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Kenneth L. Wells

University of Kentucky

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Managing Soils For Optimum Crop Production

K. L. Wells

The major resources which must be manipulated to develop a farm operation are LAND, LABOR, CAPITAL, and MANAGEMENT. Of these four broad categories of resources, LAND is the one which imposes constraints which ultimately determine the productive capacity of the individual farming system developed. This is because land is a fixed resource from the standpoint of the nature and amount of it available for developing a specific farming system. In this regard, the allocation of LABOR, CAPITAL, and MANAGEMENT should be directly linked to LAND productive capability in order to economically optimize the farming system developed. In other words, the nature and amount of LAND must be considered initially in developing an economically viable farming system which can most effectively utilize the LABOR, CAPITAL, and MANAGEMENT available. The following suggestions are about factors to consider to make LAND the least limiting as possible in developing a farming system.

KNOW YOUR SOILS

The field is the basic management unit of a farming system. Most decisions are made as they relate to specific fields. Because of this it is important that field boundaries encompass soils that can be managed somewhat alike. In order to decide what soils can best be grouped together into a single field boundary, some knowledge of the physical and chemical characteristics of individual soils types is necessary. Such information is available from published county soil survey reports or individual farm maps, both of which are prepared by the USDA-Soil Conservation Service and other cooperating agencies. With such information, field boundaries can best be established to result in individual fields containing groups of soils which can be managed in the same manner.

KEEP A FIELD RECORD SYSTEM

Once individual field boundaries are established, set up individual field records for keeping track of lime, fertilizer, and chemical use, cultural practices used, and crop yields. The intent is to develop a cost and return statement. Profitable farming is an ongoing process.
SOIL TEST
Fertilizer and lime costs quite often are the largest out-of-pocket costs incurred each year in use of each field. For this reason it is important to use lime and fertilizer only if it results in an economic return from use of the field. Soil test results provide the best information available for use in determining whether lime and fertilizer are needed, and if so, what kind and how much are needed. Needs based on the crop sufficiency philosophy used by most agricultural colleges result in the best economic returns from use of lime and fertilizer.

MATCH CROPS TO FIELDS
Be sure that productive crops and the best varieties of those crops are used for the most productive fields. The agronomic objective is to maximize biomass production from each field. This cannot be accomplished by using highly productive fields for crops having limitations in their productive potential.

BE TIMELY WITH FARM OPERATIONS
Most crops have somewhat narrow windows for most successful planting and harvesting and application of other cultural practices. Plan these operations so that they do not impose undue limitations on crop production. Increased yields resulting from timely operations are extremely cost effective.

ROTATE CROPS
Crop rotation provides economic benefits at no added costs. Yields of crops grown in rotation are usually 5 to 15 percent greater than when grown successively in monoculture. These yield increases are obtained with no out-of-pocket costs except those involving execution of the rotation. Additionally, rotation aids greatly in disease and insect control, further cutting out-of-pocket costs for crop production.

PROTECT AGAINST EROSION
Loss of topsoil reduces the productive potential of most soils which have an erosion hazard. Once diminished, productive potential rarely if ever can be built back to its original state. Appropriate erosion control practices should be used. Agronomic practices such as use of no-till planting, winter cover crops, and crop residue management are much more cost efficient than engineering erosion control practices.

DON'T COMPACT SOILS
Compacted soil usually results in diminished crop production. Compaction is caused by application of pressure to moist or wet soils, resulting in more solid material in a given volume of soil. This lowers the amount of water and air which a given volume of soil can hold, and may physically restrict root growth resulting in poor utilization of water and nutrients. Take all reasonable care not to traffic on fields when they are wet.

K. L. Wells, Extension Soils Specialist