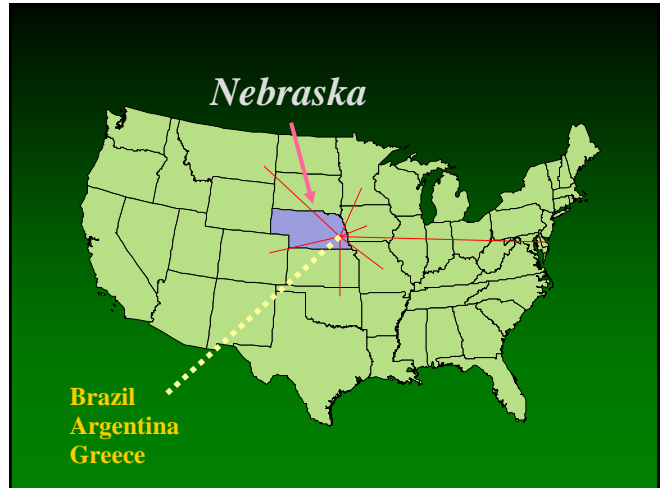


Using Remote Sensing and Related Tools for Agricultural Management

Jim Schepers

U.S. Department of Agriculture
Agricultural Research Service



ULRMC

Government
Ministry
Institute
University
NGO
Oblast
City
farmers

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Institute
University
NGO
Oblast
City

USDA-ARS

Agency
University
NGO
State
Agribusiness
Consultants
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USDA-ARS

Agency
University
NGO
State
Agribusiness
Consultants
Farmers

Farmers

mostly Grant Support

mostly Permanent Funding

Research Focus

Reduce contamination of water by **nitrate**

Safe Drinking Water Standard in USA

10 mg NO₃-N /L

45 mg NO₃ /L

50 mg NO₃ /L

(Europe)

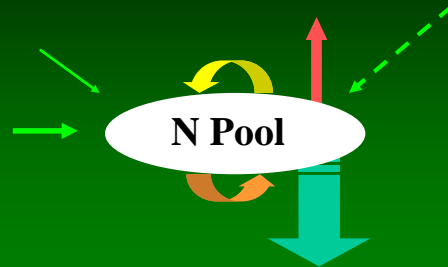
Research Focus

Reduce contamination of water by **nitrate**

Sources

- Fertilizer
- Manure
- Organic matter decomposition

How well can we estimate the supply of mobile nutrients ?



Causes of **nitrate** contamination of water

Sources

- Fertilizer
- Manure
- Organic matter decomposition

Excess water

Too much N at the wrong times

Causes of **nitrate** contamination of water

Sources

- Fertilizer
- Manure
- Organic matter decomposition

Excess water

Too much N at the wrong times

30 - 40 € /kg N

Research Focus

Reduce contamination of water by **nitrate**

Sources

- Fertilizer
- Manure
- Organic matter decomposition

Approaches

- Delineate soil management zones
- Utilize remote sensing and GIS tools
- Implement in-season N management

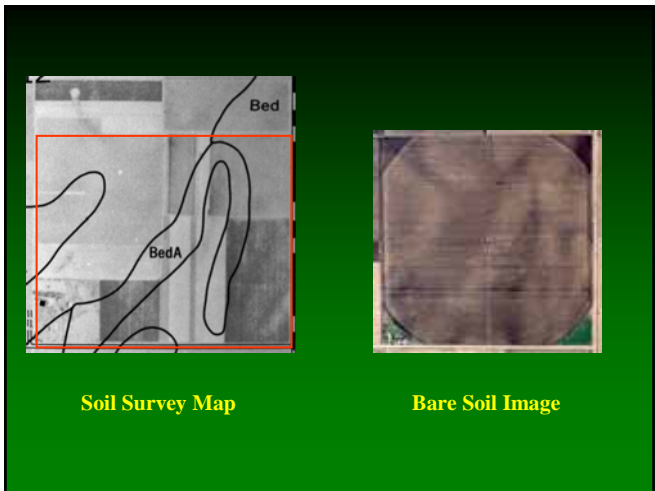
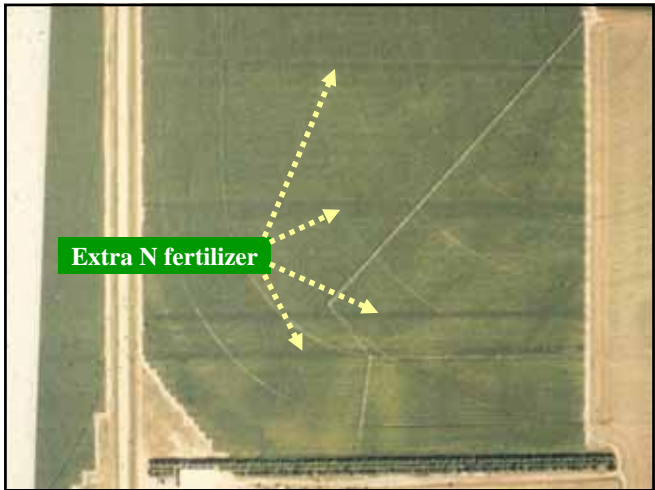
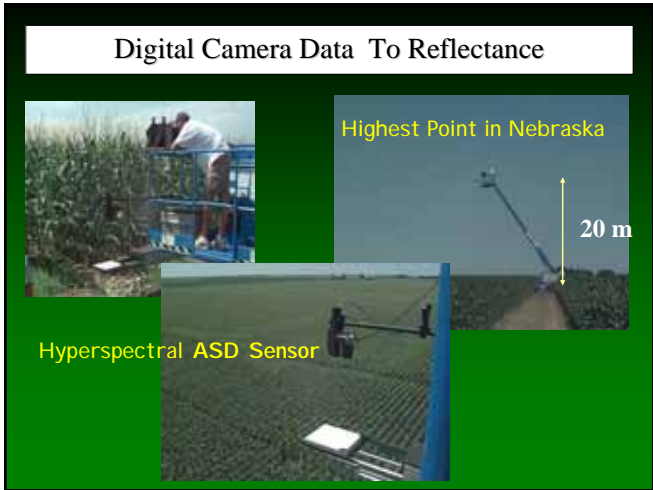
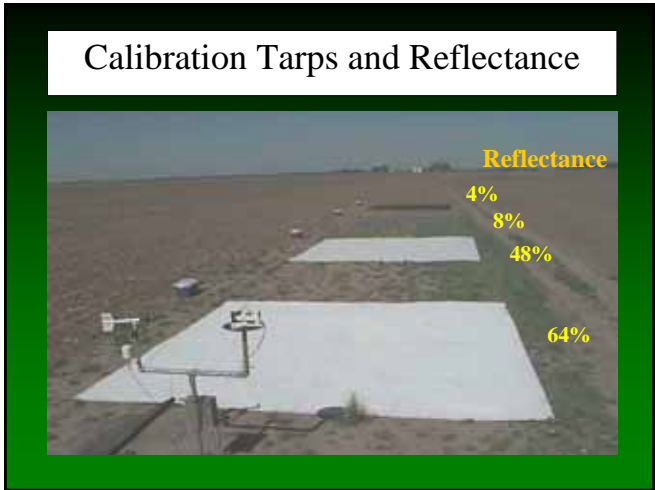
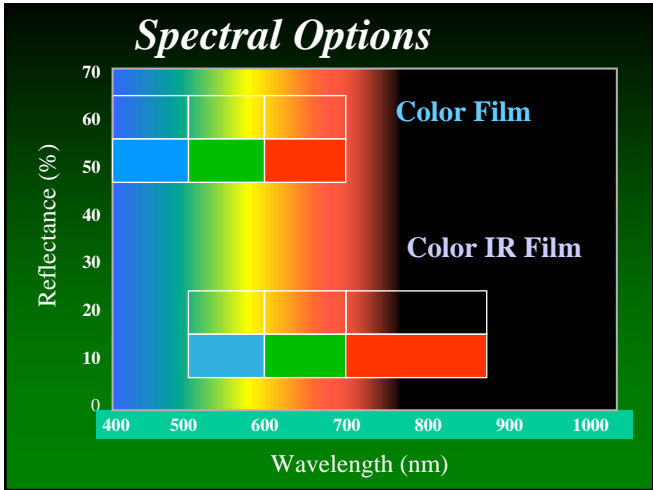
Satellites

