COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF MARYLAND, COLLEGE PARK
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OPERATING A PROFITABLE SMALL FARM

330 MONTEVUE LANE • FREDERICK, MD 21702-8200 • (301) 694-1594 • FAX: (301) 694-1588

FACT SHEET 7

Crop Rotation

Terry E. Poole
Extension agent, Agricultural Science
Frederick County, MD

I. Benefits of Rotation

Have you ever noticed that the first year a crop is grown in a field is the best production year for that crop? There is a reason for this phenomenon. It has to do with a whole host of things that involve plant pests, soil fertility, and allelopathy (plant wars). Crop rotation is one of the most important cropping practices you will need to adopt if you are to be successful as a crop producer. The benefits of crop rotation have been written about since the days of the Roman Empire. It has been suggested by some experts that crop rotation is worth 75 percent of everything else that you do for your crop production.

II. Pest Control Benefits

The continuous production/cropping of plants supports the development of pests. Many of the pests that attack our agricultural crops are either very host-specific, or an obligate parasite. This means that they are very particular about what they eat. If you continually provide them with their preferred food, they will continually eat it and produce more baby parasites. However, if you introduce a totally different plant in the field, it disrupts their life cycle. The food is unacceptable to their system, so they will either leave or die.

This is the basis of using crop rotation as a means of pest management. Pest problems involving nematodes, insects, weeds, and disease organisms can be significantly reduced through crop rotation. Crop rotation is effective for all types of plants. This includes grasses as well as broadleaf plants. Parasites build up in annual plants as well as perennial plants. As little as one year's rotation can often be enough to knock back a pest's population.

Research the life cycle of your pests and know how long a field needs to be out of a plant species before it is safe to be replanted. Also, learn what plants work well as rotation crops. For example, a rotation that features a grass crop followed by another grass crop is not a true rotation. The grass crop should be followed with a legume crop. The following year, a grass crop could be planted.

If you are using pesticides to manage pests, crop rotation will permit you to use different pesticide chemistries. Crop species vary somewhat in the types of pesticides labeled to be applied to them. By alternating different pesticide chemistries, crop producers help to minimize the development of pesticide resistance within the pest population. Insects, fungi, and even weeds have developed resistance to some of our most popular pesticides.

Weeds, next to soil erosion, contribute to the greatest loss to farm income in the country. Crop rotation can directly help to control weeds in two ways. First, some crop species can physically outcompete the weeds for light, water, nutrients, and space. They simply smother the weeds. Second, some crop species

have alleopathic properties. This means that some plants produce chemicals that inhibit the growth of other plants. In some plants these chemicals are released by the plant as it grows and in others it is released as the plant decomposes. Allelopathy can be a big contributer to the weed control program. It should be added that allelopathy can also work in reverse. Market crops can be affected by the allelopathic properties of other plants. For example, alfalfa will inhibit the growth of other alfalfa plants. Learn what plants have allelopathic properties and where they fit into your rotation.

III. Plant Fertility Benefits

One of the best known features about crop rotation is the benefit to crops following a leguminous crop. The primary reason for this huge benefit is the nitrogen-fixing ability of leguminous plants. Legumes have the ability to capture atmospheric nitrogen and convert it into a form that plants can utilize. This conversion process is assisted by *Rhizobium* sp. bacteria living in nodules on the legume plant's roots. Legumes typically fix much more nitrogen than they need, which often leaves a fair amount of available nitrogen to a succeeding crop. The amount of leftover nitrogen varies with the legume species. The amount of nitrogen can be as much as 100 pounds per acre with hairy vetch. Red clover and alfalfa are also prolific nitrogen fixers. Research which legumes fit your nitrogen needs.

Some crops have the ability to utilize plant nutrients in the soil that would otherwise be unavailable to other crops. Also, deep-rooted plants will bring up nutrients leached down the soil profile that would normally be lost. Captured plant nutrients become available to succeeding crops as plant residue breaks down, releasing the nutrients into the soil.

Different crops often will utilize higher or lower amounts of some plant nutrients. Crop rotation can thereby help to avoid depleting an important nutrient.

Rotating different crop species helps to maintain good soil structure by introducing different root systems. Fibrous root systems help to loosen the soil, larger roots provide channels for air and water to enter the soil. Deep-rooted plants expand the root zone, making more of the soil available to the producer.

IV. Rotating Cash Crops

If at all possible, you need to work crops into your rotation that have value either as a direct cash crop, or indirect cash crop. An indirect cash crop would not be marketed, but utilized directly on the farm. The value of the crop is the savings on not having to purchase that item. An example is the production of red clover. It has value as a hay or pasture to livestock producers. While its rotational benefits are developing in the field, the producer is also benefiting from its feed value to livestock.

Small farm operators, for the most part, do not have the luxury of surplus acres that can be left fallow for a year or more. Profitability hinges on getting the most out of every acre. Efficient and effective crop rotations exist for whatever cropping system you have chosen to operate. This includes field crops, fruits and vegetables.