MISSISSIPPI STATE UNIVERSITY
MS AGRICULTURAL AND FORESTRY EXPERIMENT STATION

MISSISSIPPI STATE UNIVERSITY EXTENSION

Cover Crops in Vegetable Production Systems

T. Casey Barickman, Ph.D.
Assistant Research/Extension Professor
North Mississippi Research and Extension Center

What is a Cover Crop

- A crop whose main purpose is to benefit the soil or other crops in one or more ways, but is not intended to be harvested for feed or sale.

Defining your purpose

- Cover crop species selected should have many of the following traits:
  - Fast germination & emergence
  - Competitiveness
  - Tolerance to adverse climatic and soil conditions
  - Ease of suppression
  - Fertility benefits
  - Low-cost establishment

Benefits of Cover Crops

- Cover crop benefits – long term
  - Reduce erosion
  - Improve structure
  - Smother weeds
  - Enhance nutrient and moisture availability
  - Help control pest

- Cover crop economics rooted in Nitrogen (N) dynamics
  - How much N you save or produce with cover crops

Benefits of Cover Crops

- What we do know about cover crops
  - Increase yields
  - Save on N costs
  - Reduce trips across the field
    - Reduce weeding techniques or other pesticide (organic) applications
  - Build soil health

- Farmers increasingly looking at the long-term contributions of cover crops
- Success and benefits are indicated by the commitment to making cover crops work
  - Re-tooling current cropping systems to better fit cover crop growth patterns
    - Not squeezing cover crops into an existing system, time permitting

Cover Crops

- How can cover crops reduce nutrient costs
  - Contributing N to cash crop by scavenging and mining soil nutrients
  - Legume cover crops
    - Hairy vetch
    - Clovers
    - Winter pea
    - Cowpea
    - Sun hemp
  - Cereal cover crops
    - Millet
    - Cereal rye
    - Oats
    - Barley
    - Wheat

Cowpea Cover Crop

Foxtail Millet Cover Crop

N Furnished by Cover Crops

- Clovers, alone 100 lbs
- Common vetch 100 lbs
- Cowpea 75 lbs
- Sunn hemp 100 lbs
- Grasses 0 lbs
- Clover/grass 40 lbs
- Winter pea 100 lbs
- Lespedeza 30 lbs
- Soybean 35 lbs
- Velvet bean 100 lbs

- Reduce the need for inputs for weeding
  - Smother crop that outcompetes weeds for water and nutrients
  - Residue or growing leaf canopy that blocks light, alters the frequency of light waves and changes soil surface temperatures
  - Source of root exudates or compounds that provide natural herbicidal effects

- Managing pest
  - Beneficial microbial life that discourages disease
  - Create an inhospitable soil environment for soil-borne diseases
  - Encourages beneficial insect predators to reduce insect damage
  - Produce compounds that reduce nematode pest populations

Disadvantages of Cover Crops

- Seed can be expensive – demand
- Can be difficult to eliminate
- Can become a weed
- Can compete with your crop
- Not a cash crop; lose income from cover crop
  - Benefits are more indirect
- Some cover crops are more flexible than others with seeding times

Cover crop as part of a system

- Choose cover crops to best fit desired purpose(s) and niche (window) in system.
- “Green manure” crop—cover crop or forage grown to incorporate into soil while green or flowering, to improve soil
- “Catch” crop or “trap” crop—cover crops planted to reduce nutrient leaching following a main crop
- “Living mulch”—cover crop inter-planted with cash crop

Crop Rotation with Cover Crops

Tomato Crop

Clover/Rye Cover Crop

Cucurbit Crop

Clover/Rye Cover Crop

Crop Rotation with Cover Crops

Tomato Crop

Buckwheat Cover Crop

Brassica Crop

Clover/Rye Cover Crop

Clover/Rye Cover Crop

Lettuce Crop

Buckwheat Cover Crop

Cucurbit Crop

Cover crops and nutrient cycling

- Trap nutrients that would otherwise “leak out” during fallow periods
  - leaching through soil
  - losses as eroded soil or runoff
- Release nutrients later—ideally at the time needed by the next crop
- Fix N from atmosphere (legumes)
- Translocate nutrients from deeper in subsoil, to near surface after cover crop death
- Increase soil biological activity in topsoil, potentially releasing nutrients from soil minerals
- Cover crops do not “create” nutrients in soil, but can recycle and release; except legumes can add N

