

Conservation Agriculture and its Role in Soil Health, Sustainable Food Production and Food Security.

A topical lunch on October 4th 2010 was held on the above topic. After introductions, Peter Hobbs briefly explained what soil health and conservation agriculture was from an agronomist's point of view. This was followed by a brief description of the CA web site by Lucy Fisher <http://conservationagriculture.mannlib.cornell.edu/> Erika Steiger also described her participation at the 5th World Congress on Conservation Agriculture held in Brisbane last week. The topic was then opened for discussion on ways to get a Cornell community more involved in the larger picture of sustainable land management to meet future food security needs.

There were several good comments made during the short discussion. Bernd Blossey felt the topic was too narrow to interest his environmental and larger scale research. But this means that there is a need to develop an umbrella group to encourage synergies between disciplines to better address the future challenges of feeding a population that is way bigger than nature ever intended. Sustainable Land Management will need involvement of soil science, agronomy, plant pathology, natural resource management, ecology, economics, climatology, sociology and other disciplines that we have at Cornell. We also need to link with outside agencies in the USA but also overseas.

Frank DiSalvo suggested that there was a need to leverage resources, one important role for any umbrella group. The CARE project that also has an interest in sustainable land management is an example of an outside linkage that could bring the different disciplines together. There was no time to discuss who would take the lead in finding such type of funding sources. Maybe a small working group could be formed for this purpose.

Bianca Moebius made a good suggestion after the meeting "to bring in people (in-house or from elsewhere) to explicitly address the differences in methods, vocabulary, scopes of interest, goals, mind-frames, etc, and invite a lot of discussion to move forward meaningfully." This could be done through well planned meetings where various campus groups are invited to get together and discuss issues of Sustainable Land management (SLM) including soil health, invasive species, waste management, water resources, SRI, EcoAgriculture and other interested groups.

The attendees at this meeting were:

Host Peter Hobbs, ph14 CSS and International Programs, CALS

Lucy Fisher, lhf2 CIIFAD and SRI program

Chris Barrett, cbb2 AEM

Bernd Blossey, bb22 NTRES

Janice Thies, janice.thies@cornell.edu CSS

Bianca Moebius-Clune, bnm5 CSS

Eugene Fifer, etf26 IARD MPS student

Erika Styger, eds8 CIIFAD and SRI

Frank DiSalvo, fjd3 Director Atkinson Center

Alex Travis, ajt32 Institute of Animal Health

Harold Van Es, hmv1 CSS

Champat Raj Mehta, crm236 Visiting scientist from India in CSS

David Lee, drl5 AEM

Helene Schember, hrs6 Executive Director Atkinson Center

Todd Schmit, tms1 AEM

Julie Lauren, jgl5 CSS

John Duxbury, jmd17 CSS

Emily Reiss, err76 Graduate Student Horticulture

Devon Jenkins, devonjenkins@gmail.com IARD MPS student

Meth Anne Medvecky, bam44 CIIFAD IGERT program

Mark Lawrence, mal64 Atkinson Center

Amod Thakur amod_wtcer@yahoo.com Borlaug Fellow from India

Ramana Rao Kondapally kvramanarao@yahoo.com Borlaug Fellow from India

Brian Sobol bds229 Graduate student Horticulture

Charles Hyland cph22 Research assistant CSS

Future Agricultural Challenges

- To increase food production sustainably to meet **food security** needs of a growing population now and in the future while at the same time **minimizing the effects** on the **environment** and improving the **livelihoods** of those involved in agriculture
- Improve the efficiency of natural resource use needed for agriculture through **Sustainable Land management**

WHEN

Business as usual will not get the job done.

