Crop Rotations for Long-Term Success with Strawberries

Marvin Pritts, Cornell University

A good crop rotation:

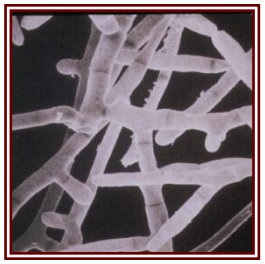
- Suppresses weed seed germination
- Increases soil organic matter
- Increases soil tilth and aggregate stability
- Can add nitrogen to the soil
- Suppresses some nematodes
- Suppresses some pathogens

Indirect benefits:

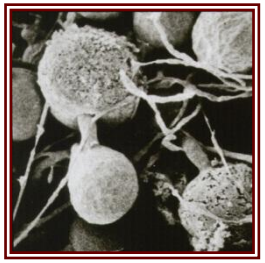
- Support pollinators
- Prevent erosion
- Conserve soil moisture
- Protect water quality
- Decrease soil compaction
- Catch and recycle nutrients

Common pathogens in berry fields

Rhizoctonia spp



Pythium spp.



Phytophthora spp.

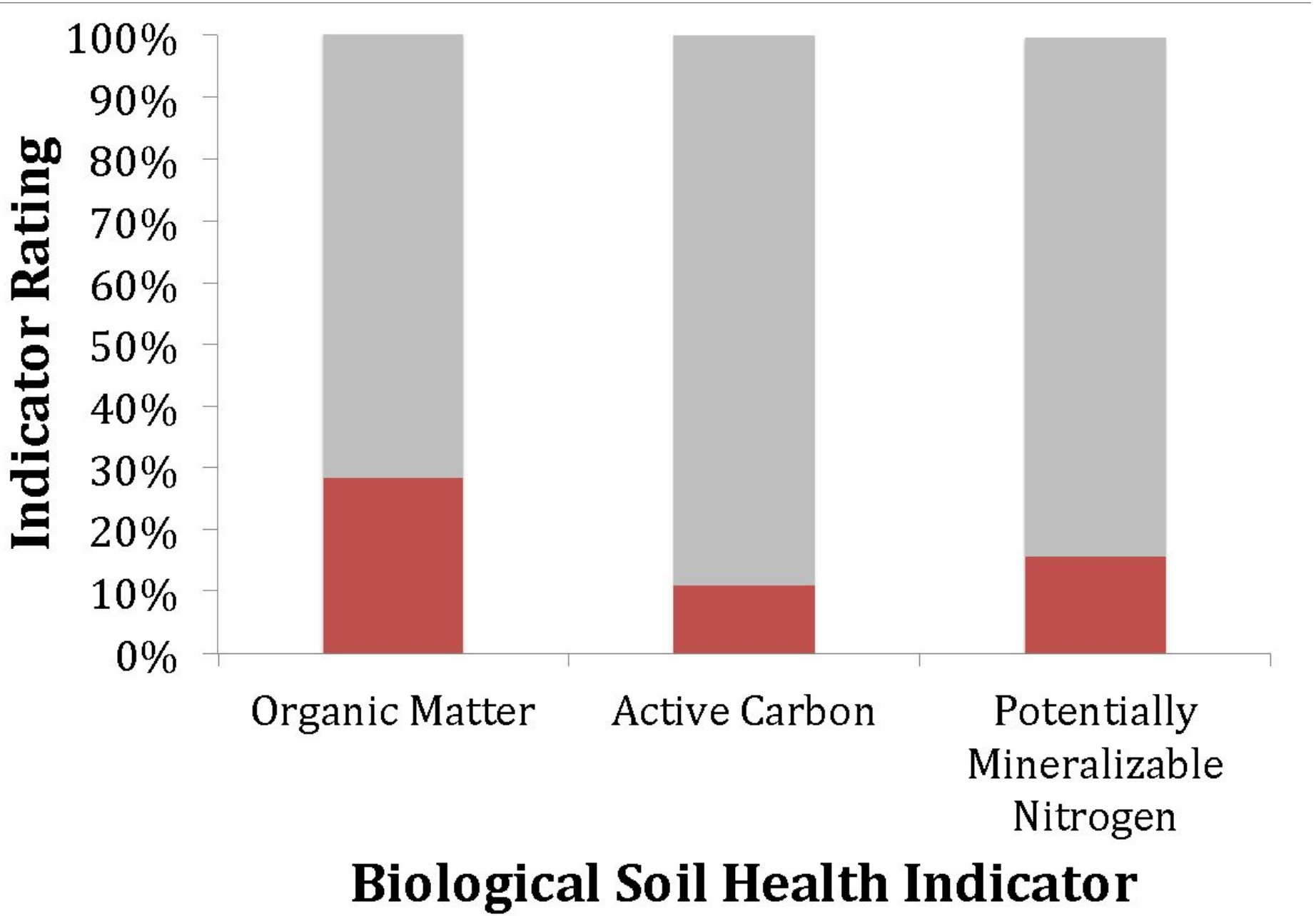
Other associated organisms

- *Verticillium albo-atrum*
- *Fusarium* spp.
- *Cylindrocarpon* spp.
- *Idriella lunata*
- Others

Nematodes harmful to strawberries

- Root knot (*Meloidogyne* sp.)
- Root lesion (*Pratylenchus penetrans*)
- Dagger (*Xiphinema americanum*)
- Sting (*Belonolaimus gracilis*)

NE SARE survey of strawberry farms



Relying on fumigation alone is not a good idea

- Survey of 27 farms
- Two locations per farm
- 104 variables (cultural, historical, physical, chemical)
- Root health – dependent variable

Factors most highly correlated with poor root health

- Age of plantings
- Cumulative years in strawberry production
- Soil compaction
- Fine soil texture
- Absence of raised beds
- High application rates of terbacil
- Non-use of metalaxyl
- **Frequency of fumigation**

Individual cover crops have desirable properties

- Smothers germinating weeds
- Allelopathic
- Suppress nematodes
- Add nitrogen
- Add organic matter

