Crop Diversity

The term diversity when applied to crop rotations means more than simply adding another crop or crop type to the rotation. In attempting to increase rotational diversity, an operator needs to focus on how crops interact with each other, with other species present, with the soil, with the environment, and with the operator's short and long term goals. The reasons for increasing crop rotational diversity include: to spread weather and price risks, to manage weed populations, reduce plant diseases, manage workloads, create the proper environment for subsequent crops, reduce fixed costs per unit of production, access alternative markets, etc.

Producers should strive to achieve levels of diversity that are **adequate** to attain the goals established for their situation. Having less diversity than needed eventually leads to production and profitability problems. Adding more diversity than needed can reduce efficiency since it increases the number of crops that must be managed, handled, and marketed. Outside influences such as government subsidies, crop insurance, etc. tend to discourage diversity.

Defining and evaluating rotational diversity is much more challenging than dealing with intensity. This is partially due to the fact that rotations that lack adequate diversity to be successful over the long-term may perform very well for periods of 4 to 10 years before their weaknesses are exposed. Consequently, it is important that the method developed for quantifying rotational diversity which is outlined in this publication (pages 5&6) be seen as an exercise to improve understanding of some of the factors important to developing proper rotational diversity. It is not meant to be a comprehensive treatment of all of the factors involved in this subject. By necessity, many areas have been simplified to make this demonstration more straightforward.

The first simplification is to classify crop plants into one of four morphological and growth habits: cool season grass, warm season grass, cool season broadleaf, and warm season broadleaf. These different plant types will have different growth and maturity habits; nominal seeding and harvesting periods; water use characteristics; pest problems; etc. It is easier in the initial phases of diversity planning to focus on the gains that can be made by using differing crop types in the rotation. Subsequent fine-tuning must be made using specific crops since some crops from different groups share common diseases (most broadleaf crops whether cool or warm season are susceptible to white mold). On the other hand, some crops of the same type can be used to break a disease cycle (sunflower are not susceptible to soybean cyst nematode) or compete better with a specific weed (winter wheat or rye provide better opportunity to control wild oats than growing tame oats).

Crop substitutions can be made within a given crop type for added flexibility and allow the producer to maintain an agronomically sound rotation. For example, if conditions are unexpectedly too wet to plant corn timely, an alternative warm season grass could be planted at a later date such as grain sorghum or millet depending on the producer's current equipment (planting and harvesting), expected weed pressure, grain handling facility, market price, etc.

The diversity index calculations contained in this publication are intended to demonstrate potential impact differing rotations can have on reducing the probability that weeds, diseases, insects, workload problems, etc. will become a problem. It assumes good management practices are being used throughout the system. It also assumes that factors such as government subsidies, marketing opportunities, crop insurance cover-age, agronomic information, labeled pesticides, operator knowledge, etc. are equivalent for all crops in the rotation. These assumptions are not necessarily true.

Briefly, the crop rotation diversity index as calculated on this scale increases according to the:

- years separating the same crop type,
- presence of both grass and broadleaf crops,
- presence of both spring and fall sown crops, and
- presence of warm and cool season crops.

Diversity index decreases if crops must be seeded and/or harvested during the same time period.

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