- Demand for food – ***increasing – areas with food insecurity***
- Harvested area per capita - ***shrinking***
- Traditional sources of productivity growth – are ***already being used?***
- ***Competition and demands*** for blue water increasing
- Future oil price ***increases*** and costs of inputs
- Impending ***climate change*** and more ***severe weather*** as a result of GHG emissions and global climate change
- ***There is resource, environmental and land degradation?***
- ***Dietary changes***
- ***Biofuel competing for agricultural land***

Soil Health a Key Agronomic component

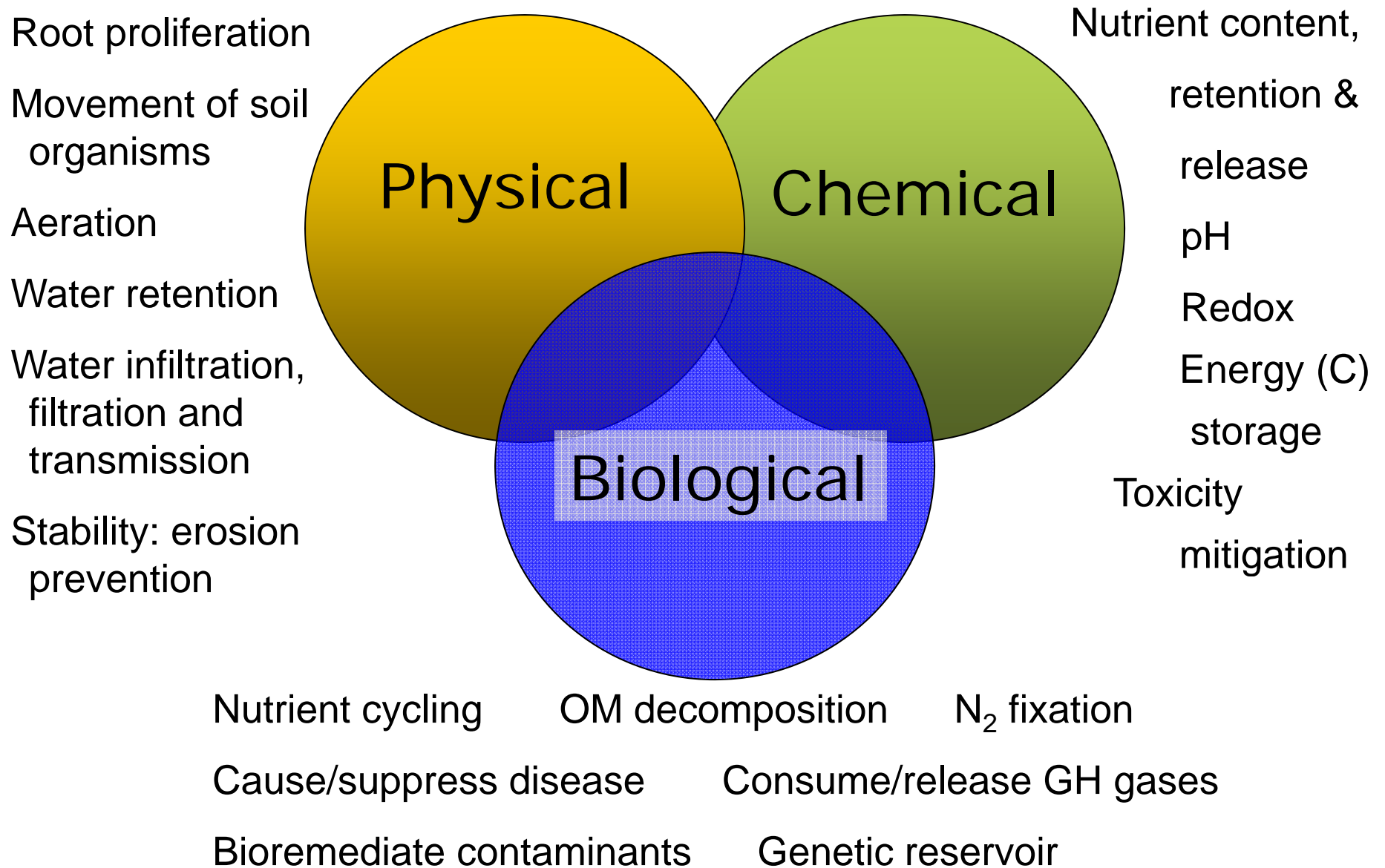
An Unhealthy Soil



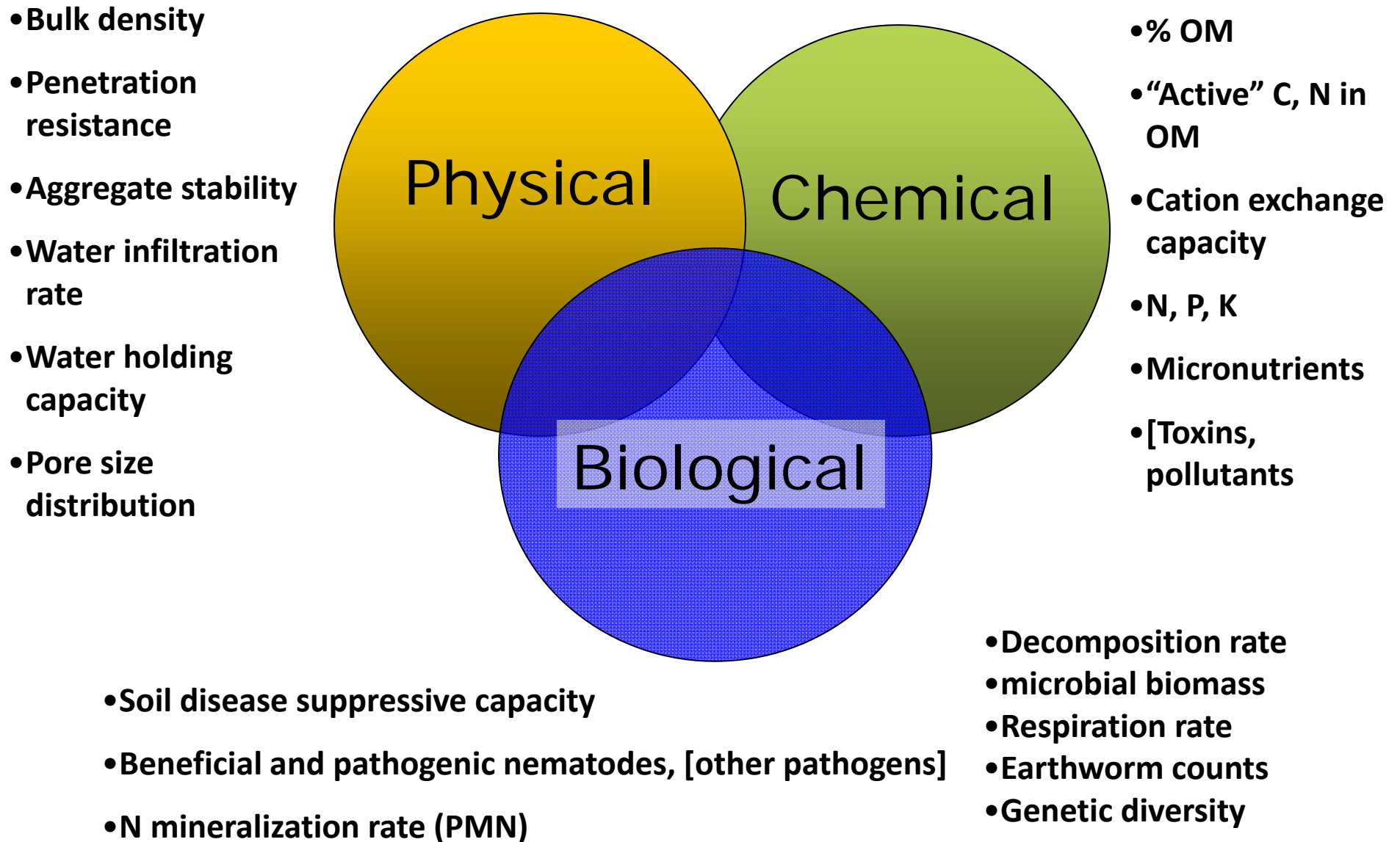
A Healthy Soil



Soil Health – Soil Function



Soil Health – Indicators



Degraded soil



Healthy soil

Low organic matter
Poor physical properties
Poor water infiltration
Poor nutrient cycling
Declining productivity
More pathogens
Nutrient deficiencies
Low biological diversity

Higher organic matter
