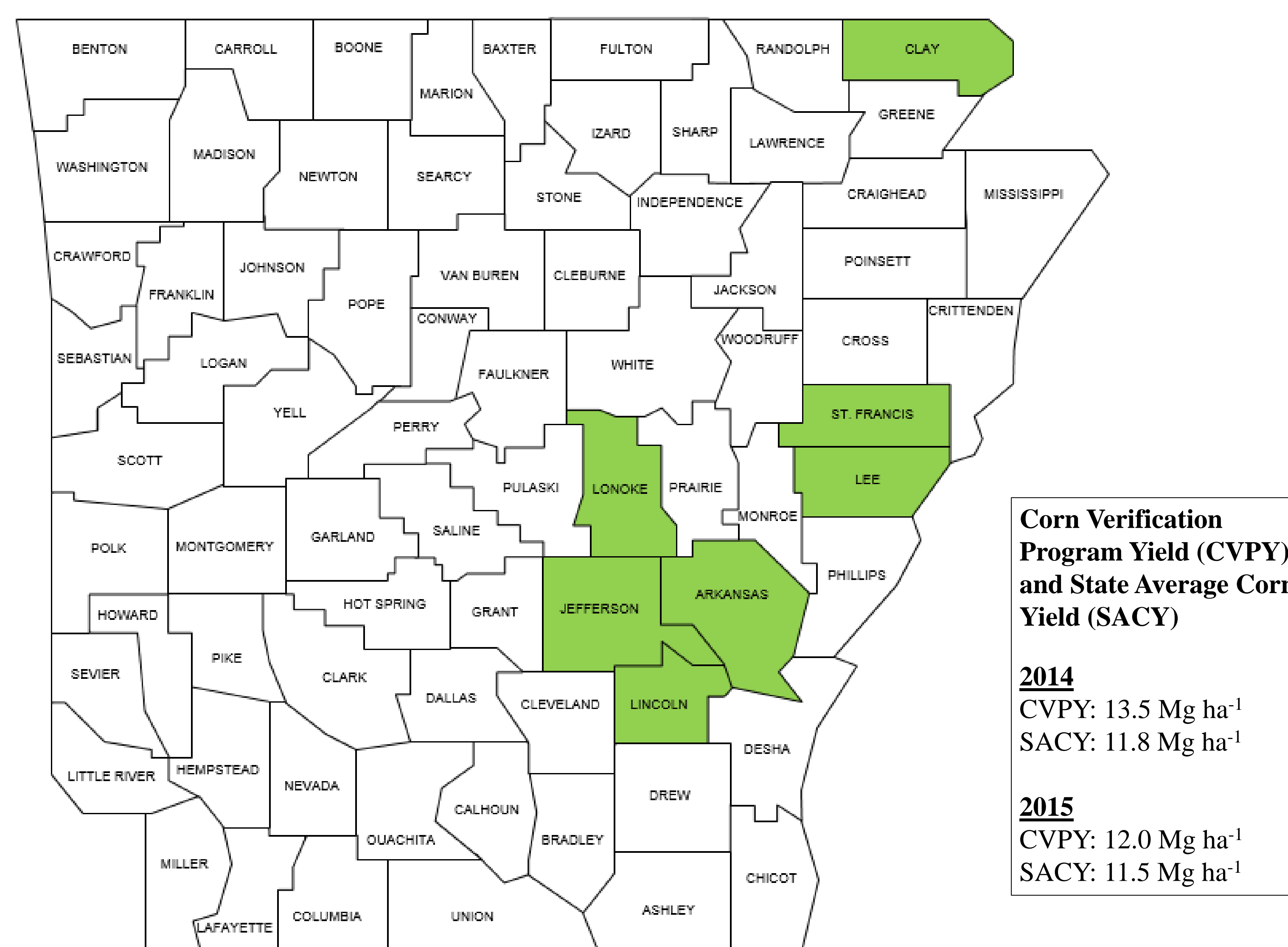
Corn (*Zea Mays* L.) is becoming an increasingly important row crop in Arkansas. Managing nutrients properly is a vital component of profitable corn production. Fertilizer is the largest input cost for producers, often exceeding 25% of their total production costs. The University of Arkansas Corn Verification Program is used to verify and demonstrate the accuracy and benefits of following land-grant University fertilizer recommendations. The Corn Verification Program is an on-farm demonstration of all the research-based recommendations for maximum grain yield in Arkansas. Ear leaf tissue samples were collected at the R1 (greensilk) growth stage to assess the accuracy of the soil fertility and fertilization program and to determine if the current recommendations provide sufficient nutrients at this critical growth stage for maximum yield. Commercial farmers enrolled in the program follow University recommendations, and management decisions were made based on field history, soil test results, hybrids and data collected from each field during the growing season.

