Executive Summary

Geographic Information System (GIS) and Linear Programming (LP) are combined to analyze cropping and livestock alternatives for tobacco farmers in Pittsylvania County, the primary tobacco producing county in Virginia. A sector of the county covering 7,926.0 acres is analyzed. GIS is used to show the location and acreage of each soil type and the crops best suited to the soil characteristics. LP is used to generate the profit maximizing combination of enterprises given constraints of soil and land characteristics and water availability for the crops and livestock characteristic of farms in Pittsylvania County. The base year for the analysis was 1997, the last year before significant cuts in tobacco quota. Broccoli and tomatoes, two representative vegetable crops, were limited 3 acres each to approximate the 1997 combinations in the area. While the crops and livestock selected for the Baseline scenario are typical of those produced, they may not by the specific acreage mix used by Pittsylvania County farmers in 1997. The intent was to generate, before quota cuts in tobacco, a *Baseline net revenue* using the profit maximizing combinations of tobacco and other selected farm enterprises.

The results of ten scenarios analyzed shows that any restrictions on tobacco production reduced the Baseline revenue. When tobacco was reduced by 50 percent and tomato and broccoli were not restricted by water availability and were allowed to enter with as high as 100 acres each, the profit maximizing solution was only $65,559 (19.8 percent) less than the $3,107,687 Baseline. Assuming that market prices did not change as a result of the increased production, growing increased acreages of tomatoes and broccoli might lead to net revenues comparable to or above those received before tobacco quota reductions. However, 100 acres of broccoli with yields of 370 20-pound cartons per acre would be 740,000 pounds of broccoli; 100 acres of tomatoes with yields of 1,600 25-pound cartons per acre would be 4 million pounds of tomatoes. Clearly, neither regional nor local markets could absorb these quantities and the price remain at $10.18 and $7.99 per carton for broccoli and tomatoes, respectively. Growers would then be faced with having to compete in the global market. For the quantity of any fruit or vegetable to be increased sufficiently to help replace revenue lost by tobacco quota cuts, local and regional market networks would have to be developed.

Beef cattle are often recommended as an alternative for tobacco acreage. The GIS/LP model was run for several iterations, increasing the revenue above all variable costs from beef cows to as much as $100 per cow unit. Reducing tobacco acreage by 50 percent and restricting the beef cow production to only land suitable for pasture or hay allows 260 cow units in the study area of nearly 8,000 acres. Net revenue is $658,515 below the Baseline. When beef cows are not restricted to soils and slopes suitable only for pasture or hay acreage, 972 cow units could be raised and would require 2,430 acres at 2.5 acres per cow unit. Net returns to beef cattle with revenue at $100 per cow unit are only $40.00 per acre. The average farm size in Pittsylvania County is 216 acres, which would accommodate 86 cows if all acreage were used for the beef cow operation.

An alternative using contract hog finishing was always in the profit maximizing set of enterprises. Swine finishing floors could be an effective revenue supplement on tobacco farms, but such intensive livestock programs raise questions about the environment and are not always encouraged in tobacco producing counties.

Using GIS and LP in combination to evaluate the possible crop and livestock combinations to maximize profits is a powerful tool. Restrictions can be placed on acreage or water availability to simulate what farmers face on their farms. The thresholds generated make it easy to see how much price must increase or how much costs must decrease for an enterprise to enter the profit maximizing set of enterprises. This information with the information from the GIS analysis of what crops the soils will support should give direction to the strategic planning and diversification programs and help producers avoid making the costly mistakes that often occur during an adjustment period.