

An aerial photograph of a rural landscape. The foreground is dominated by a dense green forest. Beyond the forest, a winding stream flows through a field. The field is divided into sections of green grass and brown soil, suggesting a mix of crops and fallow land. In the background, more fields and a few buildings are visible under a clear sky.

Integrated Farming Systems for Sustainable Production

Linda Scheffe, USDA-NRCS

We've achieved a lot, but we must all do a better job

This is our chance, maybe only chance, to really achieve sustainability

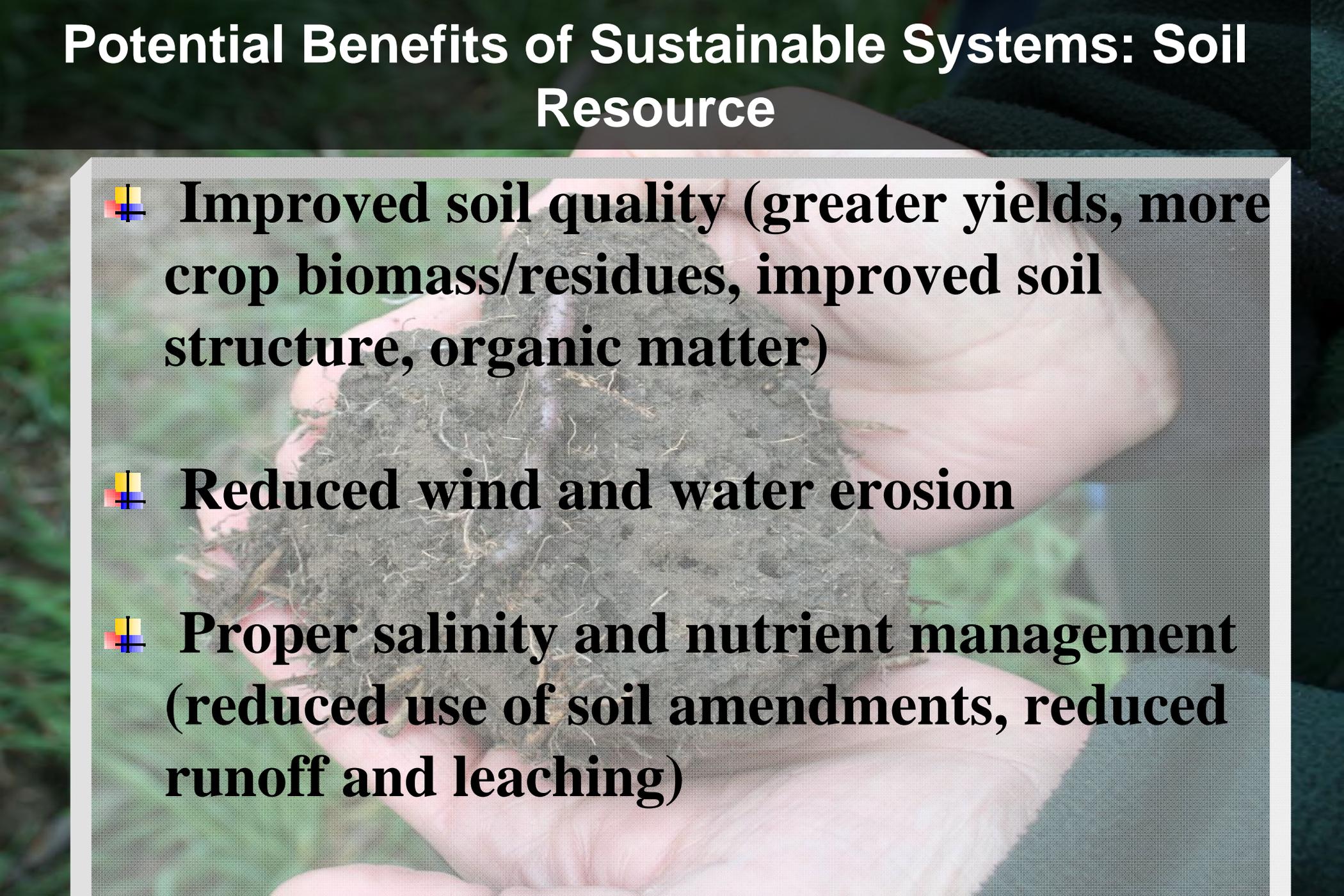
Sustainable Farming Systems must integrate:

- **Soil Quality**
- **Water Quality**
- **Nutrient and Salinity Management**
- **Cropping Systems, incl. Cover Crops**
- **Irrigation Water Management and Systems**
- **Integrated Pest Management**
- **Livestock and Wildlife**
- **Energy and Air Quality**
- **Economics**
- **Whole Farm Planning**
- **Watershed, Marketing Opportunities**

Potential Benefits of Sustainable Systems: Water Resource

- ◆ Conserved surface and ground water quantity and quality
 - ◆ Increased efficiency, higher yields
 - ◆ Reduced pumping costs
 - ◆ Water losses minimized (evaporation, runoff and deep percolation)
- 

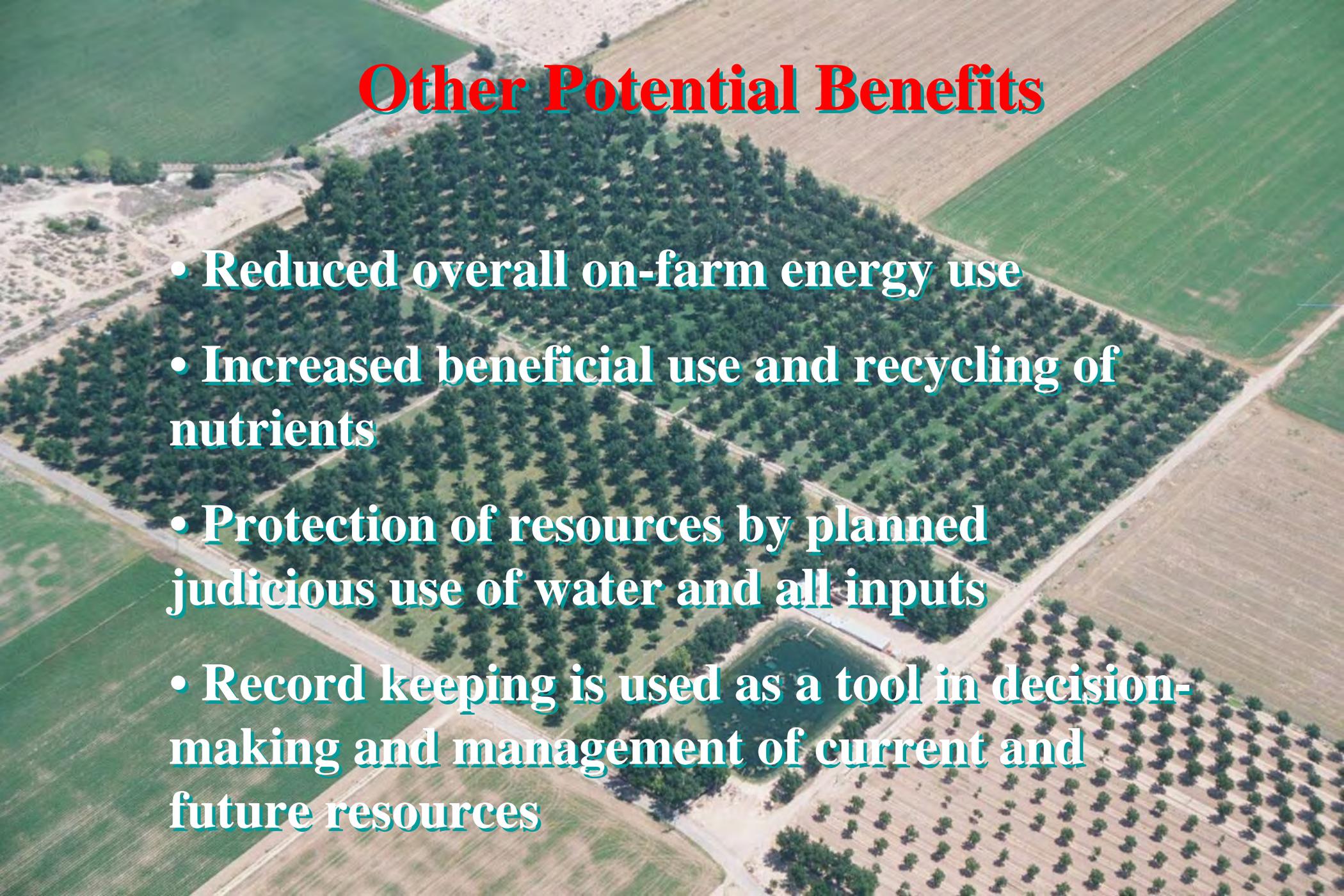
Potential Benefits of Sustainable Systems: Soil Resource