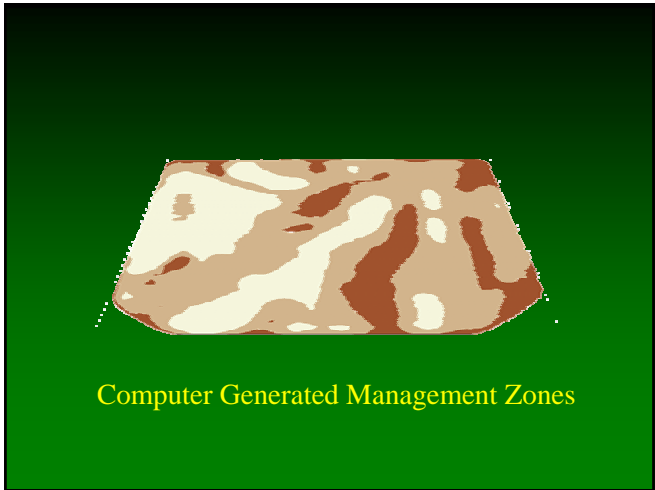
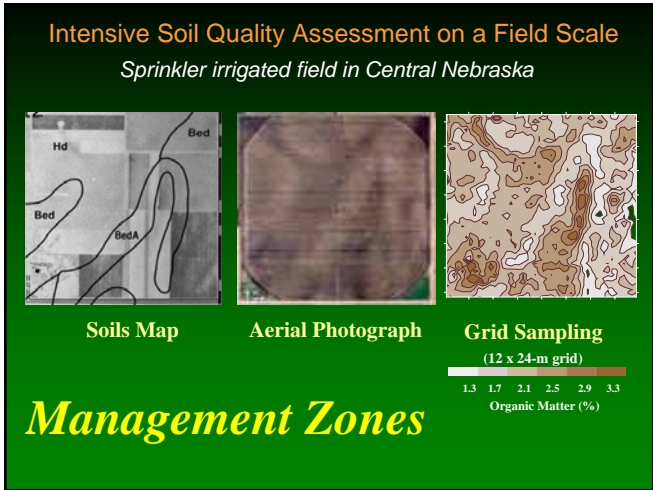
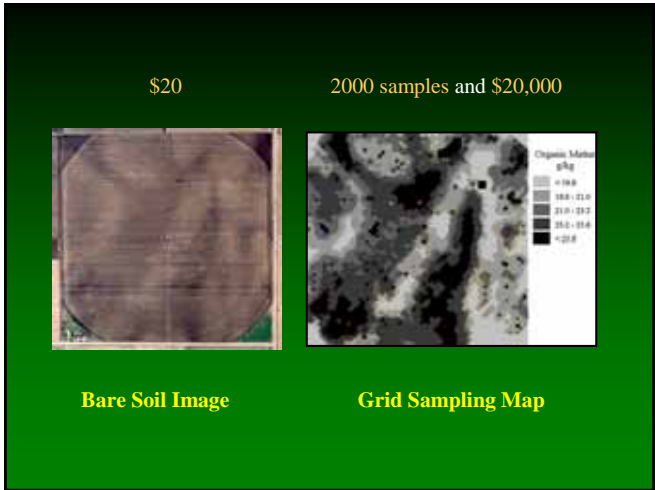
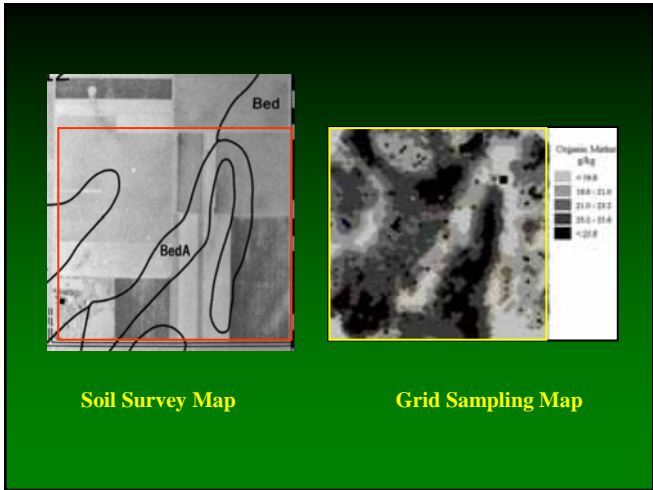
Aircraft

