Holistic Planned Cropping & Grazing

Integrating Livestock in Cropping Systems to Improve Soil Health and Farm Profitability

HOLISTIC MANAGEMENT INTERNATIONAL

HMI
Healthy Land. Healthy Food. Healthy Lives.

Holistic Planned Cropping & Livestock

Manage your land base so that you:

- Foster your soil health--soil fertility and water storage capacity
- Minimize weed and invasive species
- Reduce/eliminate pests and soil borne disease pressure
- Reduce off-farm inputs
- Reduce farm labor

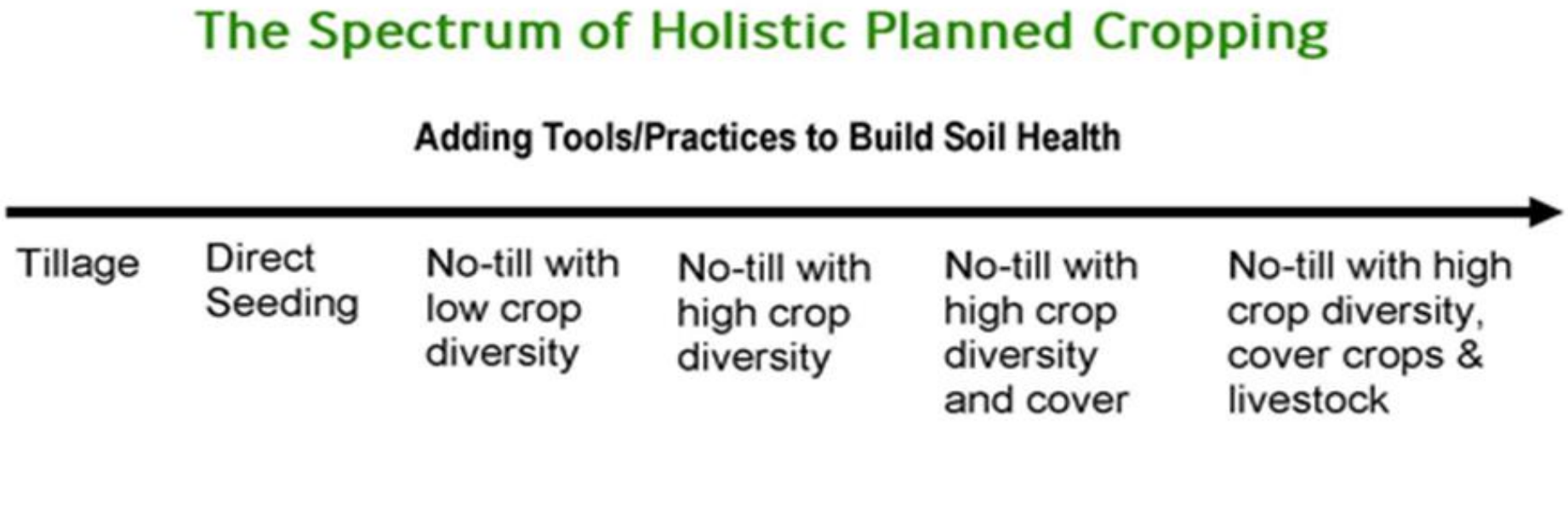
4 Holistic Cropping Principles

Guide your planning decisions and selection of tools :

1. Mimic healthy ecosystems (live root , year round)
2. Create disturbance that improves ecosystem function
3. Maximize diversity
4. Plan for recovery time

Key Holistic Planned Cropping Guidelines

- Keep soil covered.
- Provide multiple food sources for the whole soil food web.
- Eliminate gaps in food for soil organisms (live root).
- Improve or maintain soil structure.



Management Considerations & Strategies

Key Management Considerations (WHAT & HOW) in the context of the LOCATION, TIMING, and SEQUENCING through planning:

- Seeding/planting
- Feeding soil organisms and plants
- Disturbance of soil and plants (including drainage in some areas)
- Soil cover (mulching/live plants)
- Harvesting of crops
- Recovery of plants and soil
- Managing the biological community (pest/weed control, improving habitat, diversity).

