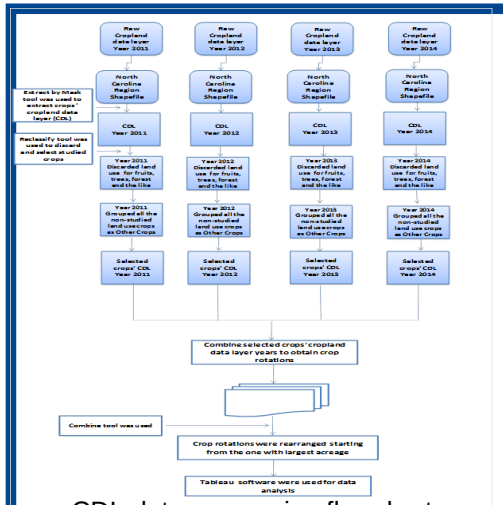
This research was funded by: NSF - CREST

Kingsley Aning Bonsu

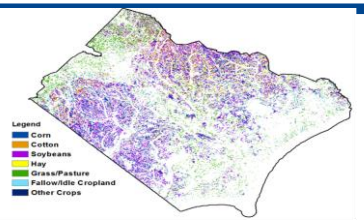
Program: Computational Science and Engineering

Dissertation Title: Movement of marginal cropland in out of production: A GIS-BASED Analysis of North Carolina Crop Rotations

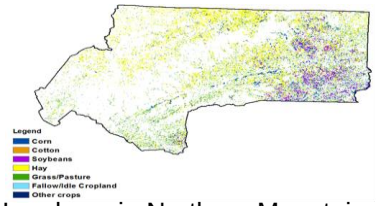
Major Professor: Dr. Lyubov Kurkalova



CDL data processing flowchart algorithm



Land use in Southern Coastal CRD.



Land use in Northern Mountain CRD

RESEARCH QUESTIONS / PROBLEMS:

- To identify the dominant crop rotations in each of North Carolina's eight Crop Reporting Districts (CRDs).
- To analyze spatial differences between crop rotation patterns on land that is in production and crop rotation patterns on land that is taken out of production periodically.

METHODS:

- I accessed the accuracy of the Cropland Data Layer (CDL) by comparing the total crop acreage in the CDL with the total crop planted acreage for the same CRD from the USDA/National Agricultural Statistical Service (NASS surveys, when available).
- In the next step I overlaid the 2011 – 2014 Cropland data layers to identify crop rotation patterns for every parcel of land represented in the CDL.
- Finally I identified the predominant patterns of the movement of land that is in production and patterns on land that is taken out of production periodically.

RESULTS / FINDINGS:

- CDL and the USDA/NASS surveys-derived CRD total acreage were positively correlated, with the R squared of 0.88.
- The differences between the means of the CDL and USDA/NASS CRD-total acreage data were not statistically significant for soybeans and for cotton, but were statistically significant for corn.
- The analysis revealed that ten most frequent crop rotations accounted for over 75 percent of the cropland in each CRD
- In the Mountain CRDs more than half of the land moved out of fallow to hay, but in the Coastal CRDs the majority of the land coming out of fallow was used to grow corn, soybeans, other crops or cotton.
- The area supply of hay with respect to price was estimated to be unit-elastic.

SIGNIFICANCE / IMPLICATIONS:

- My contribution of filling the gap in understanding crop rotations in each of North Carolina's eight crop reporting districts (CRDs) was achieved.
- The Coastal districts had highest rotation patterns in soybean-corn-soybean; it is an indication that soybean-corn-soybean land usage is the most common practice in the coastal districts. On the other hand, the Mountain and Piedmont districts showed high incidence of grassland-hay-grassland rotation pattern.