Ground-based

Platforms





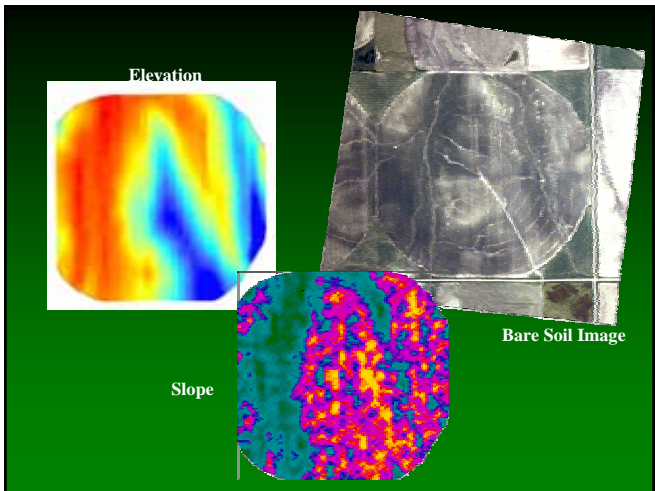


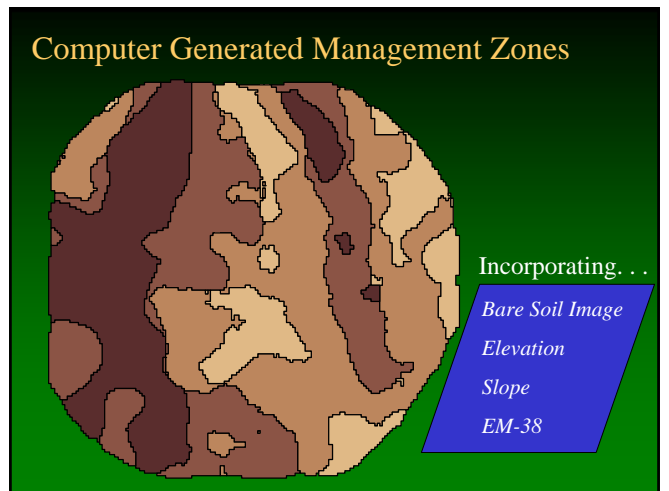
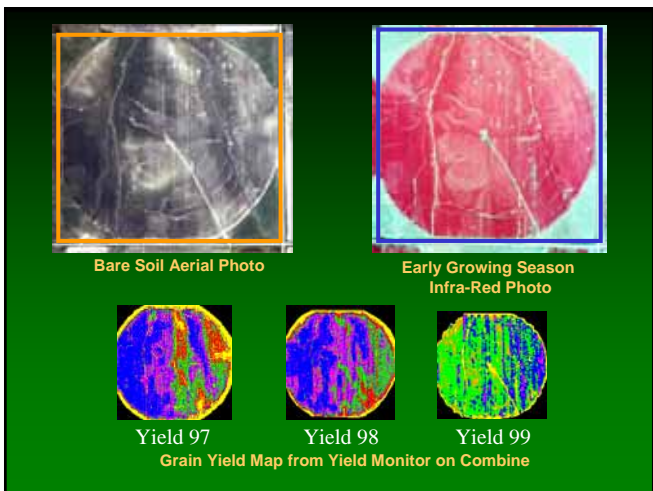
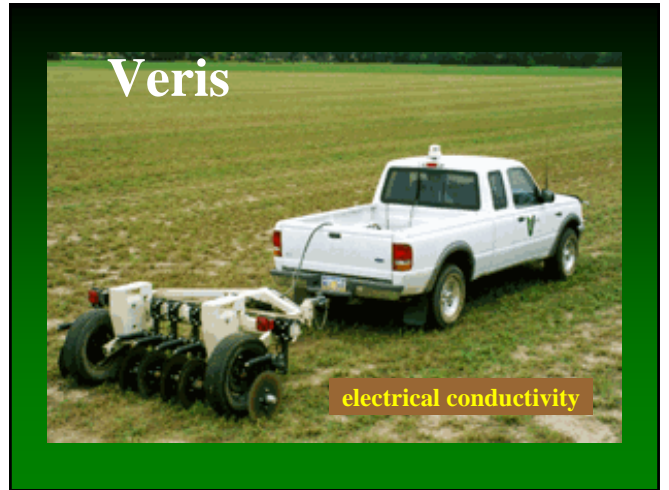
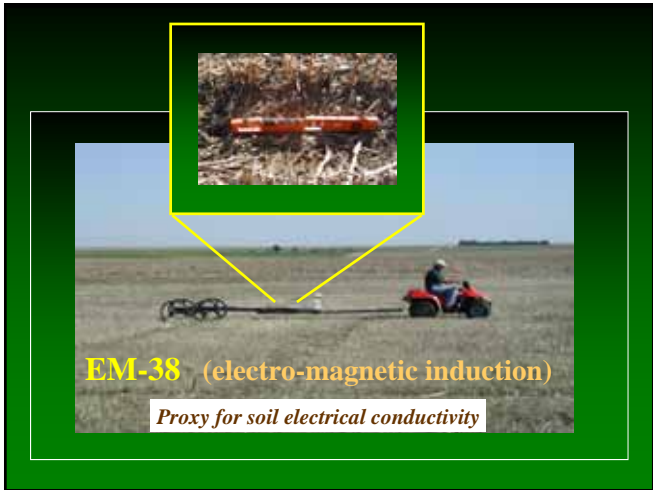
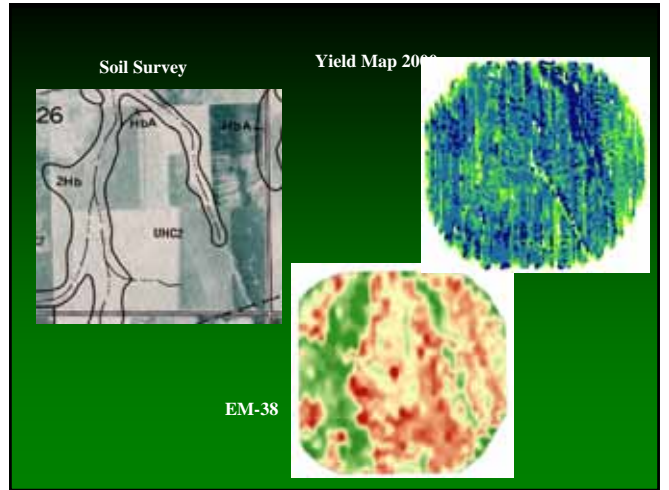
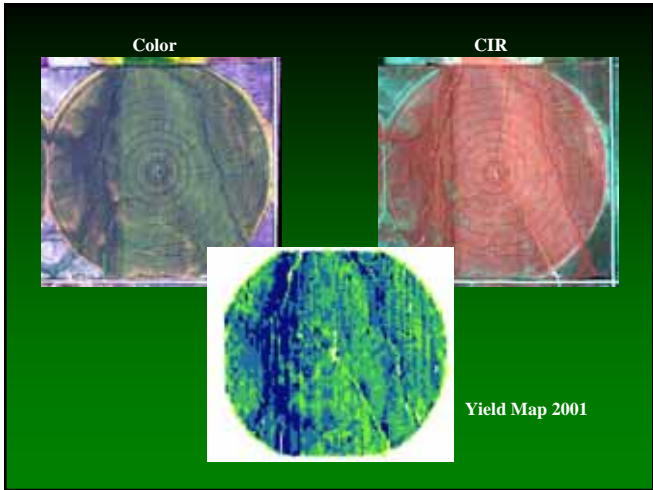
Which GIS layers are needed to delineate