Control – No amendments or preplant treatment

Cover crop – Sudan grass + Rye

Sun hemp
Crotolaria juncea

Nitrogen fixer

Nematode suppression

Biomass

Kale/Mustards

Brassica oleracea

Nematode suppression

Short lifecycle

Marigold

Tagetes erecta

Nematode suppression

Annual rye grass

Lolium multiflorum

Weed and
nematode suppression

Organic matter

Cold-hardy

Winter rye

Secale cereale

Weed suppression

Cold hardy

White clover

Trifolium repens

Nitrogen-fixer

Perennial

Alfalfa

Medicago sativa

Nitrogen-fixer

Weed suppression

Biomass

Perennial

Hairy vetch

Vicia villosa

Nitrogen-fixer

Organic matter

Field peas

Pisum sativum

Nitrogen-fixer

Sudan grass

Sorghum
× drummondii

Weed and nematode suppression

Biomass

Buckwheat

Fagopyrum esculentum

Weed suppression

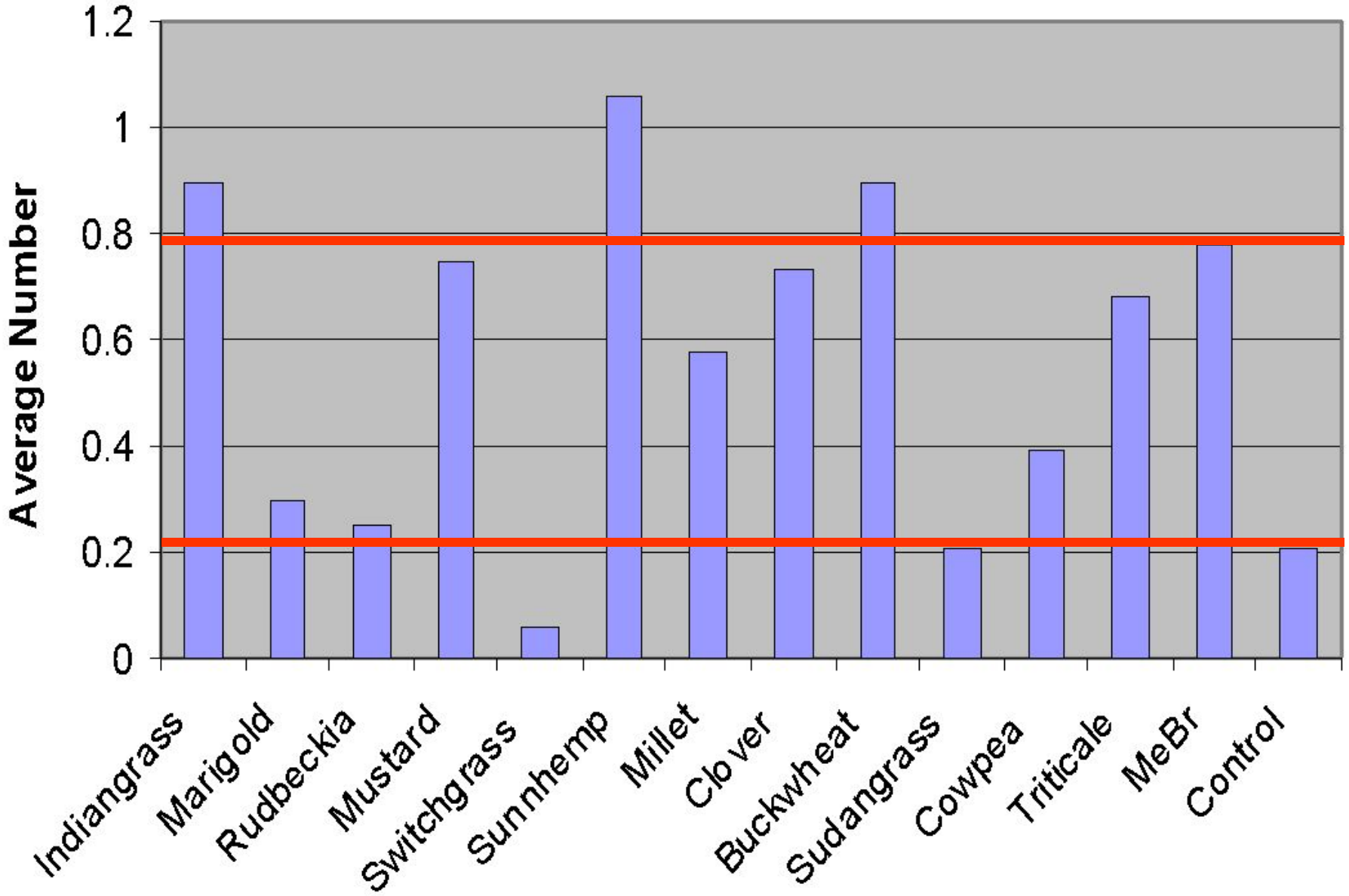
Indiangrass

Sorghastrum nutans

Biomass

Caveats

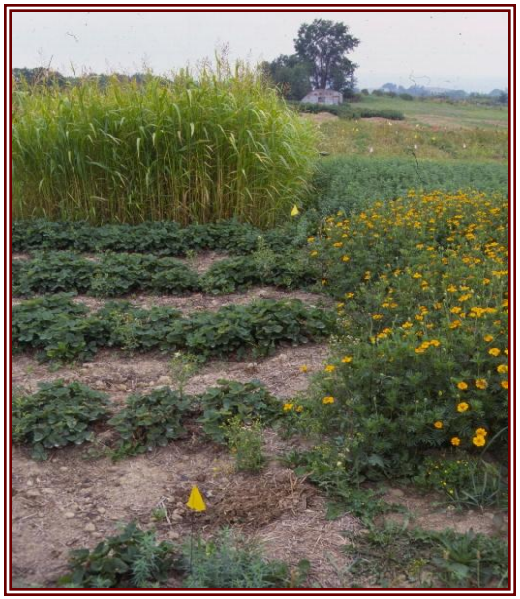
- No cover crop is 100% effective at eliminating soil and pest issues
- Individual cover crops can only do so many things at once
- Some cover crops can become weeds if not properly managed
- The wrong cover crop can carry along harmful diseases and nematodes


Runner Count 2003
Average Number
1.2
1
0.8
0.6
0.4
0.2
0
Indiangrass
Marigold
Rudbeckia
Mustard
Switchgrass
Sunnhemp
Millet
Clover
Buckwheat
Sudangrass
Cowpea
Triticale
MeBr
Control

