Cover Crops (Section 6.3)

• Conceptually they are meant to provide cover to prevent erosion during fallow periods between cash crops.
• They can provide a variety of benefits to the crop rotation.
• The intended benefit is very important when selecting a cover crop
• A good reference for cover crop management
Benefits of cover crops

• Erosion control
• Improve soil structure
  – Increase soil organic matter and surface residue
  – Increase macroporosity
  – Alleviate/prevent compaction
• Enhance soil fertility
  – N Fixation
  – Recycle nutrients
  – Prevent leaching of nutrients
• Weed Suppression
• Disease and insect suppression
• Improve water quality
• Increase crop yields!
Cover Crops: Soil Structure, Organic Matter, and surface residues

- SOM and surface residues are continuously being decomposed
- Cover crops can utilize water and sunlight that is otherwise lost during the fallow period to make biomass to replenish SOM and residue losses.
- Can be important in rotation with low residue crops
Soil Structure

- Tap rooted cover crops may penetrated dense subsoils and improve rooting depth of cash crop

Forage Radish in Ottawa Co.

Sun hemp in Kingfisher County
Soil Structure

• Fibrous root cover crops can alleviate and/or prevent surface compaction
Organic Matter, and Surface Residues

• Good examples of a cover crop used for this purpose
  – Inclusion of a cereal grain in cotton production
  – Follow soybeans with a winter cereal to provide surface residues for next corn or soybean crop.
  – Very common in organic cropping systems
Soybeans after Cover Crop Rye

• Can decrease in-season water loss
• Improve soil structure and drainage
• Yields can be improved
• Pods are set higher, improving harvest
Rye prior to Corn

- Virginia Factsheet
Cover Crops and Nutrient Management

• N Fixation
  – Legumes
  – Sometimes difficult to determine mineralization and availability to cash crop
    • Rule of thumb is that 40-60% of aboveground N can go into following crop if incorporated
    • 25% may be available if left on the surface
  – Sensor based technology can provide a better assessment of crop N status and remove the guess work
Nitrogen Fixation

• Potential total N produced by common legume cover crops
  – Cowpea=100-150 lbs N
  – Hairy Vetch=90-200 lbs
  – Berseen clover=75-220 lbs N
• This will depend on biomass production and N concentration
• Most legumes have 3.5-4% N prior to flowering and 3-3.5% during flowering.
• This concentration declines rapidly after flowering
Cover Crops and Nutrient Management

• Recycle nutrients
  – Concept that cover crops extract immobile nutrients from low testing soils and make them more available upon mineralization
  – Difficult to quantify but may serve as a cumulative benefit of cover crops
Cover Crops and Nutrient Management

• Prevent leaching of nutrients using Catch crops
  – Rye is commonly used to capture N mineralized after soybeans in corn-soybean rotations.
  – Maryland cover crop program
  – Nitrogen capture is meant to prevent NO$_3$ leaching and transport to Chesapeake Bay
  – Currently research is underway to develop management to optimize N utilization by corn following rye.
    • Can be challenging because of immobilization during decomposition of rye
Cover Crops and Weed Suppression

- Cover crops compete with weeds and suppress growth
- Some may also exude allelopathic compounds
- Cover crops should be easily killed by herbicides
- They should also be killed before viable seeds are produced in most cases.
Allelopathy

- Cover crops that have been found to exhibit allelopathic benefits
  - Brassicas such as canola, rapeseed, or radish
  - Cereal Rye
  - Sorghum Sudan
- Residue affects of the properties vary and should be considered when choosing a cover crop
- Generally they are short lived.
Disease and Insect suppression

• Some cover crops such as Brassicas (canola, rapeseed, radishes) as examples can exude biotoxnic compounds
• They can be mowed and incorporated to maximize their fumigant potential because fumigant is release when cells are ruptured
• However, this affect is low compared to commercial fumigants
Cover Crops and Water Quality

• Catch crops prevent excess N from moving to water bodies
• Erosion prevention
  – Sediment, herbicide and nutrients
• Reductions in pesticide use
  – Benefits resulting from bio-fumigation can be observed and realized but are generally not well understood.
Cover Crops and Cash Crop Yield

- Examples of yield improvements can be found
- Rye in continuous soybean production
- Rye in Cotton
- Rye prior to corn
- Legumes in rotation with corn or cereal grains
- Where severe compaction is prevented or alleviated.
Cover Crops and Cash Crop Yield

• Generally benefits of cover crops are cumulative
• May simply decrease production costs
• They can be used to fix problems with the rotation that are not be addressed with cash crops
  – Inclusion of rye in corn-bean rotation is a good example.
  – Why not just grow wheat for grain
  – Answer, wheat is not as valuable.
  – Lack of diversity is addressed with cover crop.