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THE INCLUSION OF BEEF CATTLE IN THE OPTIMAL ENTERPRISE ORGANIZATION*

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Abstract

A profit maximizing model that included many of the diverse aspects of beef cattle production and interrelationships among beef cattle, forages and field crops was developed within a dynamic linear programming framework. The optimal resource organization was determined given price levels that existed during 1973-1977.

Key Words: Field crops, forages, beef cattle, dynamic linear programming and optimal programs.

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Optimal enterprise organization models based on linear programming analyses have been used extensively for agricultural planning by both policy makers and individual producers [2]. While these models have typically provided an adequate framework for the analysis of either cropping or livestock enterprises on the farm, their ability to depict farms combining the production of both field crops and beef cattle has often proved to be inadequate.

Much of this problem can be attributed to the fact that in those models in which the inclusion of beef cattle production (in conjunction with field crops) has been attempted, it has been accomplished by specifying the herd as the unit of the beef cattle production enterprise [1, 7]. As a result, if the maintenance of the average animal in the herd was non-optimal then the entire herd was non-optimal. The inclusion of the beef cattle herd in the optimal solution would then be achieved only by the inclusion of constraints forcing the maintenance of the herd. Such a method of inclusion not only negates the benefits of marginal analysis, but also fails to recognize that in any herd there is a distribution of animals with respect to both quality and profitability [3]. Hence, while the maintenance of the average animal may be non-optimal, better-than-average animals may still be optimally included in a final solution.

The diversity of the beef cattle herd is, of course, only one aspect of the production decision involving beef cattle and field crops. Major interrelationships between field crops and beef cattle production also exist with respect to land use and the timing of production. These interrelationships include the ability of beef cattle to utilize 1) forages

produced on land that is less well suited to the production of crops, or on cropland that is unused in the production of crops during some season, 2) many of the by-products of crop production such as corn stubble and 3) crops that are often grown primarily as cover crops. Beef cattle are, therefore, able to produce desirable products from feeds and lands that might otherwise be unused and thereby contribute to the farm's net revenue.

The major objective of this study was the development of a profit maximizing model that included the consideration of field crops, forages and beef cattle production. To fully endogenize beef cattle in this model attention was given to the many diverse aspects of beef cattle production and to the many interrelationships among beef cattle, forage and field crop production.

Analysis

The firm-level planning model developed in this study involved an analysis of field crop, forage and beef cattle enterprises typical of North Florida [8]. A representative 500-acre farm was hypothesized for this purpose and recommended production practices for all crops and beef cattle enterprises having potential in the area were assumed.

Model Specification

To determine the optimal mix of these enterprises, the problem was formulated as a linear programming problem in which multiple production periods were considered and a single objective function was maximized. Specifically, production in each month of each year of a five-year planning horizon was considered for a profit maximizing producer.