

Exploring Summer Cover Crops for Vegetable Systems in the Northeast

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Why Use Summer Cover Crops?

Summer cover crops are most common in Southeast where cash crop seasons are Spring and Fall



Fall/Winter Cover Crops are most effective when seeded early and terminated late

- Seed mid-August to mid-September in Massachusetts (Farsad et al. 2011)
 - Delaying 1 week past optimal date reduced fall rye biomass 29%
 - Delaying 4 weeks past optimal date reduced fall rye biomass 79%
- Seeding mid-September to early October and terminating in mid-June produced the most biomass in Pennsylvania (Duiker 2014)



Optimal timings do not fit with vegetable production schedule

Summer cover crops can complement winter/fall covers, help to make up for biomass reductions from late planting and early termination

Why Use Summer Cover Crops?

- Weed Suppression
- Habitat for Beneficials and Pollinators
- Build Soil Organic Matter
- Fix Nitrogen
- Biofumigation
- Prevent Erosion
- Improve Soil Structure



Summer Cover Crop Choices

- Buckwheat (*Fagopyrum esculentum*)
- Teff (*Eragrostis tef*)
- Japanese Millet (*Echinochloa esculentum*)
- Mustard (*Brassica* spp.)
- Field Pea (*Pisum sativum*)



Buckwheat

Uses: insectary crop, weed suppression

Strengths:

- Germinates and grows quickly (5 weeks)
- Easily incorporated; residue breaks down quickly
- Bee pasture
- Solubilizes phosphorous and calcium

Weaknesses:

- Will re-seed if not killed before 50% bloom
- Volunteers compete with fall vegetables
- Not drought tolerant
- Should be drilled for best results

Seeding Rate: 50 to 100 lbs/acre

Cost: \$38 to \$88 per acre



Teff

Uses: Weed suppression, living mulch, biomass

Strengths:

- Can mow with lawnmower
- Tolerates traffic
- Does not become weedy
- Frost-killed residue will suppress weeds into Spring, can use as killed mulch for fall vegetables
- Seed with drop spreader

Weaknesses:

- Best seeded mid-May to mid-July
- Does not mix well

Seeding Rate: 8-12 lbs/acre

Cost: \$25/acre conventional or Organic





Ways to use teff



Japanese Millet

Uses: Biomass, weed suppression; plant after spring vegetables

Strengths:

- Can produce 3 to 4 tons/acre biomass in 6 to 8 weeks
- Can mow with 2-wheel tractor
- Very responsive to nitrogen

Challenges:

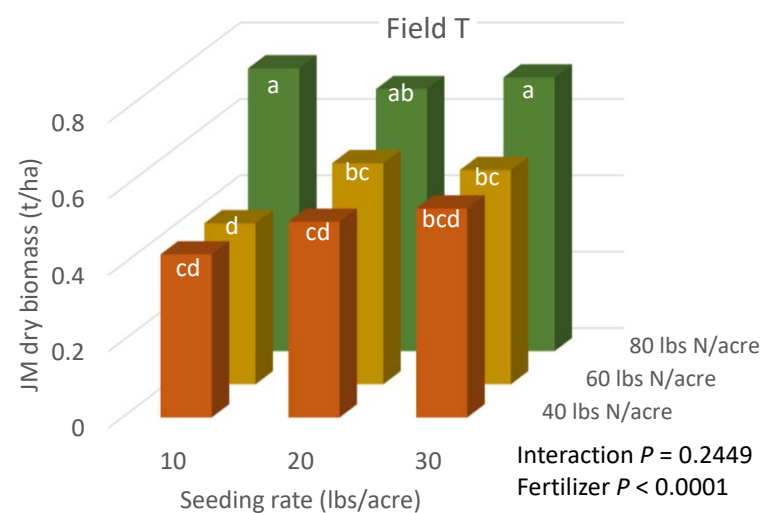
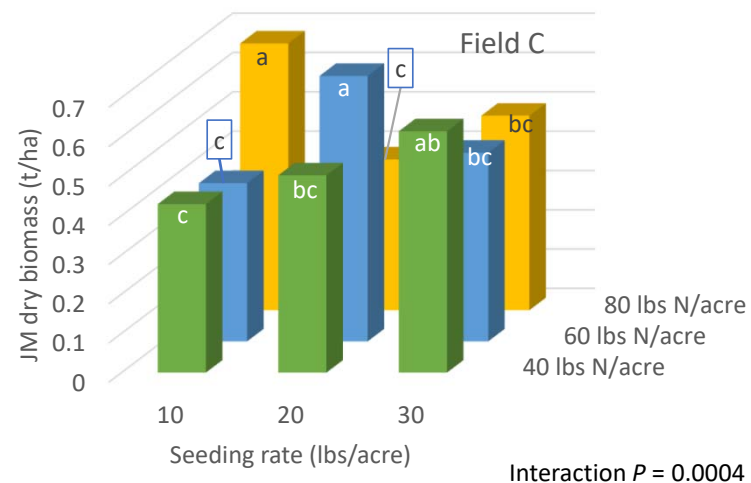
- Weedy if allowed to mature seed
- Biomass production reduced if seeded after mid-July