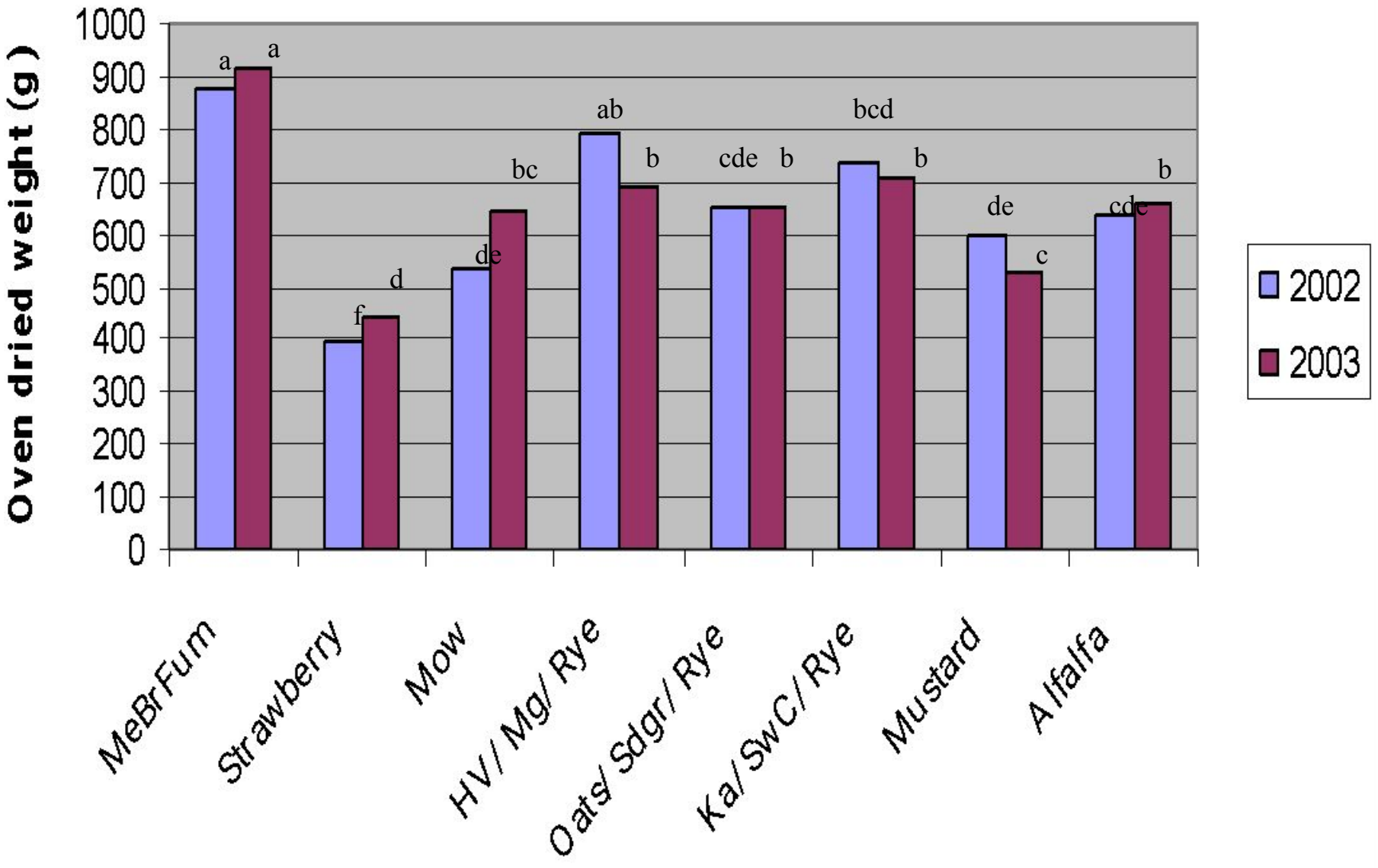
Individual cover crops have specific advantages, but to get the most out of them, they should be used together either simultaneously or sequentially.