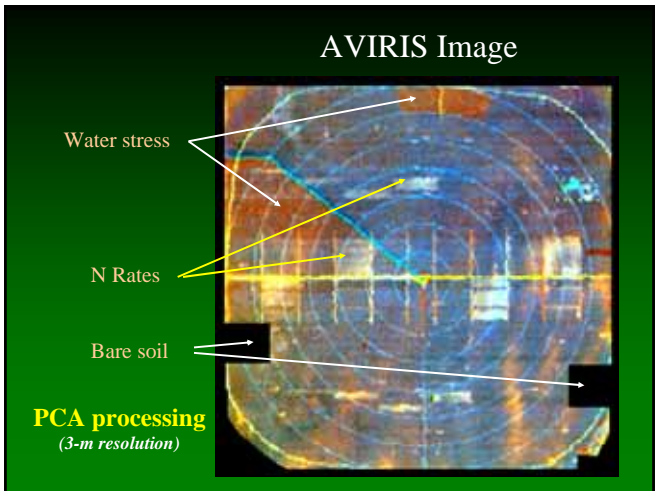
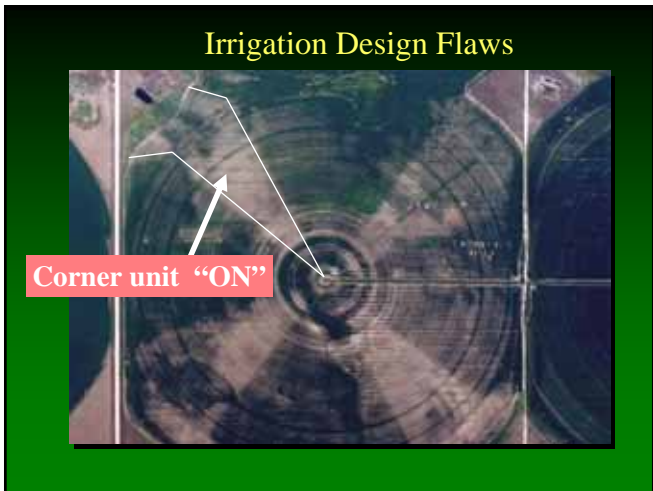
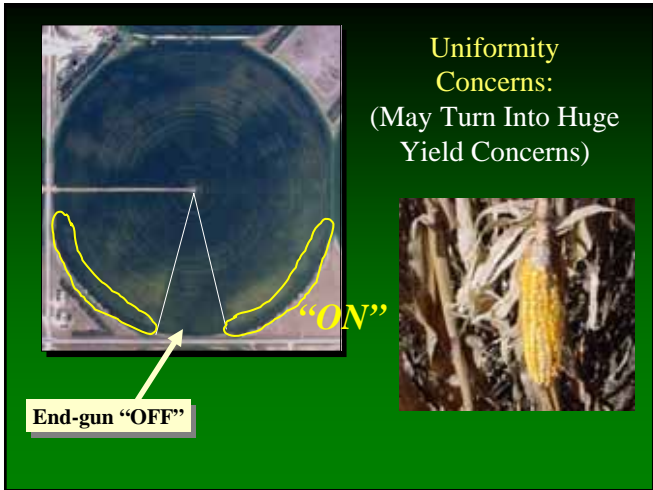
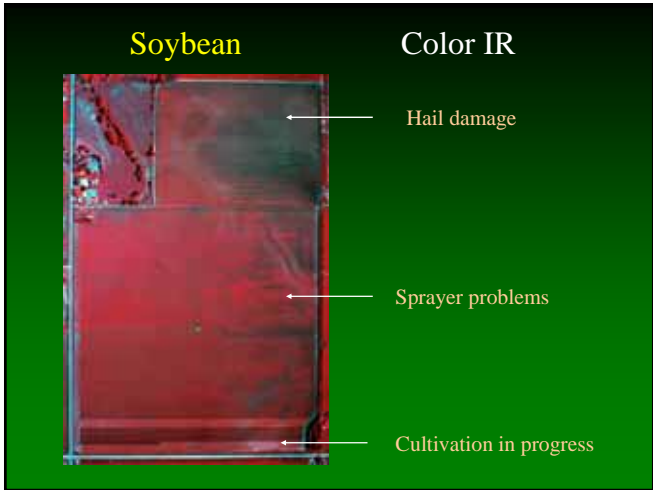
Management Zones