How many of each farming step can be completed by livestock

Seeding and Planting

Feeding Soil Organisms & Mulch/Live Plants

Corn plant emerging through downed cover crop. Courtesy of SARE.

Disturbance of soil and plants & Harvesting

Profit vs. Production

- Gabe Brown numbers
- Yield is actually higher than surrounding counties
- Expenses significantly less because of soil fertility/biodiversity

Gross Profit
Income/Acre
Yield 159 bushels/acre @ $6.48/bushel
$1030.32/acre
Expenses/Acre
Seed $64.05
Herbicide $12.50
Crop Insurance $17.94
Planting $18.00
Combining $22.00
Trucking $24.40
Storage $15.90
Total Expense $174.79
Gross Profit $855.53/acre (does not include income from direct payments, CSP, and winter grazing)
Cost per bushel of corn = $1.10 (excluding land cost). US Average at time: $4.40/bushel. 25%
Gross Profit $5.38/bushel

Farm Ecosystem Strategies

- Cover Crops
- Intercropping/Polyculture/Perennials/Pasture Cropping
- Hedgerows/Windbreaks/Shelterbelts
- Mulching
- Integration of Livestock
- Tillage/Disturbance
- Composting/Input Feeding
- Crop Rotations/Sequencing

Consider all the options and tools available:

- Chemical (Inputs)
- Physical (Mechanical)
- Biological (Plants/Animals)

Pasture Cropping

1. Pastures monitored for slowing growth and signs of dormancy
2. Severe grazing--pasture grazed to 3-4 inches (lots of litter).
3. Grain crop is drilled directly into grazed field.
4. Grain crop monitored.
5. Grain crop mechanically harvested when mature or animals harvest it (crop insurance).
6. Pasture regrows and returns to grazing cycle.

Why Pasture Cropping

Benefits of a perennial pasture:

- Stable soil structure
- Active soil microorganisms
- High organic matter content
- Carbon sequestration
- Improved pastures
- Increased fertility and yield
- More native grass species
- No field prep means more availability for grazing and lower cost
- Yields of the grain crop are consistent with a monoculture of grain with the added benefit of more immediately harvesting a hay or pasture crop following the grain.

	No-till	Wheat pasture intercrop	Hay production
Wheat price ($ per bushel)	7.00	7.00	
Hay price ($ per ton)		45.00	45.00
Yield/acre Hay (tons)	0	1.3	1
Yield/acre Grain (bu.)	40	30	0
Revenue/acre			
Hay	0.00	58.50	45.00
Grain	280.00	210.00	0.00
Total Revenue/acre	280.00	268.50	45.00
Costs ($) / acre			
Seed	10.89	10.89	0.00
Pre-Harvest Machinery			
No-Till Planting	13.73	13.73	0.00
Fertilizer Application	4.97	4.97	0.00
Herbicide Application	5.01		
Fertilizer			
Urea	35.88	35.88	0.00
Dap	91.38	91.38	0.00
Herbicide			
Glyphosate	31.25	0.00	0.00
Harvest Machinery			
Haying	0.00	11.83	11.83
Combine	21.65	21.65	0.00
Land Value (Cash Rent Equivalent)	45.00	45.00	45.00
Total costs/acre	259.76	235.33	56.83
Net return	20.24	33.17	(11.83)