Materials & Methods
Field Study

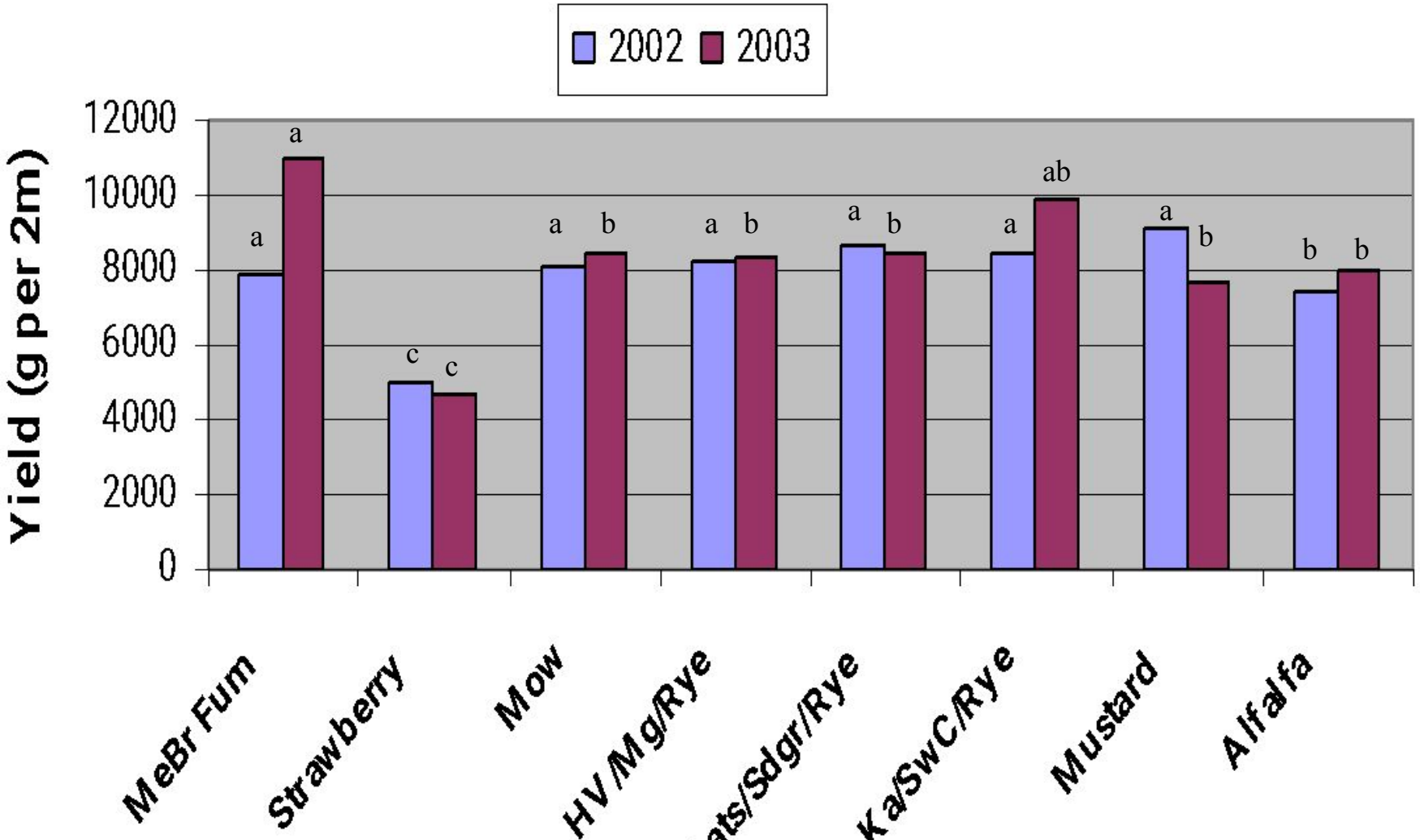
- Experimental Design
  - RCBD
  - Eight Treatments (following 7 years in strawberry):
    - Continuous Strawberry (2 more years)
    - Mowed Weedy Fallow
    - Fumigation (MeBr)
    - Alfalfa (perennial)
    - Mustard (3 crops)
    - Kale→ Sweet Corn →Rye
    - Hairy Vetch →Marigold →Rye
    - Oats →Sudan grass →Rye
  - Four Replicate Blocks