- 
- ✚ Improved soil quality (greater yields, more crop biomass/residues, improved soil structure, organic matter)
 - ✚ Reduced wind and water erosion
 - ✚ Proper salinity and nutrient management (reduced use of soil amendments, reduced runoff and leaching)

Potential Benefits: Plant Resource

- Crop production costs reduced
- Increased crop yield and quality
- Reduced pest incidences (e.g. weeds, insects, diseases)
- Available water quantity and quality meet specific requirements of crop (consumptive use, leaching)

Other Potential Benefits

An aerial photograph of a farm. A large, dense wooded area is the central feature, surrounded by various agricultural fields in shades of green and brown. A small pond is visible near the bottom center of the wooded area. The overall scene depicts a well-managed agricultural landscape.

- **Reduced overall on-farm energy use**
- **Increased beneficial use and recycling of nutrients**
- **Protection of resources by planned judicious use of water and all inputs**
- **Record keeping is used as a tool in decision-making and management of current and future resources**

Achieving Sustainable Farming

- 
- # **Whole System (Ecosystem, Field, Farm, Watershed)**
 - # **Resource Opportunities**
 - # **Think Critically**
 - # **Use Problem-Posing/Solving Approach**



Think Resource Efficient
Think On-site and Off-site
Effects

Plan Creatively and
Flexibly
Technology Exchange not
Transfer

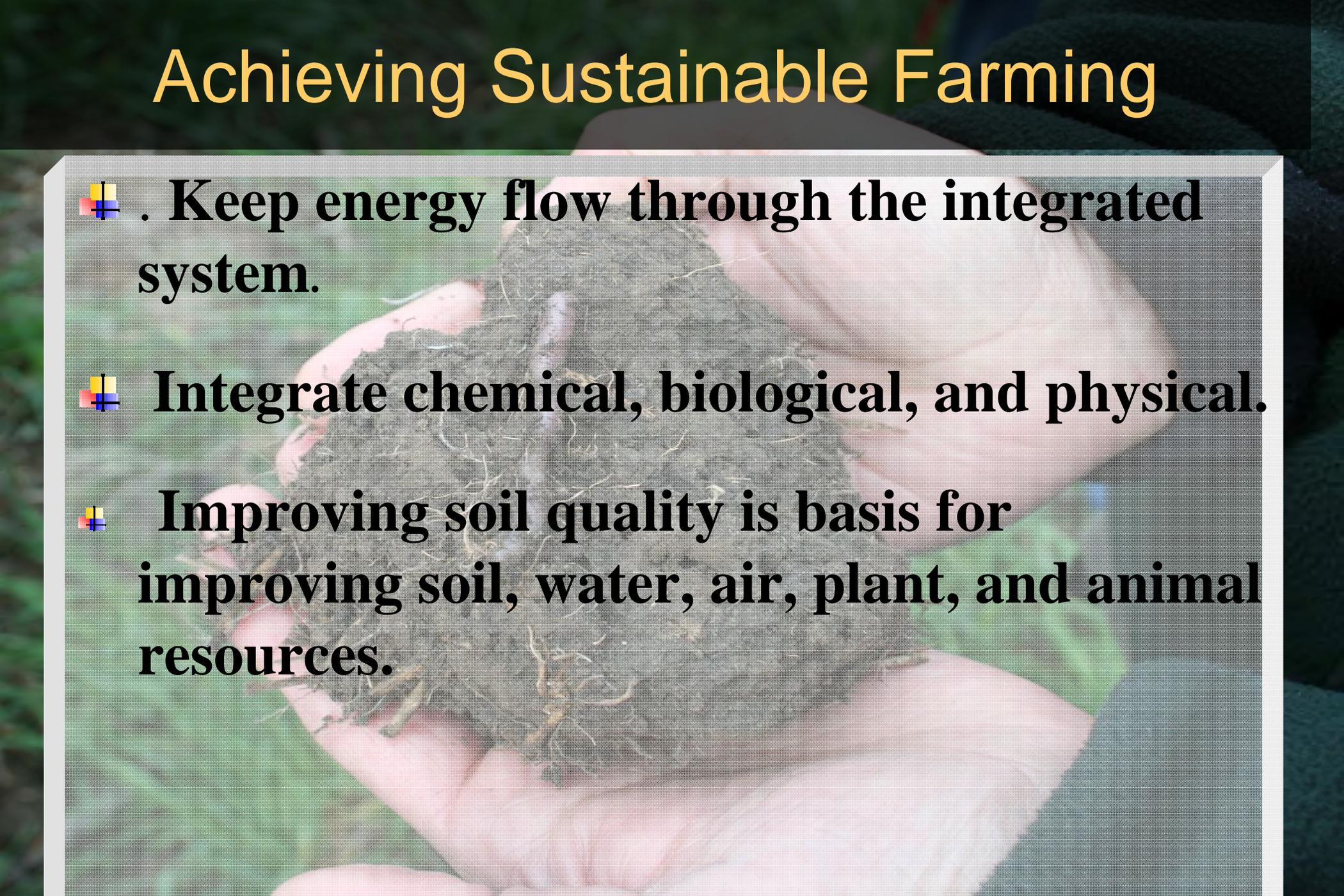
Achieving Sustainable Farming