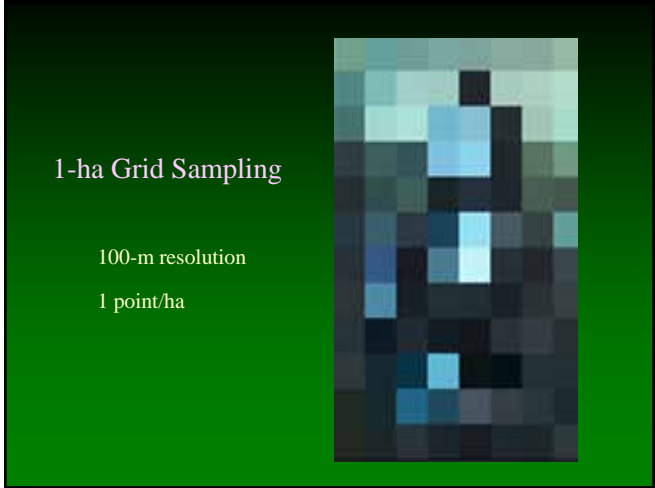
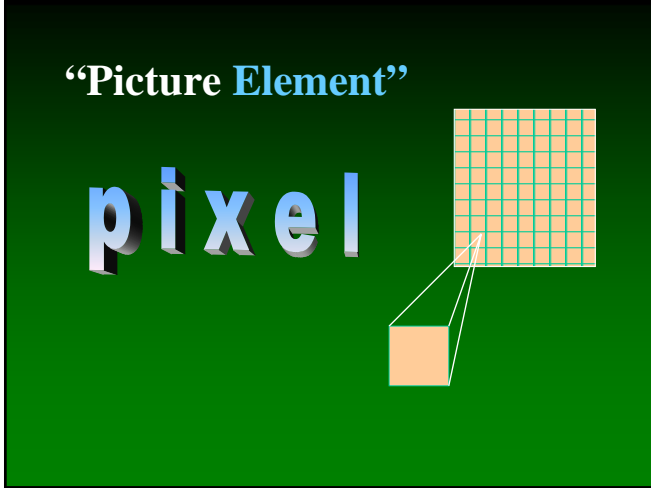
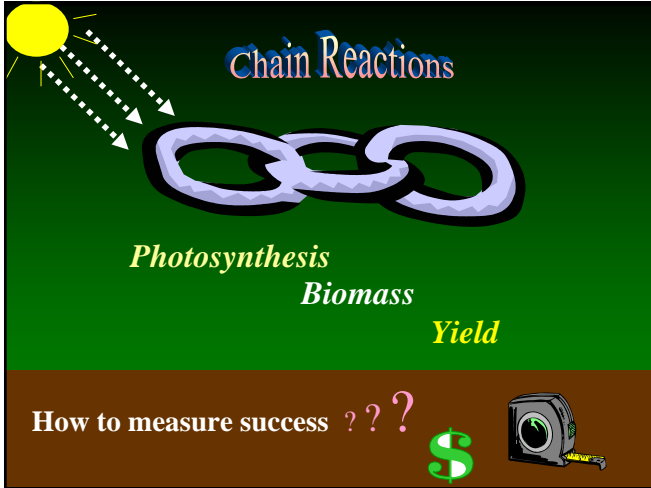
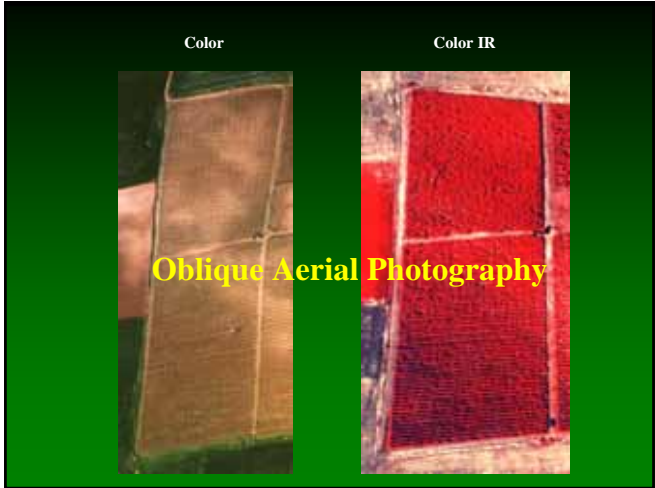
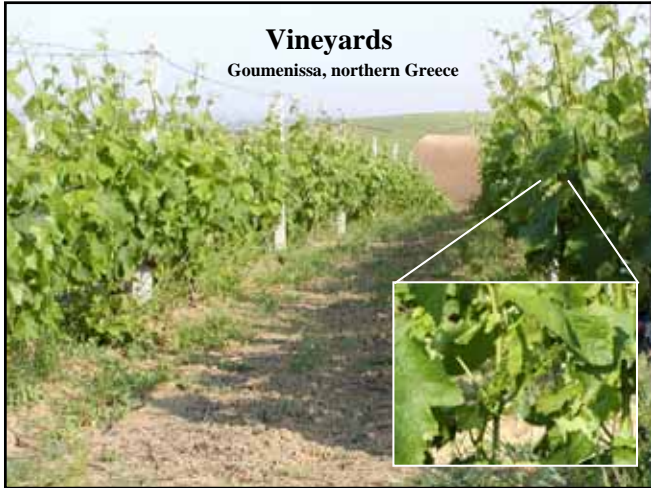
Management Zones

