Managing Tillage, Crop Rotations, and Environmental Concerns in a Whole-Farm Environment

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Introduction

Tillage practices are a topic of much conversation among row crop producers due to environmental requirements and as a method to reduce production costs. Crop rotations are also an important topic to many row crop producers. Extension personnel as well as crop advisors are often asked to make recommendations on various tillage practices or row crop mixes (i.e., crop rotations). There are environmental and agronomic reasons for implementing certain tillage practices and crop rotations. Additionally, there are economic reasons. Often published university crop budgets are used to make economic recommendations. However, in a whole-farm scenario, per-acre enterprise budgets do not always tell the complete story. For example, a no-till budget may appear more expensive than a conventional tillage budget based on increased herbicide costs, even though future capital investment costs (i.e., disks, cultivators, etc) are reduced. On the other hand, a no-till budget may appear less expensive where capital investment expense (i.e., fixed costs) is substantially reduced for one enterprise unit, even though the capital investment is still needed on the farm to raise other crops in the farm’s rotation. These factors can vary in degree of magnitude across farm sizes. A whole-farm mixed-integer programming model can evaluate all these alternatives simultaneously, including environmental soil loss requirements. This article presents an example of the results obtainable with this type model. Additionally, this report analyzes and summarizes the major economic implications of adopting reduced tillage practices.

Background

In the mid-South, as elsewhere, cotton growers have sought technology that will lower costs and/or increase productivity. For example, alternative tillage systems continue to be the focus of economic analysis for potential improvements in economic efficiency (2,3,7). The Mississippi Delta is a region with both dryland and irrigated cotton production, although limited moisture is not a major impetus for adoption of reduced tillage systems. Rather, the main motivation for reduced tillage is cost savings and potentially greater profitability. Soil conservation is also not a major issue vis-a-vis productivity, although some soils/crops/tillage systems in the Delta may result in enough erosion to violate Natural Resources Conservation Service (NRCS) soil conservation compliance constraints.

Since the 1990s, researchers at Mississippi State University and the Delta Research and Extension Center have collaborated with growers to compare alternative tillage systems. Parvin et al. (3) reported that no-till cotton systems