Seeding Rate: 30 to 40 lbs/acre; can reduce if abundant nitrogen

Cost: \$35/acre, Organic seed not available

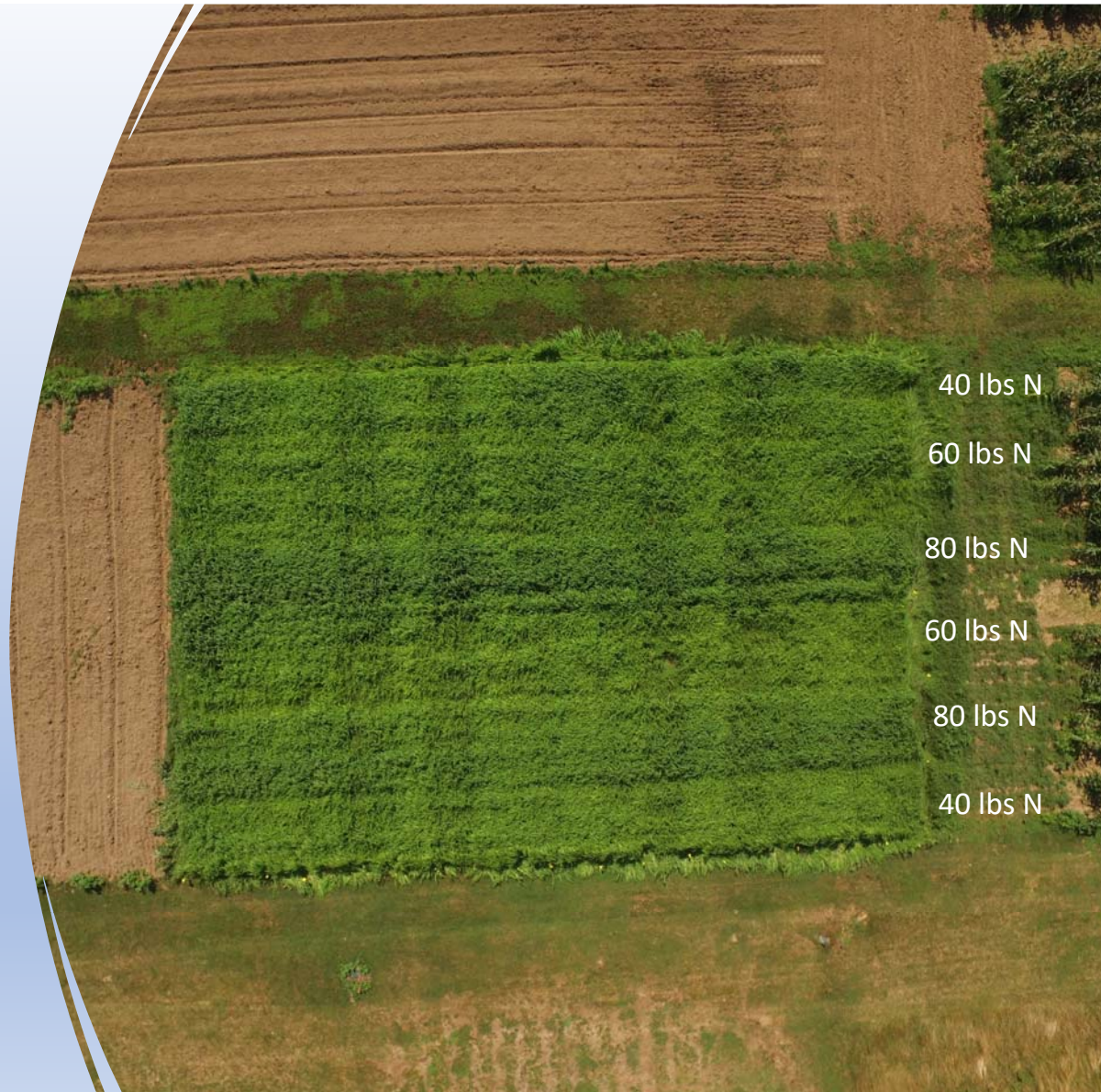
Effects of Nitrogen on Japanese Millet

- Fields differed in response to increased nitrogen
- Increasing nitrogen compensates for decreasing seeding rate
- Biomass increased with nitrogen rate for all seeding rates in Field T
- Some other factor restricted biomass in Field C
 - Likely water – T has much higher organic matter than C



Difference Visible from 200 feet!

Field T 1 week before
harvest. Fertilizer
treatments are horizontal
bands, seeding rate
treatments are vertical
bands.