- Producers need to demand quality service. NRCS, in addition to NMSU, CES, and other agencies, must help develop sustainable farming systems. Need interdisciplinary teams including producer.**



- Producers are the drivers of sustainable farming as we develop/exchange technologies, case studies, field trials, on-farm demonstrations, farmer-to-farmer networks.**

Achieving Sustainable Farming

- 
- ✚ . Keep energy flow through the integrated system.
 - ✚ Integrate chemical, biological, and physical.
 - ✚ Improving soil quality is basis for improving soil, water, air, plant, and animal resources.

Sustainable Farming – Diversify Enterprise

- ✚ Market outside commodity supply
- ✚ Emphasize direct marketing and specialty markets
- ✚ Form cooperative
- ✚ Add value through on-farm processing



BUY FRESH
BUY LOCAL

Sustainable Farming – Build Soil Quality

- # Minimize or eliminate tillage
- # Apply nutrients according to soil, plant, tissue tests and nutrient budget
- # Increase on-farm nutrient cycling, plant species diversity
- # Maintain ground cover year round by using cover crops and mulches and by leaving crop residues in field
- # Manage/protect soil organisms to preserve biodiversity
- # Rotational grazing, prescribed grazing

Sustainable Farming – Develop Conservation Plan

- ✚ Use integrated approach to inventory resources and develop conservation plan for whole farm
- ✚ Choose and apply conservation practices, technologies, approaches to address identified resource concerns and take advantage of opportunities
- ✚ Not only think outside the box but step outside the box