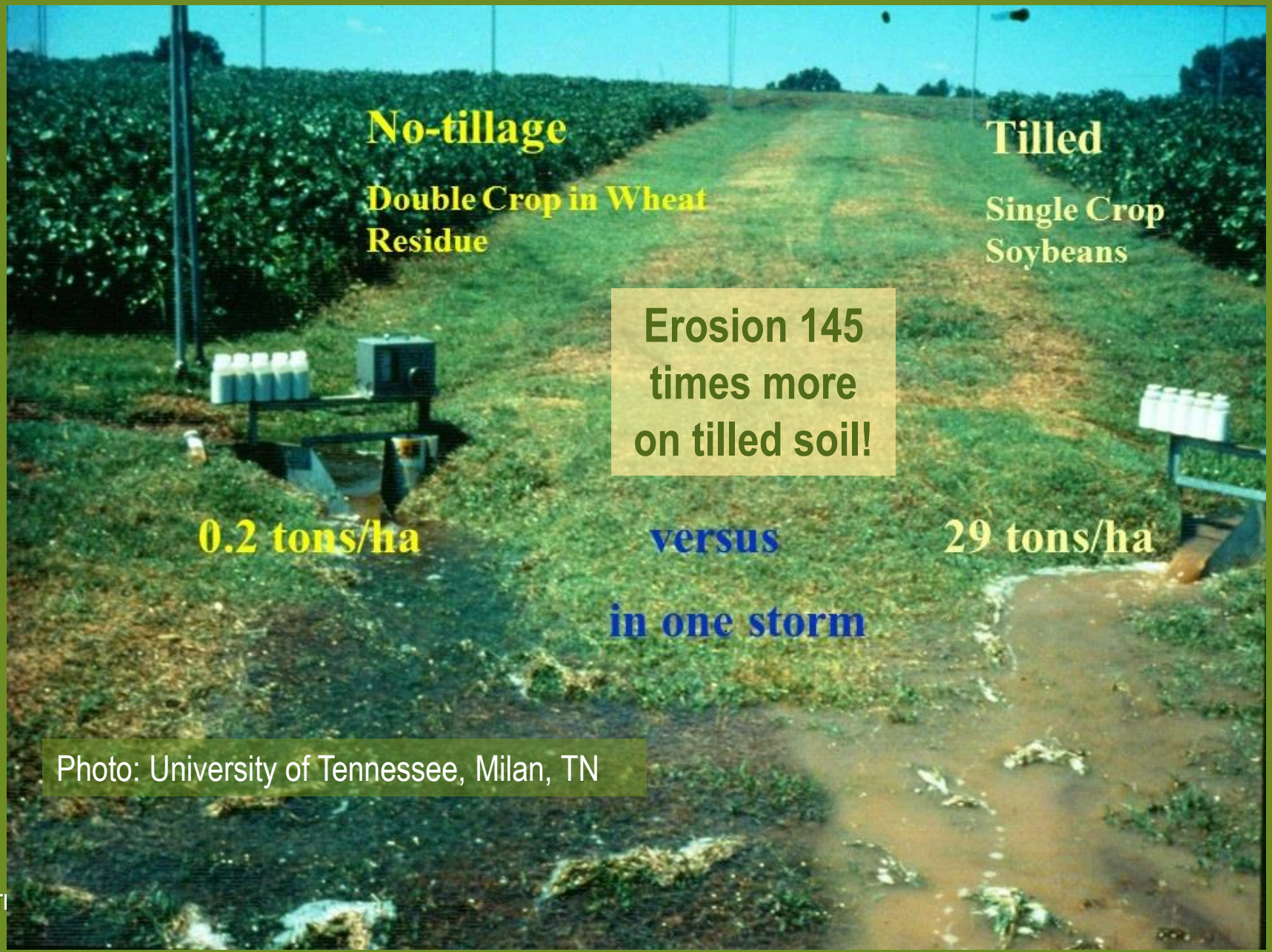
Timing of Livestock/Pasture Cropping

- Stress “competition” plants with grazing before direct seeding/drilling/transplanting “cash crop.”

When to time grazing animals?

- When will they do the most good and help the cash crop.
- When they create the least interference for cash crop parameters—like prepping for the cover crop.

No-till drastically reduces erosion



Integration of Livestock

Different livestock used in different contexts to address different concerns regarding: cover crops, reduce weeds and diseases, incorporate crop residue, cycle nutrients, add fertility and increase organic matter.