Improved physical properties
Improved water infiltration
Improved nutrient cycling
Sustainable production
Less pathogens
Balanced fertility
Good biological diversity

Intensively mined agricultural soil
No organic amendments

Forest soil – not disturbed
Leaf mulch

Degraded soil



Healthy soil

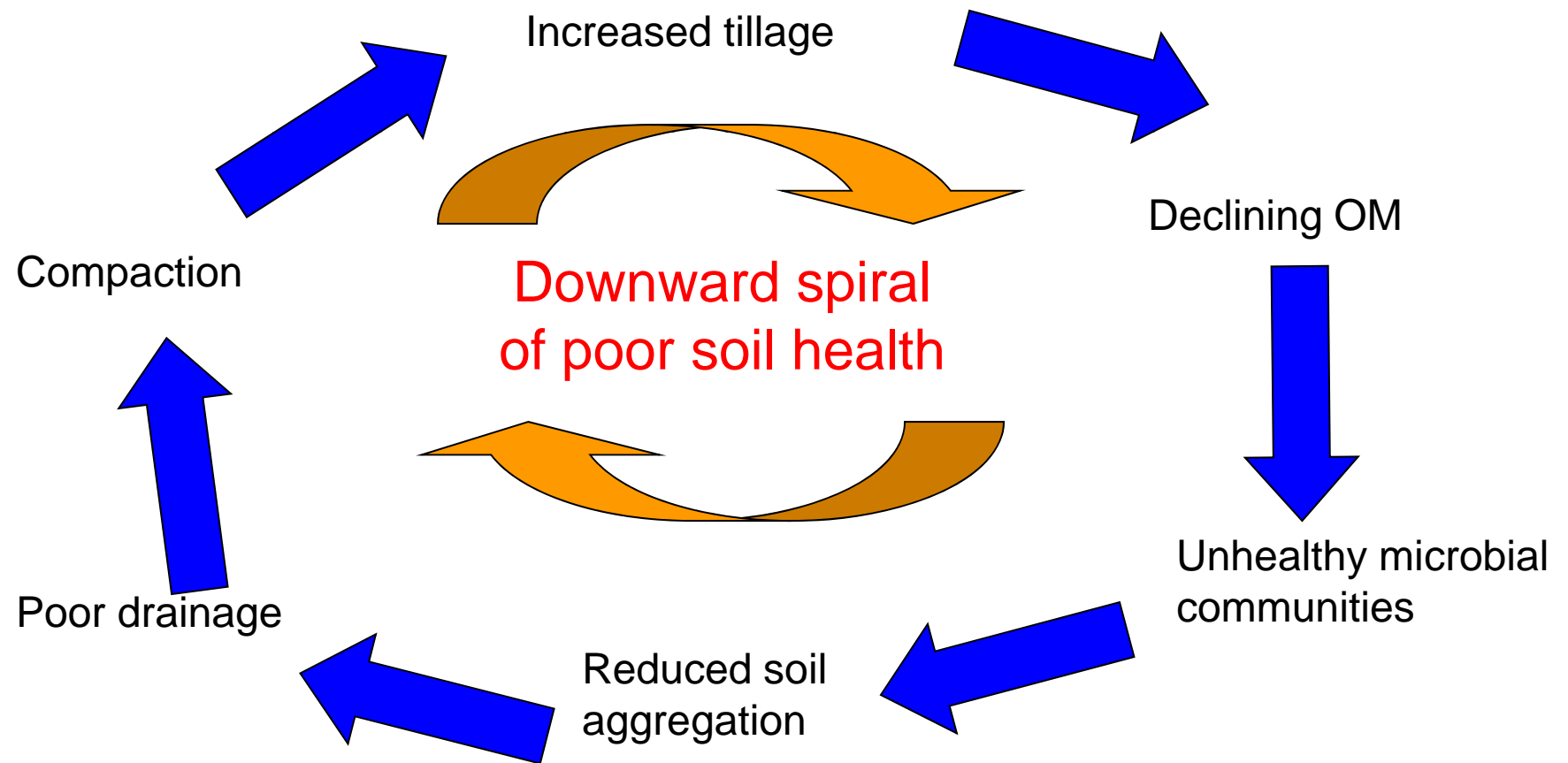
No addition of organic matter
Only use chemical fertilizer
Excessive tillage
Use of toxic pesticides
Mining of soil nutrients by
unbalanced fertilizer use
Erosion – wind or water