Green Manure Crops

- Produce 40-200 lbs.N/acre, depending on species, biomass produced, %N in plant
- Approx. 40-60% of N available to subsequent crop
- Incorporation of green manure into soil results in increased N for 4-6 weeks; after this supplemental N may be required

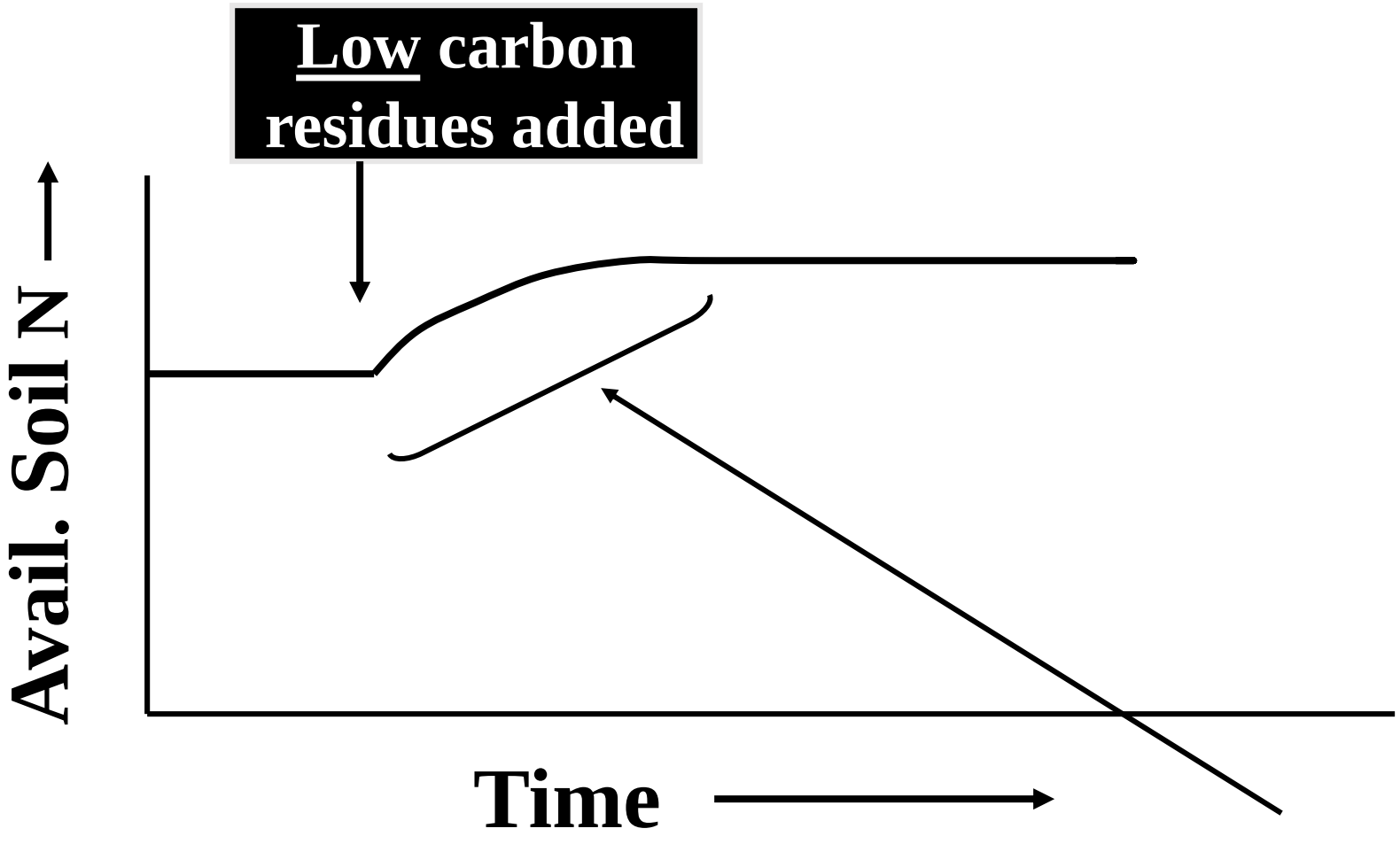
Green Manure Crops

- Long enough growth period to produce enough biomass to fix sufficient N, in cooler climates (for full season vegetable crop)
  - Good results in south (longer winter growth)

- Usually need fertilizers, manure, composts, or other organic materials in addition to legume covers, to provide sufficient N to main crop

- Hairy vetch, Austrian pea, sunn hemp, cowpea, mustard greens (Brassica greens), clover