Management Zones









0.2-ha Grid Sampling

45-m resolution

5 points/ha



Yield Monitor

~4-m resolution

625 points/ha



Aerial Photograph

~0.3-m resolution

~100,000 points/ha



Concern / Analogy

Measure it with a micrometer (um)

Mark it with a piece of chalk (mm)

Cut it with an ax (cm)

Inputs

Water, Fertilizer, Pesticides

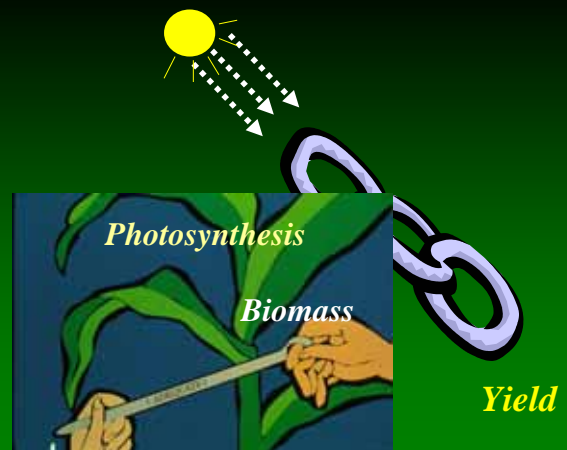
"If I apply it, **good things** will likely happen!"

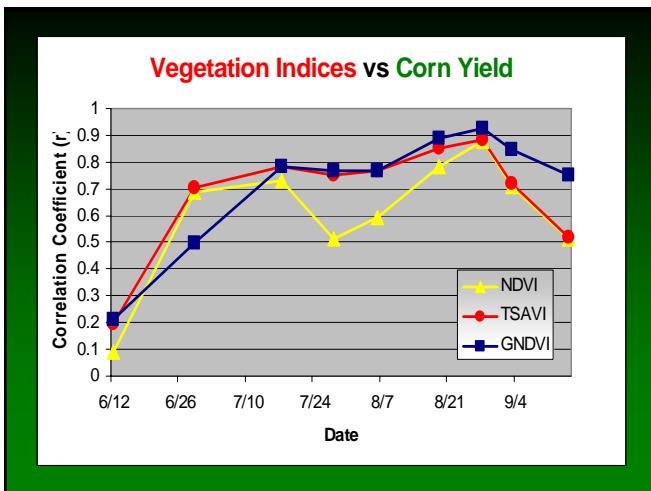
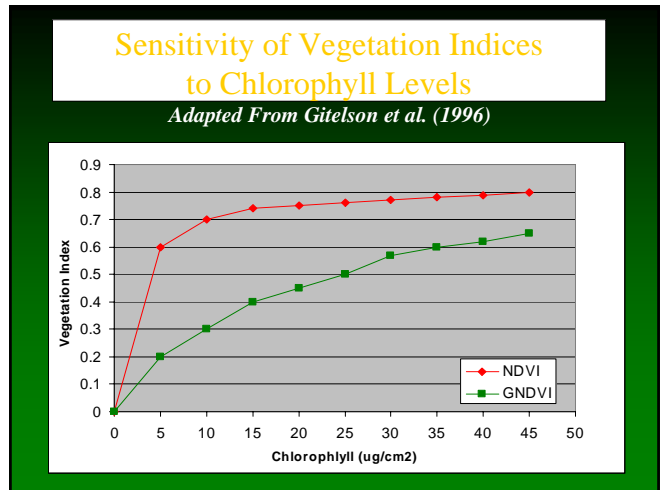
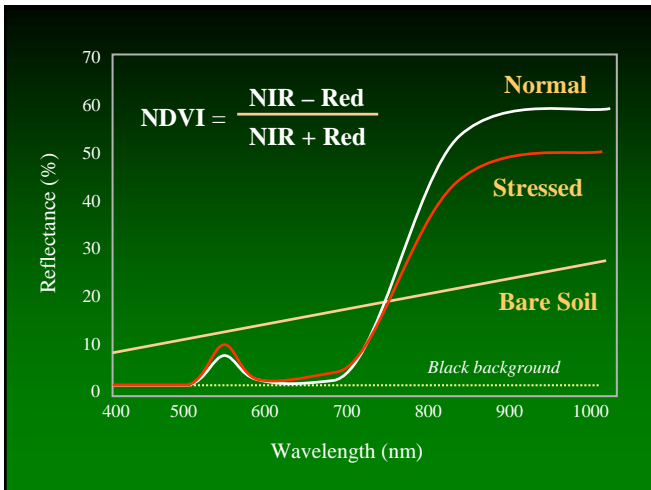
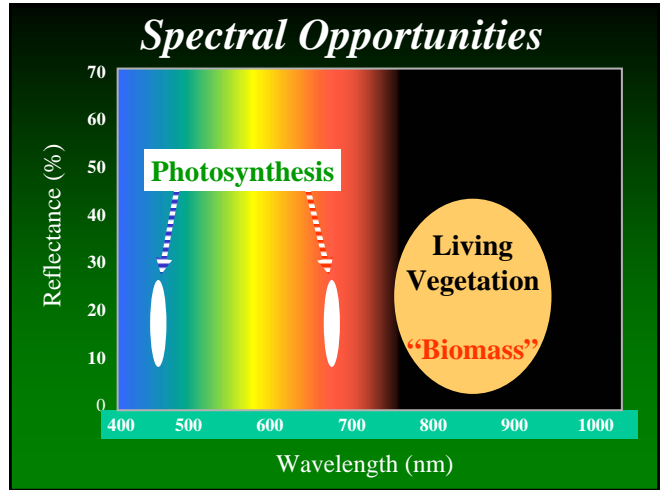
Yield Monitor