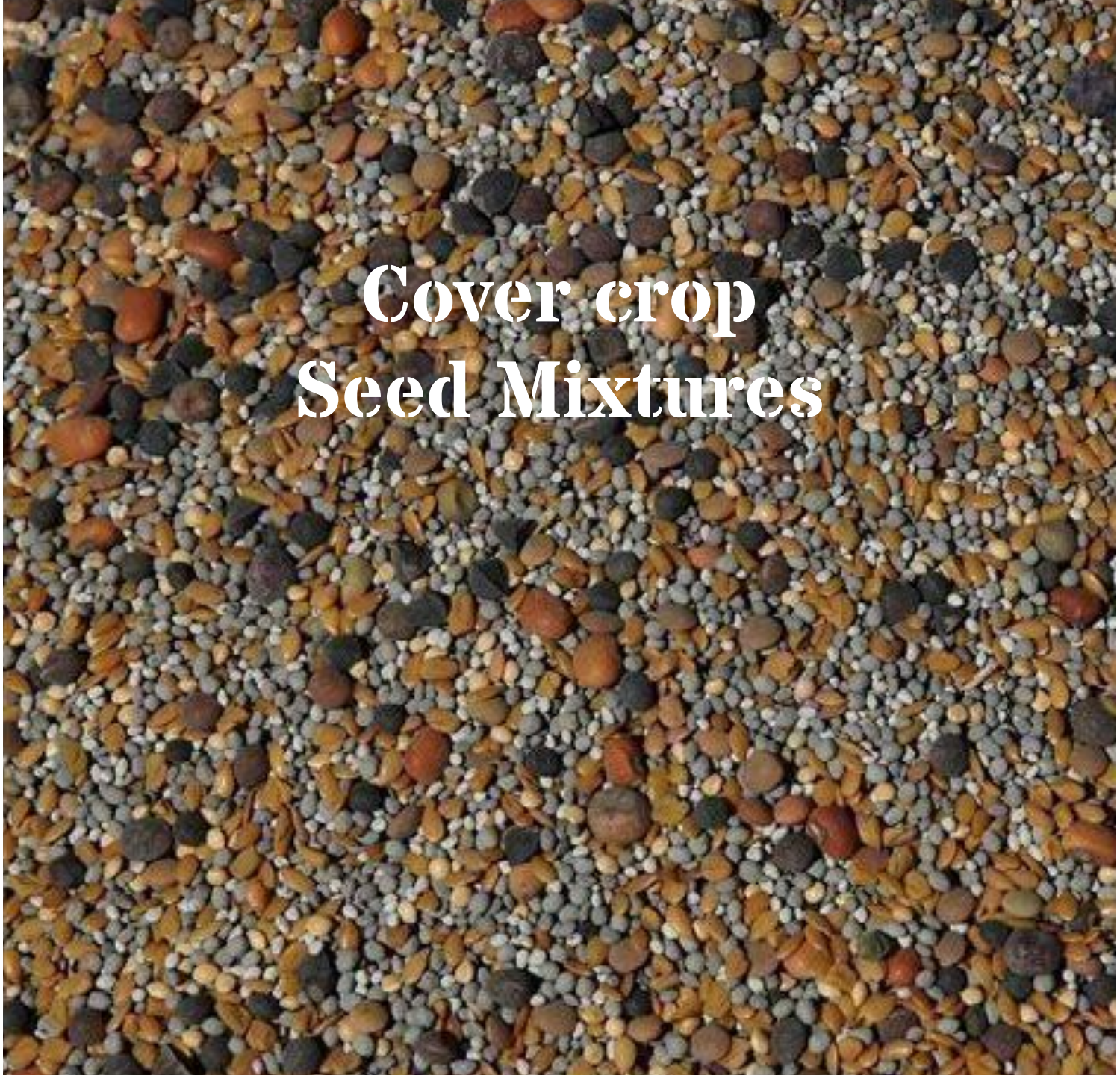


Foliar Biomass



Fruit Yield 2002 & 2003




Cover crop
Seed Mixtures

Cover crop seed mixes for sale:

- Winter wheat, field peas, annual rye grass, red clover and hairy vetch
- Peas and oats
- Austrian field pea, hard red winter wheat, triticale, daikon radish
- Crimson clover, hairy vetch, peas, and oats
- Winter rye, field peas, rye grass, crimson clover, and hairy vetch
- Field peas, oats, and hairy vetch
- Triticale, peas, oats, vetch, ryegrass, crimson clover

Questions to Consider:

- How will I seed the crop?
- How will I kill the crop?
- Is the crop perennial?
- Is the weather suitable for seed germination?
- Is there enough time left in the season to grow the crop?
- Is the crop warm-season or cool-season so I know when to plant it?
- Is it the right species for what I need it to do?

Managing Cover Crops Profitably

THIRD EDITION

FOURTH EDITION

BUILDING SOILS FOR BETTER CROPS

ECOLOGICAL MANAGEMENT FOR HEALTHY SOILS

FRED MAGDOFF
and HAROLD VAN ES

SARE HANDBOOK 10
Sustainable Agriculture Research & Education