

# County-Level Assessment of Manure Nutrient Availability Relative to Crop Nutrient Capacity in Iowa

## A.S. Leaflet R2904

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### Summary and Implications

During the twentieth century, agricultural production strived to achieve increased food production in order to satisfy demands. This led to increased farm sizes and an operational separation of crop and livestock production. Society fears that the trend of increasing industrialization of animal agriculture has resulted in concentration of waste products associated with their production over relatively small geographic regions that are spatially segregated from crop production areas. A county level analysis of manure nutrients relative to crop nutrient capacity was conducted to assess the prevalence of these issues in Iowa. Results indicated that in general all counties had sufficient nutrient utilization capacities to value manure as a resource; however, counties in Northwest Iowa are becoming progressively more manure rich, while counties in Southwestern and Central Iowa are becoming progressively more manure poor. This separation of crop and livestock production is becoming more pronounced, indicating that nutrient (especially phosphorus) recovery systems that can concentrate manure nutrients for transport could become more important in maintaining county nutrient balances.

### Introduction

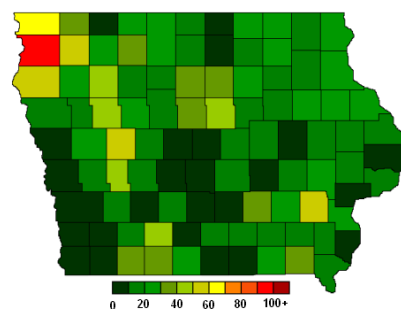
Driven by world-wide population increases, growing incomes, and increased urbanization, society has experienced a marked and rapid dietary transformation. Specifically, there has been an increase in per capita demand for animal proteins (meat, milk, and eggs). This has led to increased farm sizes (more acres per farm or animals per farm), an operational separation of crop and livestock production as farms became more specialized, and an increased use of animal confinement facilities. Society fears that the trend of increasing demand for meat and livestock products and the associated growth of the animal production industry will result in greater amounts of manure, in many cases beyond the ability of the soil around the facility to utilize it. Thus, my objective was to explore if animal production in Iowa is intensifying to such a degree that in certain areas of the state manure will be viewed as a waste instead of resource. Changes in these trends over time will also be assessed.

### Materials and Methods

Data from the census of agriculture were used to make estimates of crop and livestock populations and production within each county. The nutrient assimilative capacity of crop land was estimated by multiplying the amount of a commodity produced times the nutrient content of that commodity. A model operation type was chosen for each livestock species and utilized in the estimation manure production. Available nutrients in manure were calculated by estimating average animal populations and multiplying this value by a manure production coefficient, a manure capture coefficient, the amount of nutrient expected to remain after storage, and finally the percent of those nutrients that would be crop available.

### Results and Discussion

The results indicated that while both manure production and nutrients available in manure have generally increased over the last 50 years, the nutrient assimilative capacity from crop production has increased much more rapidly. This has resulted in Iowa being able to obtain progressively less of its nutrient needs from animal manures. At the current time it is estimated that manure nutrients can provide only about 25% of the state's nitrogen and phosphorus needs. In most counties a similar pattern emerged, that is manures produced within the county accounted for a progressively smaller fraction of the counties nutrient needs. There were



**Figure 1. Manure nitrogen availability as percent of crop utilization capacity.**

several notable exceptions to this trend, most notably in Northwestern Iowa where manure nutrients are capable of supplying more than 70% of the counties nitrogen

and phosphorus needs. This work indicates that while manure is still a resource throughout the state, a trend of spatial separation of crop and animal production is developing. This could result in the need for improved nutrient separation systems to facilitate movement of manure nutrients to areas of crop production.

### Acknowledgments

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