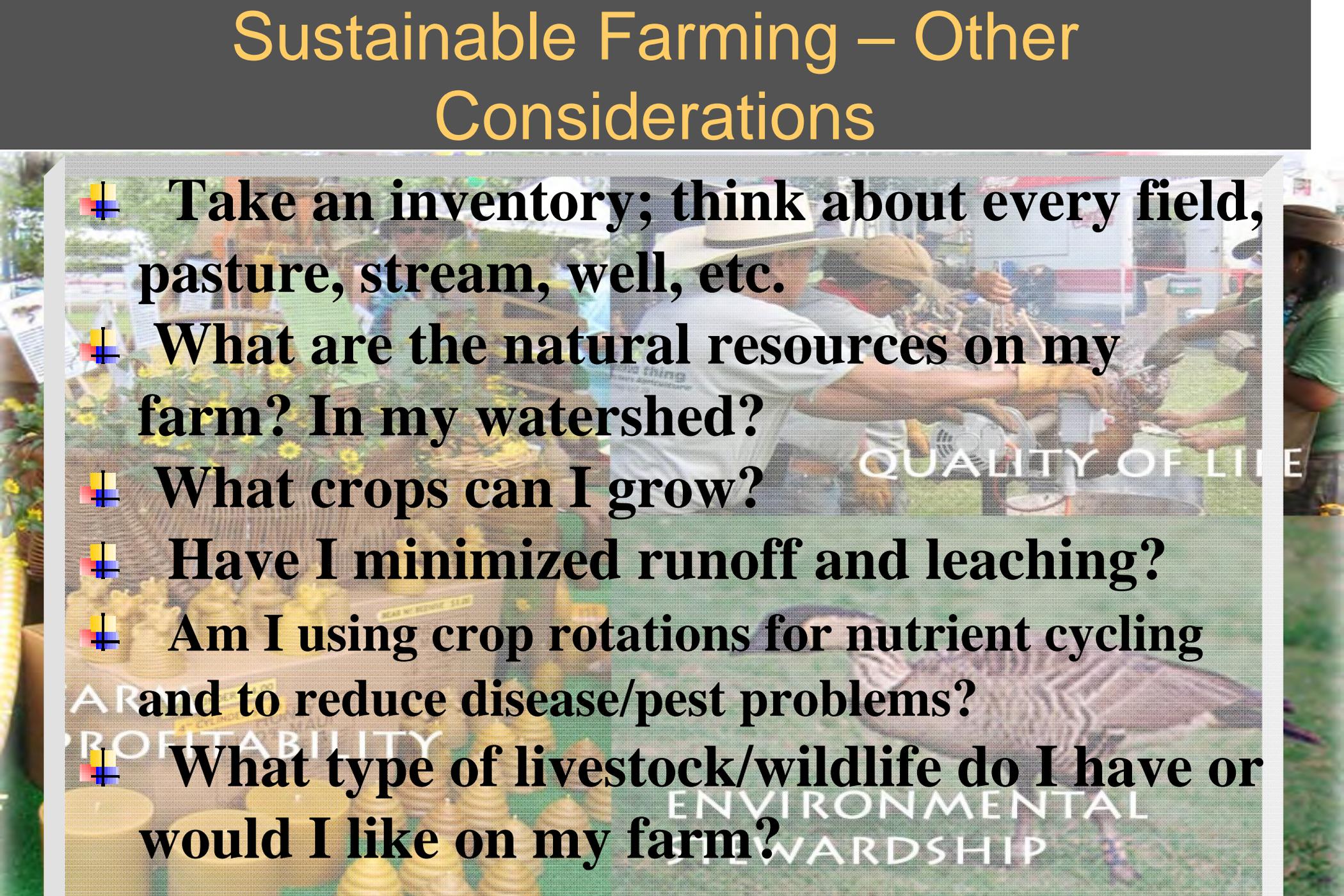
Sustainable Farming – Manage Pests Ecologically

- ✚ Prevent pest problems by building healthy, biologically active soil, creating habitat for beneficial organisms, and choosing appropriate plant cultivars/rotations
- ✚ *Tolerate, don't eradicate*
- ✚ *There is no silver bullet*
- ✚ *Treat the causes of pest outbreaks, not the symptoms*
- ✚ *If you kill the natural enemies, you inherit their job*
- ✚ *Pesticides are not a substitute for good farming*

Sustainable Farming – Maximize Biodiversity

- 
- ✚ Integrate crop and livestock production
 - ✚ Use hedgerows, insectary plants, cover crops, etc. to attract beneficial insects, bats, and birds
 - ✚ Plant trees and perennial crops
 - ✚ Abandon monocropping in favor of crop rotations, intercropping and polycultures
 - ✚ Manage pastures to support diverse selection of forage plants
 - ✚ Plant cover crops