The objectives of this study were to identify how University of Arkansas recommendations influenced corn ear leaf nutrient concentrations and to provide insight as to where future soil fertility research needs to focus.

## Materials and Methods

- Cooperators and fields were selected prior to planting
  - Cooperators paid production expenses, provided expense data and implemented recommended management practices
- Fields were located in Arkansas, Clay, Jefferson, Lee, Lincoln, Lonoke, and St. Francis Counties
  - Three sites from 2014
  - Six sites from 2015
- Producer selected hybrids
- Management practices were determined based on:
  - Field history
  - Soil test results
  - Data collected during growing season
- Corn was grown based on UA recommendations
- Ear leaf tissue samples taken at R1 and analyzed for plant essential nutrients
  - Fields were divided into 10 equal sections
  - A minimum of 20 ear leaves were sampled from each of the 10 sections of the field
- Full reports for the corn verification trials are located at the University of Arkansas Extension website:
  - [www.uaex.edu/verification](http://www.uaex.edu/verification)

**Figure 1.** Map of counties where Corn Verification Program fields were sampled in 2014 and 2015.

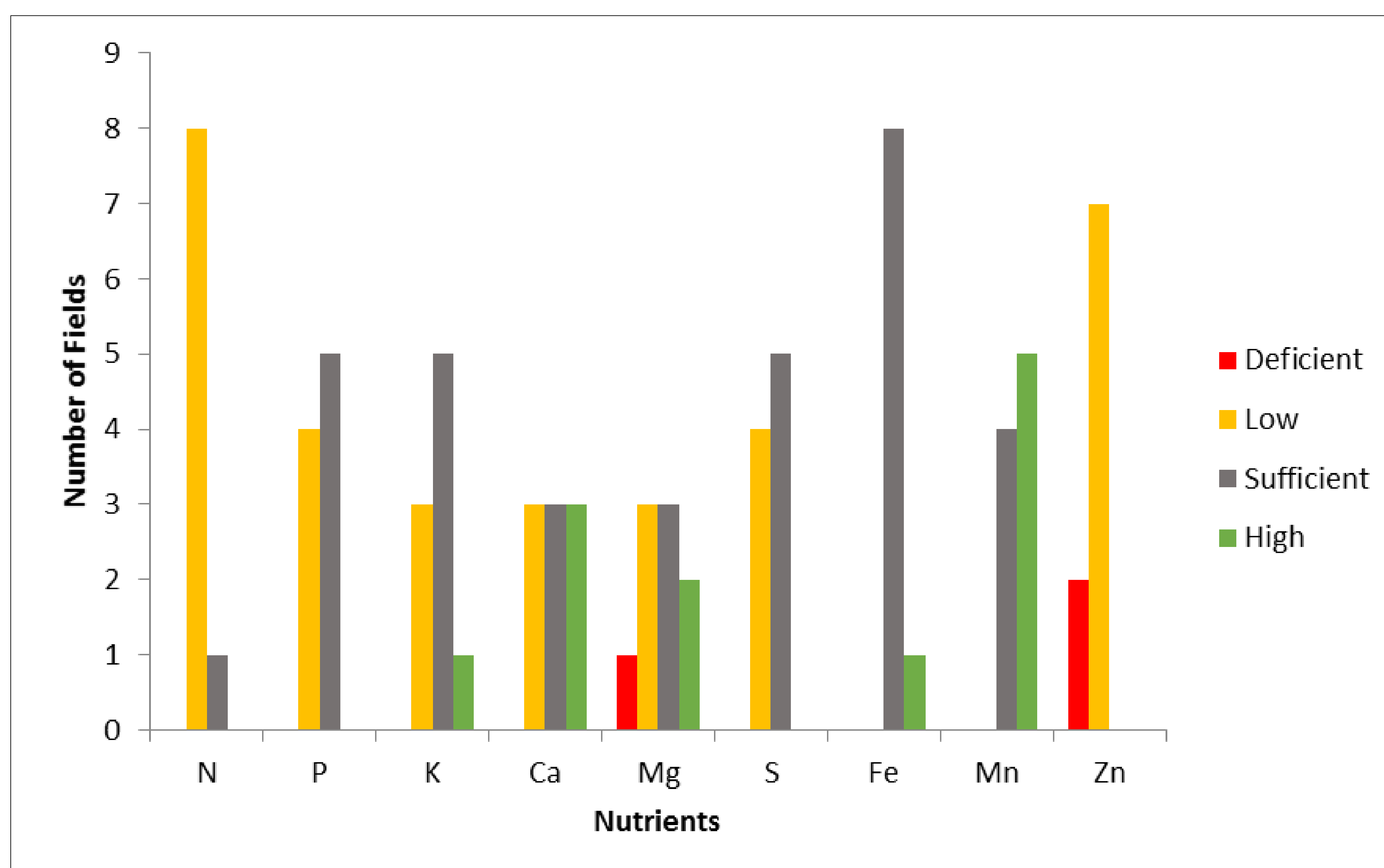


**Table 1.** Interpretive ranges for plant nutrients in corn ear leaf tissue at silking to tasselling.

Nutrient Concentration in Tissue					
Nutrient	Deficient	Low	Sufficient	High	Excessive
N, %	<1.75	1.76-2.76	2.76-3.75	>3.75	--
P, %	<0.16	0.16-0.24	0.25-0.50	>0.50	--
K%	<1.25	1.25-1.74	1.75-2.75	>2.75	--
Ca, %	<0.10	0.10-0.29	0.30-0.60	0.61-0.90	>0.90
Mg, %	<0.10	0.10-0.15	0.16-0.40	>0.40	--
S, %	<0.10	0.10-0.15	0.16-0.50	>0.50	--
Zn, ppm	<12	12-18	19-75	76-150	>150
B, ppm	<2.0	2-5	5.1-40	41-55	>55
Mn, ppm	<12	12-18	19-75	>75	--
Fe, ppm	<10	10-49	50-250	251-350	>350
Cu, ppm	--	<3	3-15	16-30	>30

Source: National Corn Handbook, Cooperative Extension Service, Purdue University

**Figure 2.** Field Ear Leaf Nutrient Concentration.



## Acknowledgements

The Corn and Grain Sorghum Research Verification Program is funded by Arkansas corn and grain sorghum producers through checkoff monies administered by the Arkansas Corn and Grain Sorghum Promotion Board

## Results

The majority of the recommendations resulted in low and sufficient nutrient concentrations in the ear leaves at the R1 stage.

