



In the past, summer fallow in the northern plains (<16" rainfall) was a conventional practice used to store water for the up coming crop year. Fallow will conserve moisture however, further research has identified the moisture storage inefficiencies of these systems and identified the additional negative impacts of these systems which include soil erosion, saline seeps and declining soil organic matter levels.

Conventional winter wheat/fallow systems have moisture efficiencies of approximately 40%. In other words, 60% of the precipitation during the fallow period is lost through evaporation, runoff or leaching. These impacts can be seen as rills and gullies in watercourses or in the development of saline seeps in fallow fields. In addition, the impact of tillage in fallow systems mineralizes soil organic matter as a nutrient (nitrogen) source for the next wheat crop.

Example Wheat-Fallow Rotation - Conventional tillage (surface residue after fallow operations is <10%).

Nutrient Sources: (In this Example – Nitrogen Sources)

Manure, Commercial Fertilizer, Legume Credits – None
 Plant Residues: Wheat straw (0.8lbs of N/Bu produced)
 Atmospheric Nitrogen – 5-10 lbs./acre/year
 Soil Organic matter mineralization with tillage.

Targeted Yield goal:

E.g. Wheat -30bu.

Nitrogen Needed:

Reference: South Dakota EC-750 “Fertilizer Recommendations Guide”
 Yield goal times crop need – Wheat at 2.5lbs of N per bushel X yield goal
 2.5lbs of N X 30bu = 75 lbs. of N/acre needed

Nitrogen Available to the Crop:

Total Nitrogen Required (2.5 lbs. N X 30 Bu.) =	75 lbs.
Nitrogen in the straw is (0.8 X 30 Bu.) =	-24 lbs.
Nitrogen from the atmosphere (10 lbs. Per year X 2 years) =	-20 lbs.

Nitrogen needed from Soil OM = 31 lbs.

In summary, 75 lbs. of nitrogen is necessary for a 30 Bu yield. An additional 31 lbs. of N is needed from external sources (i.e. manure, commercial fertilizer, legumes) or from the mineralization of organic matter.

The Impact of Declining Soil Organic Matter

The negative soil impacts of reduced soil organic matter include: reduced nutrient and water holding capacities of soils, increased soil surface puddling and crusting, reduced water infiltration, increasing runoff, and reduced soil tilth.

Increasing Surface Residue or Intensifying Rotations

Many producers in the western half of the northern plains are reducing tillage in fallow systems, changing surface residue amounts, intensifying rotations or completely eliminating fallow. These beneficial changes require nutrient management because the nitrogen normally released from mineralizing either crop residues or soil organic matter during the fallow period is not occurring with these changes. Reducing tillage, increasing soil organic matter, and increasing rotational intensities requires additional nutrients to be effective and economically viable. Crop production systems without proper nutrient management will eventually fail.