Sustainable Farming – Other Considerations

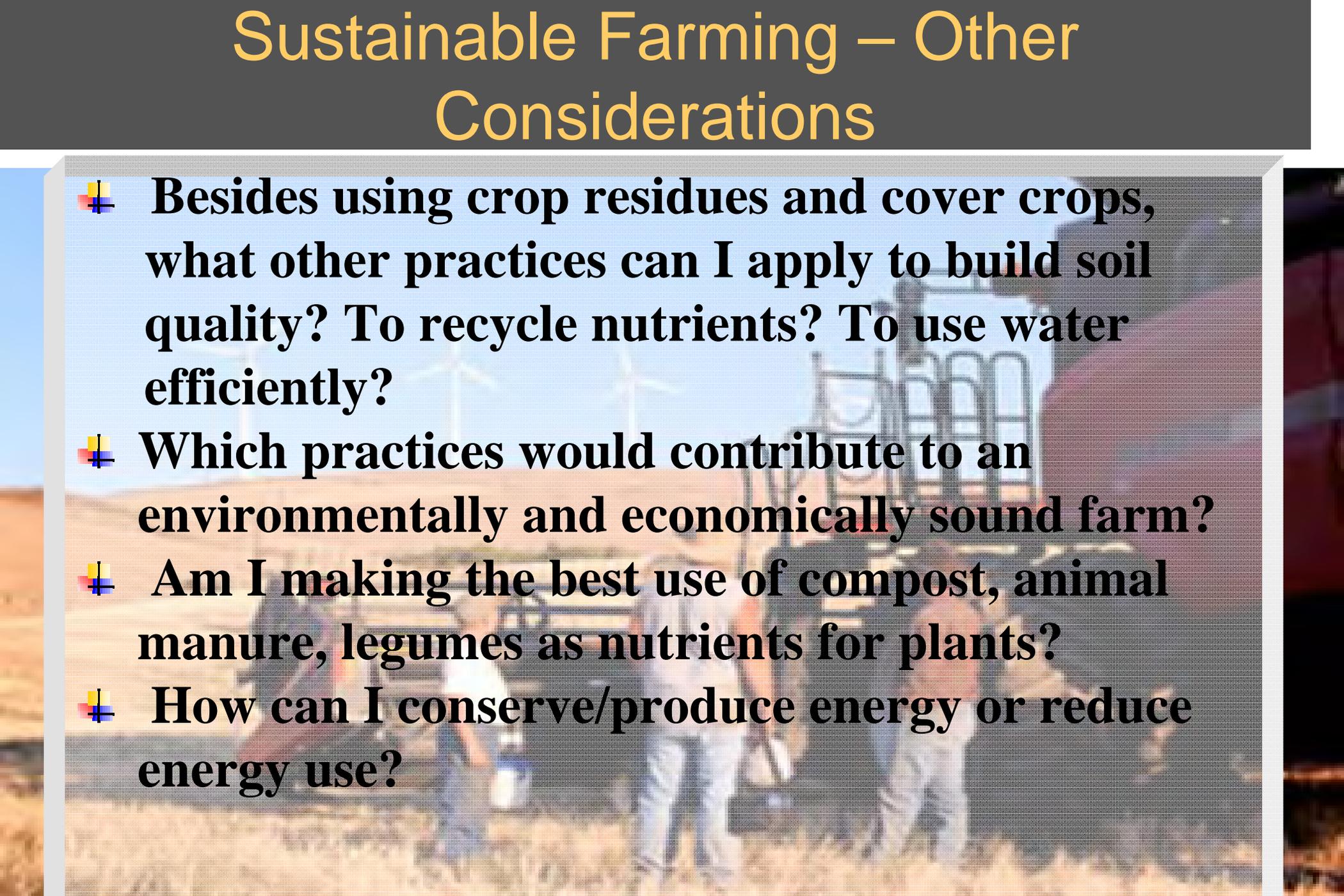
- 
- ✚ Take an inventory; think about every field, pasture, stream, well, etc.
 - ✚ What are the natural resources on my farm? In my watershed?
 - ✚ What crops can I grow?
 - ✚ Have I minimized runoff and leaching?
 - ✚ Am I using crop rotations for nutrient cycling and to reduce disease/pest problems?
 - ✚ What type of livestock/wildlife do I have or would I like on my farm?