"Now that I have these maps, **what do I do?**"

Remote Sensing

"If **you** spend money on it, **nothing** is likely to happen until **you** do something else!"

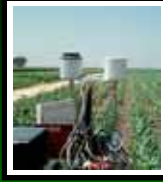




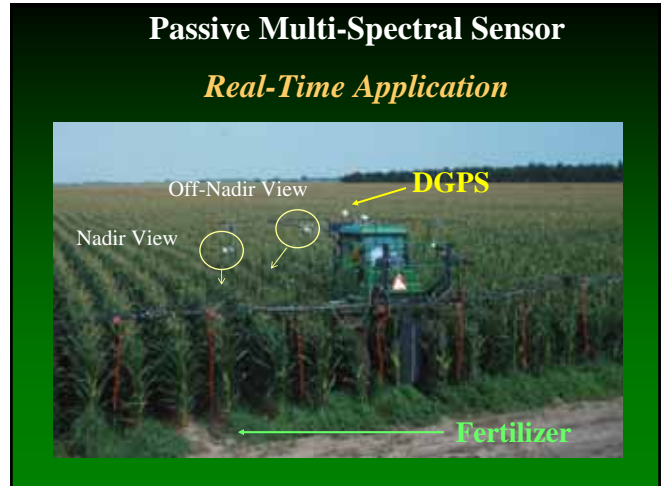
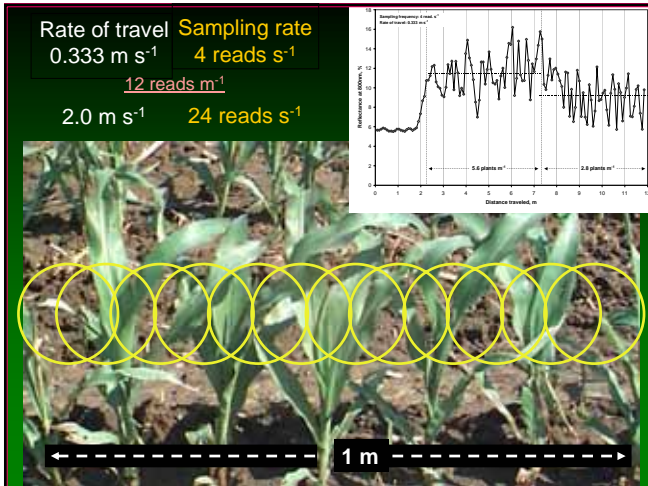
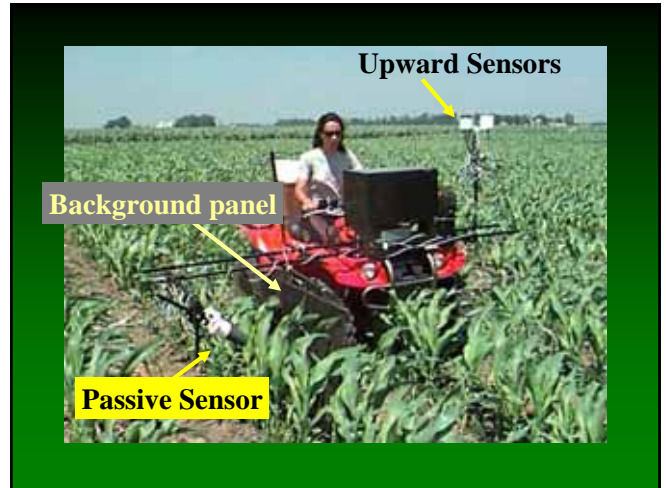
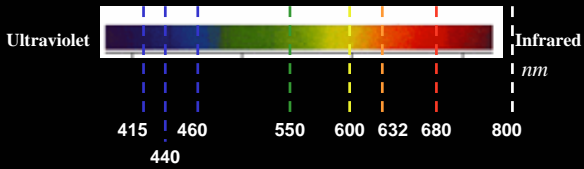
Passive Sensors

Natural Light

Development of narrow band field sensors:



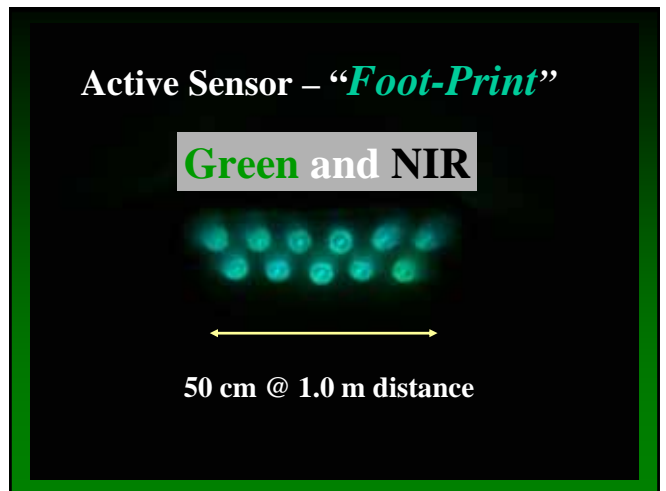
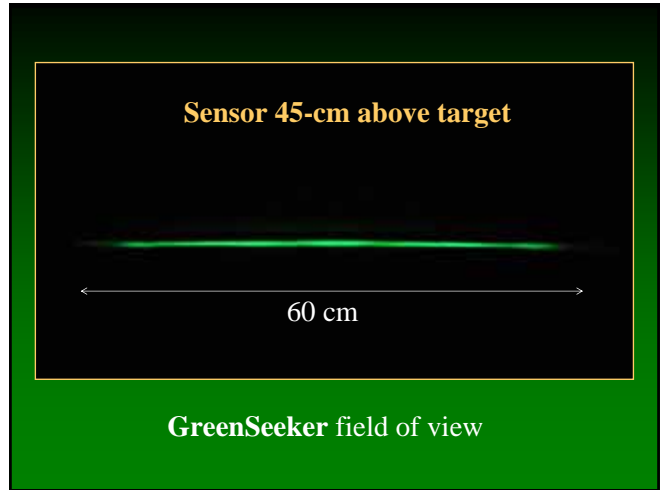
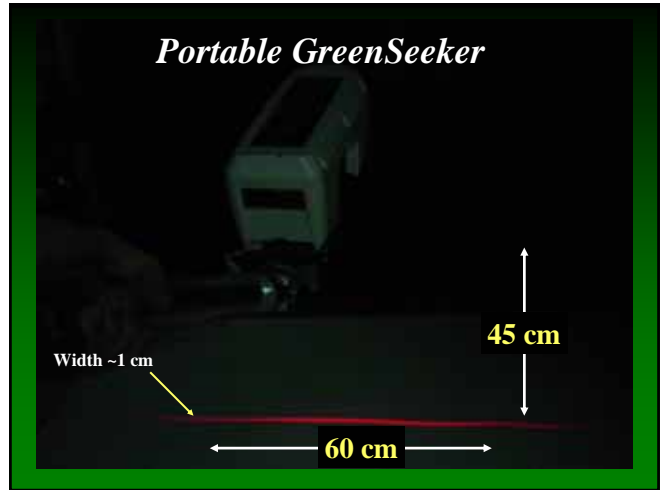
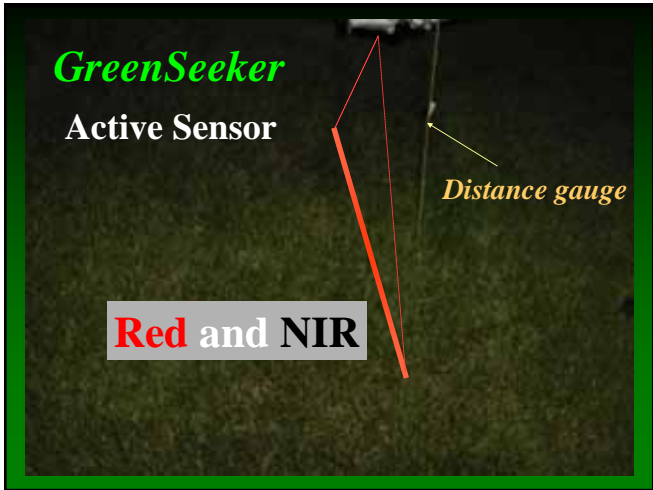
Holland Scientific



Active Active Sensors

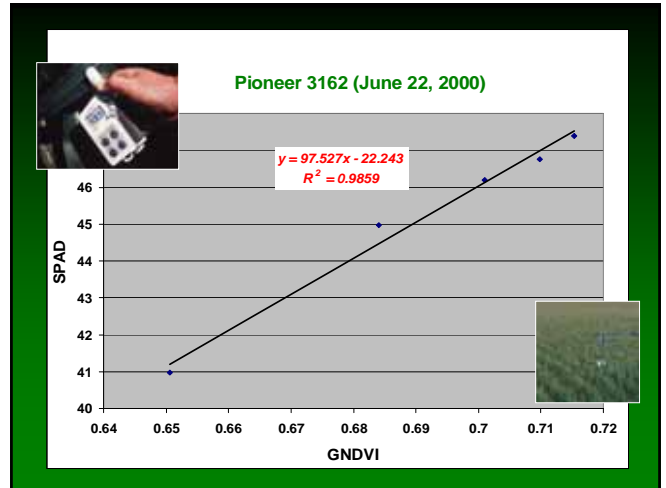
substitute
 controlled radiation source
 for
 natural radiation





Calibration

- What crop parameter is being estimated ?
 - leaf N
 - chlorophyll
 - biomass
 - yield
 - LAI
- Interactions with weather ?



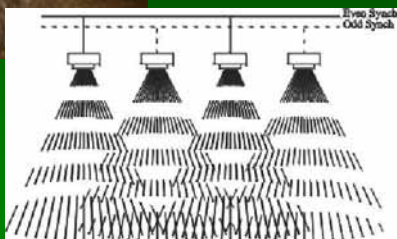
Real-Time Active Sensor / Sprayer



Appropriate allocation of **new** inputs



Capstan Ag Systems, Inc.



Comment

Remote Sensing

"If **you** spend money on it, **you** need to be prepared to do something with the information (i.e., make a decision . . .) or else the activity will only have

Entertainment Value

Congratulations . . .

You Survived !!!

Acknowledgements :

U.S. Embassy Science Fellow Program

Michele Dastin

Ukrainian Land and Resource Management Center

Eric Luhmann

David Schaub

Others

Family and Colleagues

Marilyn Schepers

USDA-Agricultural Research Service

Thanks a Bunch