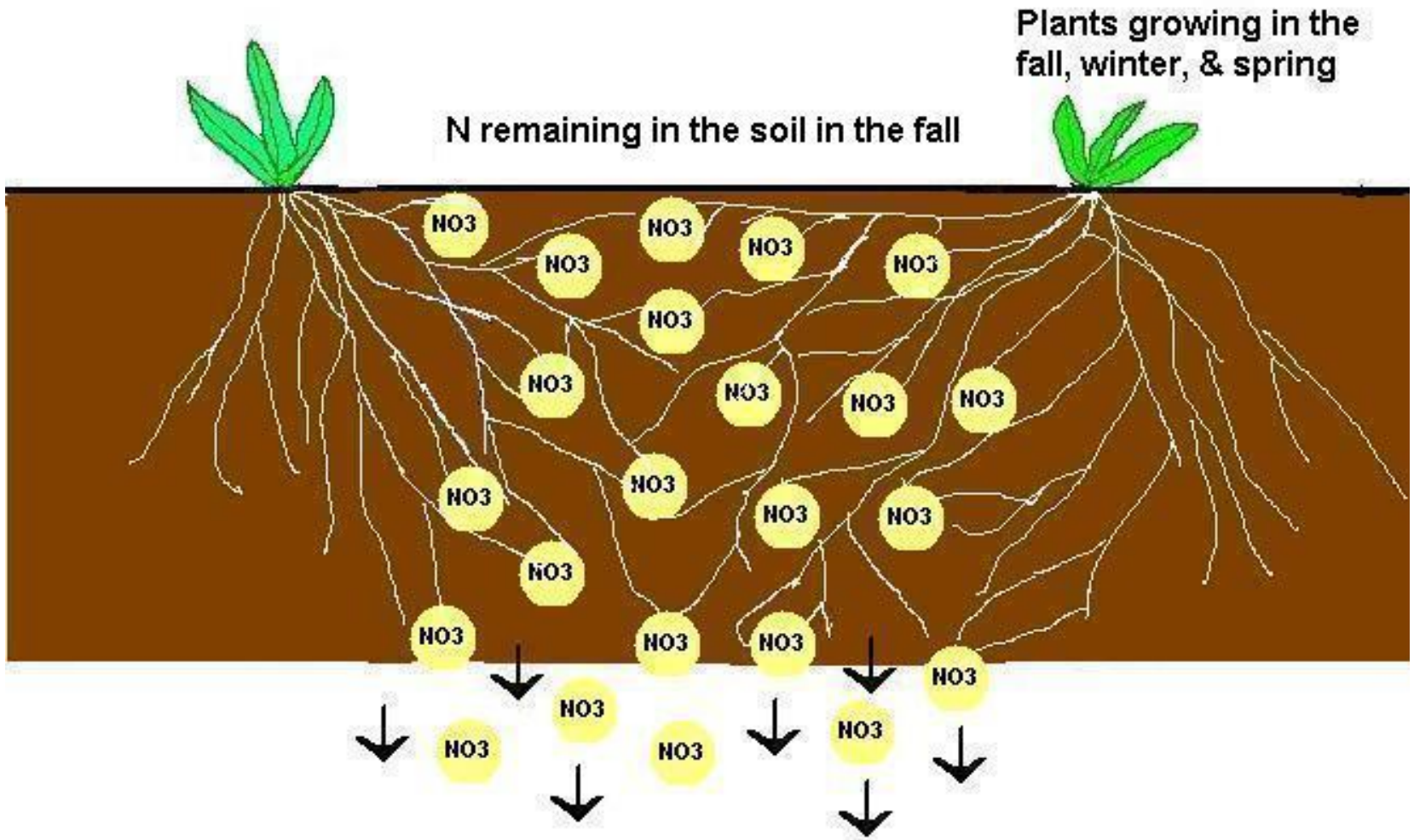
Residue Addition and N Availability



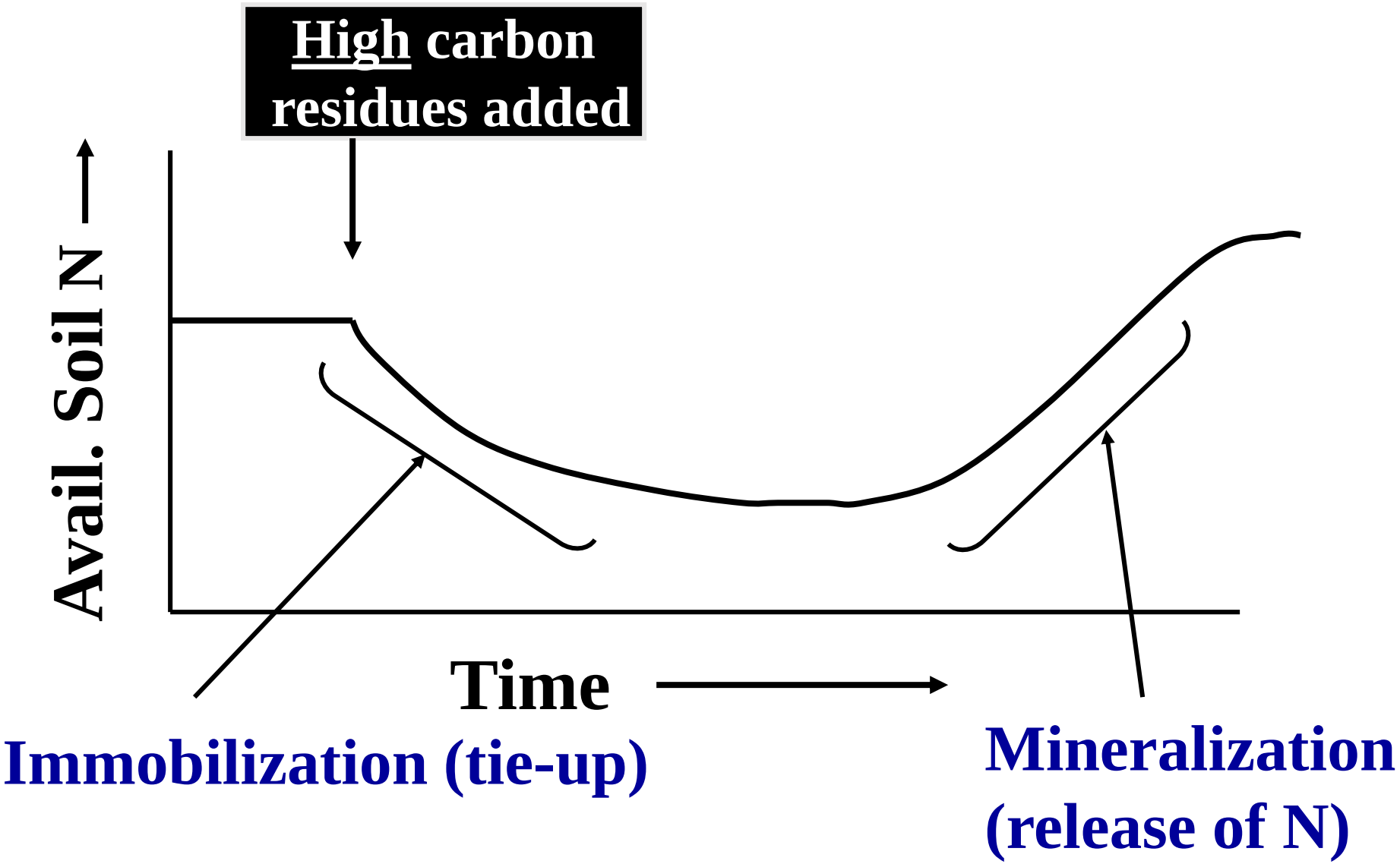
Trap crops

- Amount of biomass produced is key to nutrient uptake—good stand, rapid growth
- Age/stage of plant when killed, determines N%, C:N, plant composition, and therefore decomposition rate (along with weather!) Huge challenge!
- Cereal rye, millet, wheat, oats, barley

Cover crops, living mulches, and perennials can capture N left in the soil before it is lost.



Residue Addition and N Availability



Summary of Cover Crops

- Legume cover crops can “fix” N from atmos.
  - Amount depends on amount of growth, species, soil, etc.
  - Often need additional N sources such as compost or manure
- Non-legume cover crops effective to “trap” N that would leach through soil
  - Amount depends on amount of growth
  - Release depends on C:N ratio, weather, etc.
- Cover crops as part of a system for nutrients, soil organic matter, and soil physical properties

NMREC Horticulture

- **Website**
  - vegetablelab.mafes.msstate.edu
- **Twitter**
  - @TCBarickman

MISSISSIPPI STATE UNIVERSITY
MS AGRICULTURAL AND FORESTRY EXPERIMENT STATION

MISSISSIPPI STATE UNIVERSITY
EXTENSION

Contact Information:

T. Casey Barickman, Ph.D.

t.c.barickman@msstate.edu