Sustainable Farming – Other Considerations

- # Have I taken a soil test?
- # Have I taken an irrigation water test?
- # Have I taken plant tissue tests?
- # How is my soil quality? Soil fertility, Aggregate stability, active organic matter; visual indicators, including erosion, weeds, blowing soil, sediment deposition, crop or plant quality and production, earthworms



Sustainable Farming – Other Considerations

- 
- The background of the slide is a blurred photograph of a farm. In the foreground, several people are visible, some wearing hard hats and work clothes, appearing to be engaged in a task. In the middle ground, there is a large piece of farm machinery, possibly a tractor or a combine harvester. The background shows a vast, open field under a clear sky, with some distant structures or trees. The overall scene is a typical representation of a busy agricultural environment.
- ✚ Besides using crop residues and cover crops, what other practices can I apply to build soil quality? To recycle nutrients? To use water efficiently?
 - ✚ Which practices would contribute to an environmentally and economically sound farm?
 - ✚ Am I making the best use of compost, animal manure, legumes as nutrients for plants?
 - ✚ How can I conserve/produce energy or reduce energy use?



Sustainable Farming Workshops

- ▣ Share resources, including Integrated Water Management Handbook on NRCS website: <http://www.nm.nrcs.usda.gov>, click on Irrigation
- ▣ Evaluate site-specific conditions, including chemical, biological and physical
- ▣ Build soil quality and improve overall farming system



Sustainable Farming Workshops

- Promote user friendly integrated management and technology exchange
- Reduce overall on-farm energy use, inputs, production costs, pest incidences, pumping costs, water loss, soil loss.
- More economical, sustainable farming enterprise
- Healthier watershed and community

On Farm Demos/ Case Studies:



Farming Goal

- **To produce high quality crops through implementation of agro-ecological principles.**



Larry Sanchez Farm

Located in Adelino

South Field:

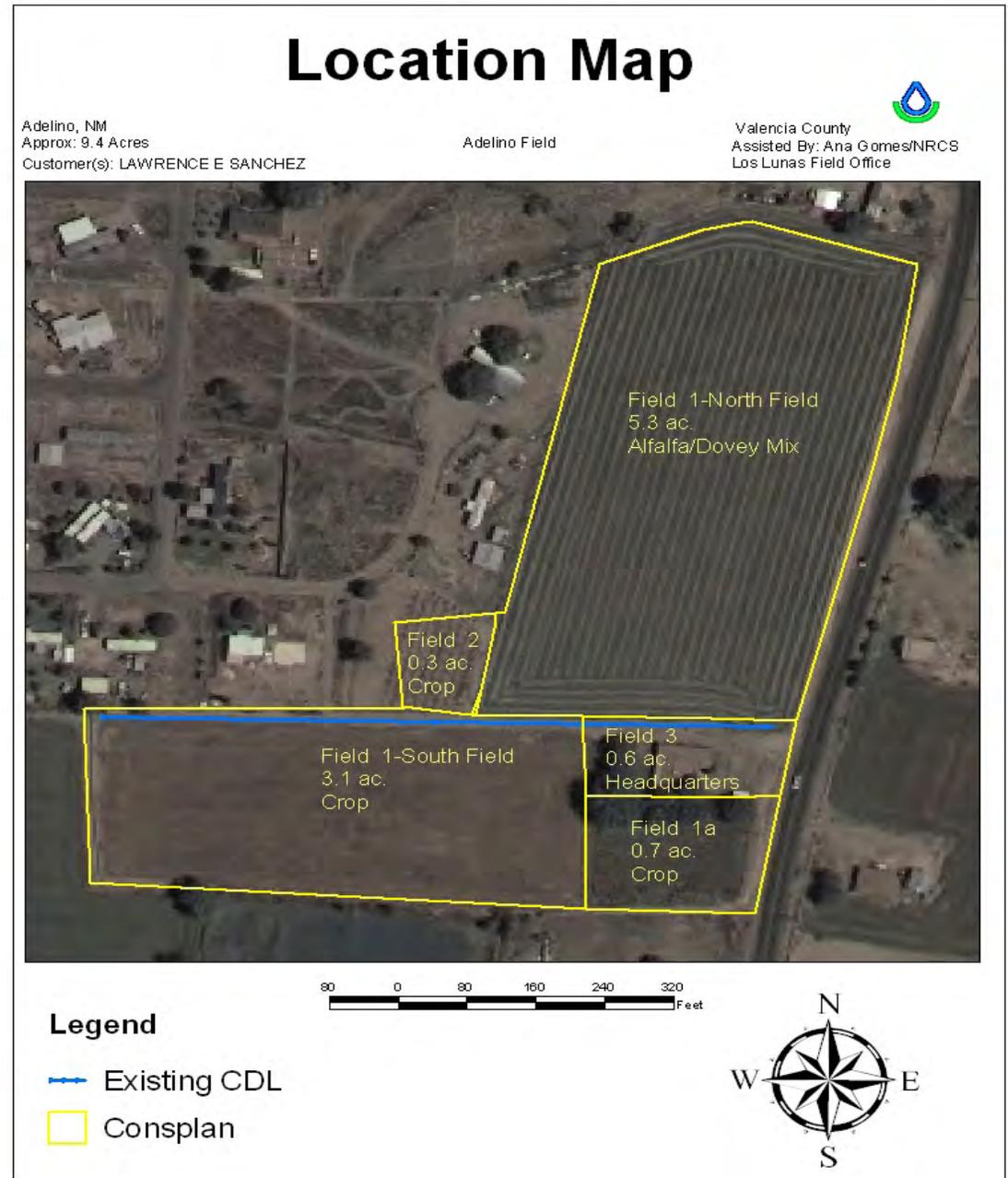
- 3.1 Acres
- Dovey Fescue

North Field:

- 5.3 Acre
- Dovey/Alfalfa Mix

Field 2

- Vegetable Garden



Irrigation Water Management

- **Flood Irrigation:
Concrete Lined Ditch- 8
CFS**
- **Land Leveling to
correct slope on soils**
- **Irrigation Timing**
- **Farming Practices**



Organic Matter

- **Chicken Manure**
- **Cover Crop**
- **Stubble**
- **Soil Sampling**
- **Minimum Till**



REDUCED TILLAGE FIELD



SOILS

GE=Gila Loam, Slightly Saline

GK=Gila Clay Loam



PRODUCING PLANTS WITH HIGH NUTRIENTS



PRODUCING PLANTS WITH HIGH NUTRIENTS

- Amendments in soils to improve physical properties
- Trials that Plant Materials Center assisted with finding highest producing grass
- Working the soil

Before and After



CUTTING HAY



Baling Hay



Harvest

Before



After



Measuring







0	0
5	2.5
10	5
15	7.5
20	10
25	12.5
30	15
35	17.5
40	20
45	22.5
50	25
55	27.5
60	30
65	32.5
70	35
75	37.5
80	40
85	42.5
90	45
95	47.5
100	50

Capacity 110 lb x 1lb
50 kg x .5 kg
Not Legal For Trade

Santa Fe - Raised Beds, Drip, Diversity, Manure, Compost, Cover Crops, Transitioning to Organic



Carlsbad - Integrated Water Management/Nutrient Management Field Trial/Demonstration



Golden: Double Dug, Composting, Mulching



Las Cruces: Cover Crops, Residue Management, Salinity Management, Integrated Water/Nutrient Management



Deming: Wind Erosion/Herbaceous Wind Barriers Field Trials/Demonstrations



Residue Management/Soil Quality Field Trials/Demonstrations



Keys to Achieving Sustainable Farming



- ✚ use integrated systems approach (ecosystem, whole farm, watershed)
- ✚ problem-posing, problem-solving
- ✚ actively seek resource, watershed, marketing opportunities
- ✚ resource efficient and resource conserving
- ✚ technology "exchange" vs. "transfer"
- ✚ develop whole farm conservation plan creatively and flexibly, step outside the box
- ✚ consider on-site and off-site effects
- ✚ focus on keeping energy flow through the integrated system
- ✚ reemphasize biological factors, improve biodiversity
- ✚ improving soil quality is key to improving soil, water, air, plant, and animal resources
- ✚ case studies, field trials, on-farm research/demonstrations, farmer-to-farmer networks
- ✚ interdisciplinary teams including producers and partners
- ✚ farmers need to demand quality service
- ✚ recordkeeping is tool in decision-making and management of current and future resources
- ✚ need user friendly fact sheets, brochures on integrated systems