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 o 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

Sorghum Sudan roots in grazed wheat field in Kingfisher Co

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
- http://www.ag.auburn.edu/auxiliary/nsdl/scasc/Proceedings/2009/Thomason.pdf

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 biotoxic 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 observe red 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.