### Nitrogen

Eight of the nine sites had a low nutrient concentration for nitrogen in the ear leaf tissue. None of the sites were deficient or excessive in nitrogen.

### Phosphorous

Five of the nine fields had sufficient phosphorous in the ear leaf tissue. Four sites were classified as low, but none of the sites were deficient.

### Potassium

Three of the fields were classified as low, with the other six in the acceptable range from sufficient to high nutrient concentration.

### Sulfur

Five of the fields were sufficient in sulfur while four fields had low sulfur tissue concentrations.

### Zinc

Two fields had ear leaf tissue with deficient concentrations of zinc.

## Conclusion

Low values occurred for every nutrient except for Fe and Mn. Three or more fields tested low for N, P, K, Ca, Mg, S and Zn. Though the nutrient concentration in the tissue was low, this is not necessarily a negative result. Low values may not influence yield and, with N, may indicate high N use efficiency. However, deficient tissue nutrient concentrations are expected to reduce yield. Two essential nutrients fell into the deficient category in at least one field during this study: Mg and Zn.

Currently, soil test recommendations for Mg have not been developed in Arkansas. Results from this study indicate that further investigation of Mg fertility is warranted.

Two fields were identified as deficient in Zn, but both fields received a Zn fertilizer application. One deficiency occurred in Lee County, where 11.2 kg ha<sup>-1</sup> of Zn was custom applied before planting. Deficiency symptoms occurred, so an additional 6.7 kg ha<sup>-1</sup> of Zn was applied throughout the season. Zinc was the only deficient nutrient. This field yielded 11.3 Mg ha<sup>-1</sup>, which is lower than the average yield that year. This, along with all other fields testing deficient or low, indicates that further research needs to go into Zn recommendation rates and application methods for improved Zn uptake.

## Future Research

Future research should be targeted at developing more accurate recommendations for nutrients that fell into the deficient category: Mg and Zn. Research on the affects of application method may lead to insight on nutrient availability and uptake efficiency.