Use of organic amendments
Minimal soil disturbance
Use of surface mulching
Use IPM, IWM, IDM, ICM
Rotations
Nutrient balancing

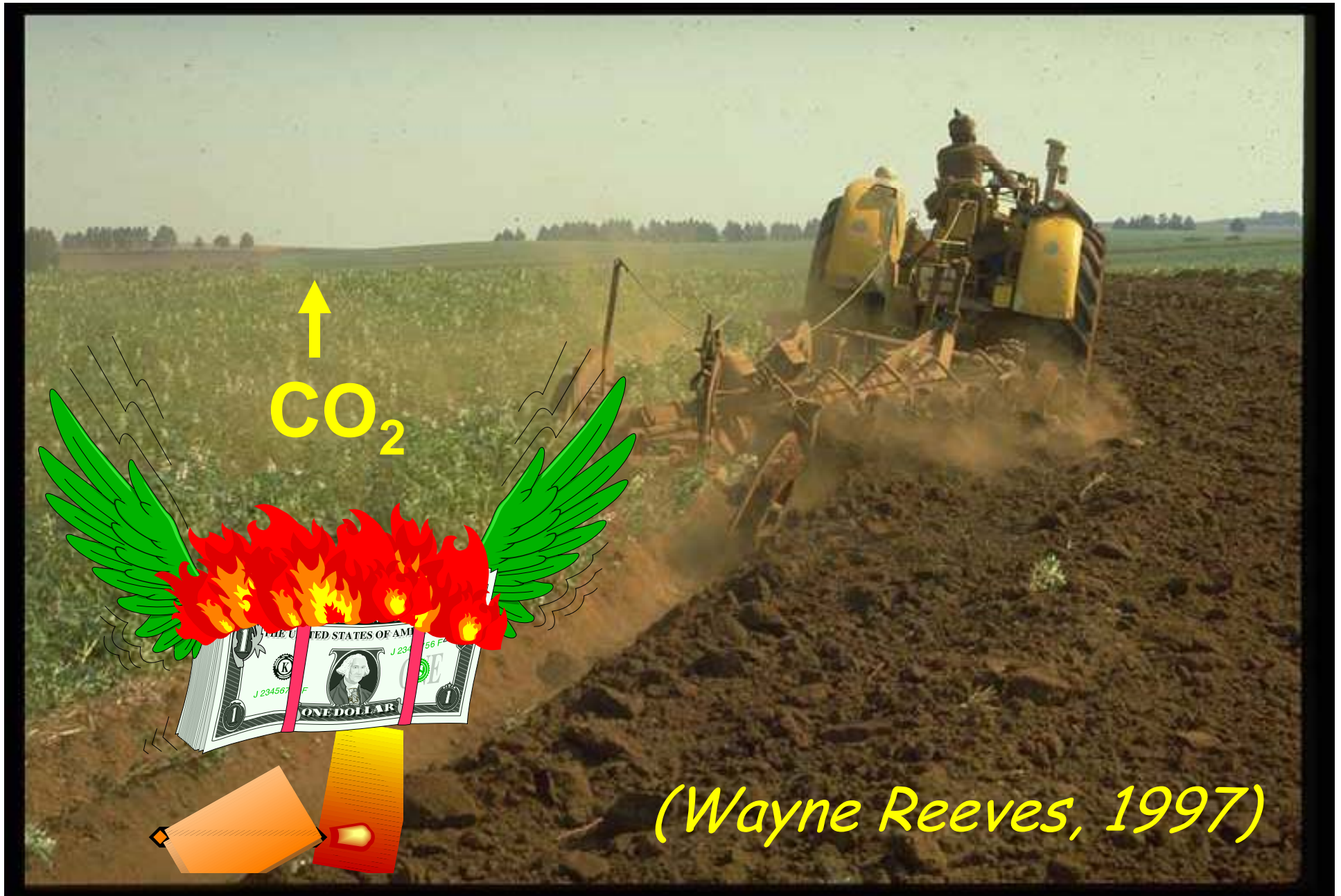
Present farming practices??