40 lbs N

60 lbs N

80 lbs N

60 lbs N

80 lbs N

40 lbs N

Mustard

Uses: Weed suppression, insectary crop, biofumigant

Strengths:

- Rapid germination
- Long planting window
- Excellent biofumigant if incorporated at pod fill
- Slower to mature seed than buckwheat
- Deep taproot

Weaknesses:

- Shares pests with Brassica vegetables
- Only 2 to 3 tons/acre biomass

Seeding Rate: 15 lbs/acre

Cost: \$25 to \$50 per acre



Field Pea (4010 Forage type)

Uses: Nitrogen fixation, weed suppression

Strengths:

- Can fix up to 150 lbs N/acre
- Can produce over 5 tons/acre biomass
- Best weed suppression of spring/summer legumes

Weaknesses:

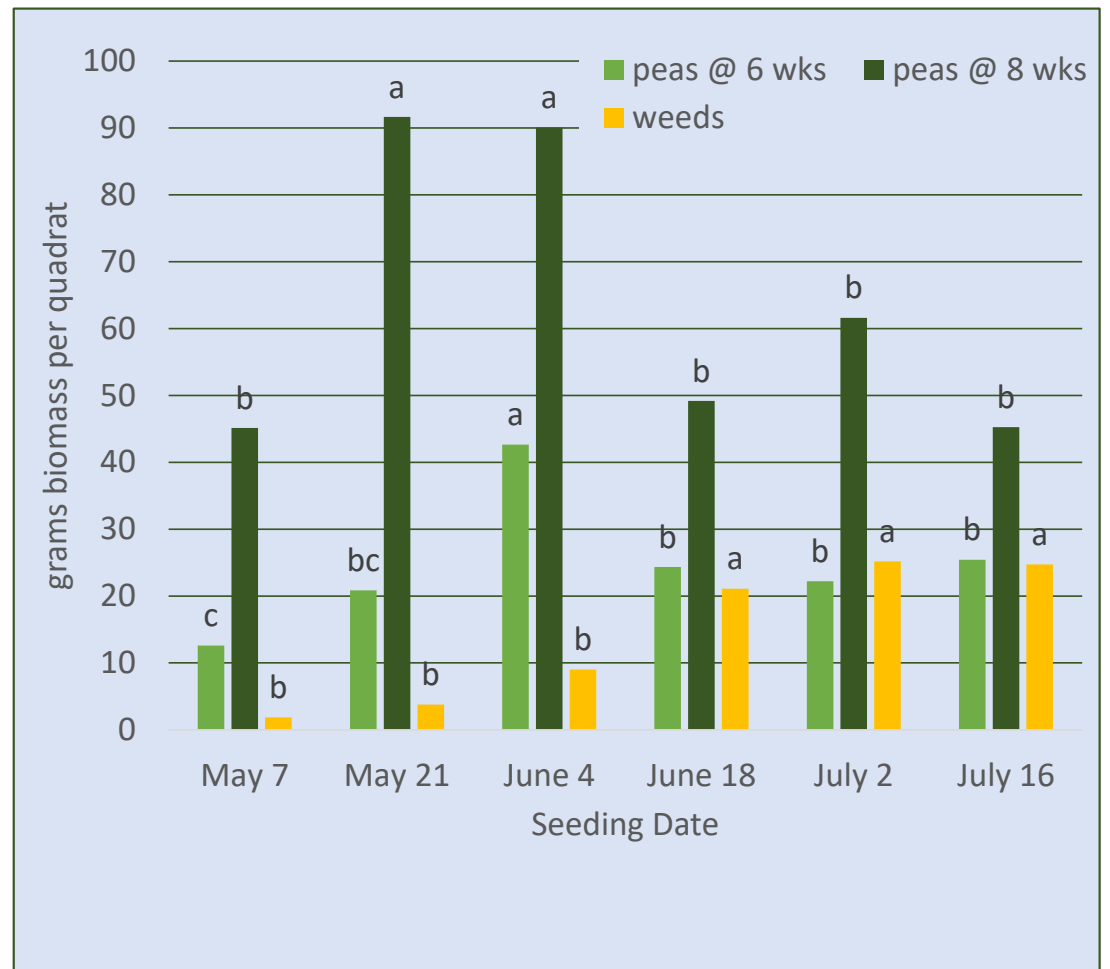
- Susceptible to *Sclerotinia* fungus
- Should be drilled for best results
- Weed suppression reduced when sown after mid-June

Seeding Rate: 100 lbs/acre

Cost: \$38 to \$52 per acre



Peas – not
just for fall
and spring!



Ways to Integrate Cover Crops with Vegetables

- Teff in alleys, as living mulch for fall crops, as winter-killed mulch before early spring crops
- Japanese millet or peas before fall crops
- Mustard or buckwheat between spring and fall
- Winter covers interseeded into fall-harvested crops