Integrating Livestock

Browns Ranch

(Native Rangeland SOM: 7.2)

Two Years Mob Grazing West Side of Shelterbelt	No Mob Grazing East Side of Shelterbelt
Total Biology: 6105 ng/g soil	Total Biology: 4228 ng/g soil
Actinomycetes: 213 ng/g soil	Actinomycetes: 418 ng/g soil
Bacteria: 4417 ng/g soil	Bacteria: 3349 ng/g soil
Fungi: 786 ng/g soil	Fungi: 386 ng/g soil
Ratio Bacteria/Fungi: 5.6	Ratio Bacteria/Fungi: 8.7
Mycorrhiza: 230 ng/g soil	Mycorrhiza: 145 ng/g soil
SOM: 5.0	SOM: 3.8

Almost 45% more biological activity in the soil where livestock had been integrated. As much as 75% reduction in input costs

Vine to Ovine to Wine

Economic:

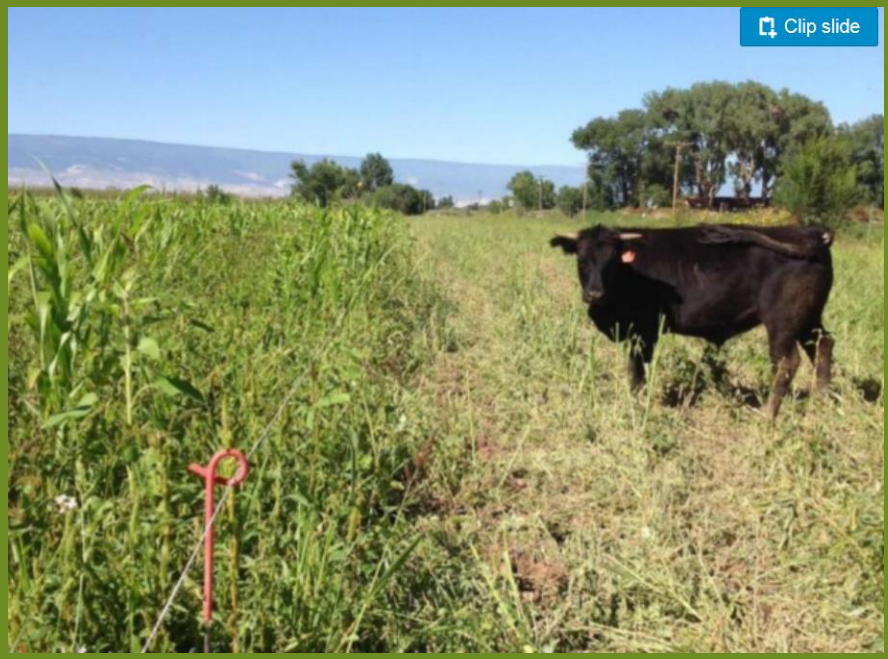
- UC Extension 2008-2009 study of $134/acres savings--reduction in tractor/labor use for mowing, cultivation and fertilization (in 2017 estimate is $450/acre)
- Reduced irrigation use: from 24 gallons per vine in 2008 to 5 gallons in 2009 (both were drought years).
- No need to mow between rows and cultivate under the vines
- Sheep as additional income stream

Ecological:

- Improved soil structure through reduction in tractor use (compaction) and beneficial effects of planned grazing.
- Improved nutrient cycling—carbon sequestration
- Reduced impact on beneficial insects and habitat
- Lower pollution levels through reduced tractor use.
- Increased biodiversity-sheep tend to attract birds
- **Social**
- Improved neighbor and community relations due to less noise and pollution.—*Kelly Mulville*

Considerations for Integrating Livestock

- Experience managing livestock
- Potential collaborator
- Infrastructure needs
- Additional labor needs
- Timing of labor demands
- What livestock or products?
- Marketing of products? Time/channels?