Sustainable Land Management like
Conservation Agriculture or
Resource Conserving Technologies

Tillage Addiction: Downward Spiral in Soil Health




Is tillage necessary?



(Wayne Reeves, 1997)

Conservation agriculture?

- Minimal soil disturbance – zero-tillage if possible – just enough to get the seed in the ground
- Permanent soil cover – residues of past crop or cover crop grown to provide cover. NO burning of residues
- Rotations – mainly for residue pest, disease, weed control
 - But still need to use integrated practices for weed, pest and disease control
- Can be on the flat or on raised beds



Residue retention distinguishes Conservation Agriculture from conventional farming systems, which are characterized by leaving the soil bare and unprotected, exposed to climatic agents.

The plant cover is not incorporated into the soil by tillage.

Conservation agriculture is different from conservation tillage in that soil disturbance is minimal

(FAO, 2002)

CA is applicable to all farm sizes



No-tillage on big farms with tractors

No-tillage for animal traction

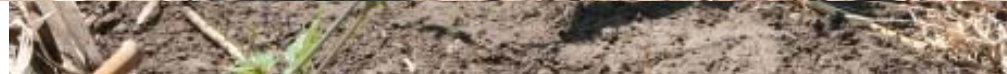
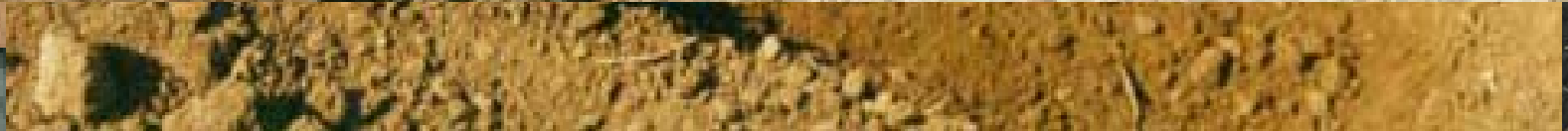


No-tillage in manually operated farms





Basal Dressing



“There are a lot of changes necessary to adopt zero tillage (and conservation agriculture) but the biggest change is in the mind.”



Franke Dijkstra

Pioneer Brazilian zero tillage farmer. Started 26 years ago.

CA web site

<http://conservationagriculture.mannlib.cornell.edu/>

Atkinson Center Grant

- Continue to develop, add to and improve the CA web site
- To organize an umbrella group at Cornell to promote interdisciplinary research, scholarly dialogue, and international knowledge-sharing related to *Sustainable Land Management* of which conservation agriculture is one management system.