Step 3 Management Considerations Worksheet ROI Analysis

Concern/Location on Crop Map	Root Cause	Potential Short-term (ST) or Long-Term (LT) Actions	Action chosen to Integrate into This Year's Plan and Return on Investment	Knowledge, supplies, equipment and labor needed to successfully integrate strategy	Notes
Field 1	Poor soil aggregation and low organic matter due to tillage	Subsoil rip or keyline (ST)	Subsoil: $40/acre cost. 10% increase in yield @ $400/acre=$40/acre return. Front wheels $500 over 10 years=$50/year over 10 acres= $5/year/acre.	20 hours of labor	John Doe
Poor water infiltration		Get dual front wheels for tractor to reduce soil compression (ST)			
		Increase perennial grasses (LT)			
Field 2	Poor soil aggregation and low organic matter due to tillage. Near springs with no flow control mechanism.	Add new headgates to control water (ST). Increase perennial grass cover (LT)	$200 for headgates. Ge 50 bales/year more at $8/bale= $400 return	10 hours labor, get neighbor to show me how to install head gate	John Doe
Flooding			Plant grass		
Field 3	Poor soil aggregation and low organic matter due to tillage.	Lime (ST)	Purchase lime.	10 hours of labor	John Doe
Poor production		Increase stock density and recovery time so perennial establish (LT)	$50/acre with $150/acre return on increased investment.		

Step 8 – Plan Draft

Holistic Cropping Plan Chart

Line for events

S= Soil Prep, P=Plant, H20=Water, H=Harvest, G=Growing, W=Weed
I=Input, L=Livestock, M=Mulch, PR=Perennial, R=Recovery
CC= Cover Crop, $C= Cash Crop

Name
Year
Farm Size

Field Name	Acres	Planned Yield	Management Considerations/ Recent Crops/Past Tools, etc	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	# of Cash Crops	# of Plantings	Management Strategies	Resource Concerns Addressed	Feedback Loop/Notes/Issues
							last frost date 10			conf 10-12			first frost date 30		22-26 Xmas					
Plan #1	5	4,000#/acre garlic; 42 bushel/acre soybean; vetch mix 3T/acre	previous crop tomatoes	Garlic	Garlic	Garlic	Garlic	Garlic	Garlic	H:15-31	P-Soybeans/CC	Soybeans/CC	H Soybeans/CC=15-22; P Vetch CC 22-31	Vetch mix CC	Vetch mix CC	2	3	CC to build OM, no-till	Vetch for OM and N	began with 2.1% OM
Actual/Yield	5									22,000#			205 bu		L- 20 stockers 20-30					$66,000 garlic + $3700 soybeans
#2	5	fava beans 1.5 tons/acre, broccoli 600 boxes/acre	previous crop spinach	ryeCC	ryeCC	ryeCC	P:15--Fava beans	Fava beans	Fava beans	H:20-31	P-Brassicas	Brassicas	Brassicas	H Broccoli :15-20, P Vetch 22-28	Vetch mix CC	2	4	CC to build OM, no-till	rye and vetch	began with 1.9% OM
2-Actual/Yie	5			L-20 stockers 1-31						8 tons				3000 boxes						$4000 fava beans + $66,000 broccoli
#3	5	250 bushel/acre okra, 7 ton per acre basil, spinach 8 tons/acre	some ponding	daikon CC	daikon CC	daikon CC	P:15--spinach	H:29-31 spinach	P:1--okra, basil	okra, basil	H:1-6 okra, basil, P-lettuce	lettuce	H:29-31 lettuce	S: 1-3 subsoiler, oats 4-6	oats	4	6	daikon to break hard pan, subsoil if that doesn't work,		began with 1.5% OM
3-Actual/Yie	5				L-20 stockers 1-28			40 tons		500 bu okra, 21 tons basil	500 bu okra, 21 tons basil		25,000 head/acre							$12,500 okra, $25,200 basil, $35,000 spinach, $ 150,000 lettuce
#4	20	3 T/acre	pasture mix																	
4-Actual/Yie	20					L-20 stockers 1-31	L-20 stockers 1-30													$20,000 cattle sales
#5	100	Dry Beans: 1000lb/ac	Fallow, Wheat	Fallow	Fallow	Fallow	Fallow	Prep Field	Plant	Cultivate	Cultivate		Harvest	Plant Wheat	Wheat	1	2	till on contuour, add a grassed waterway	reduce erosion	Total Sales: $200/ac, $20,000
5-Actual/Yields		Actual yield: 800lb/ac	Water Erosion																	
#6																				
6-Actual/Yields																				

Design & Manage for Life

Integration of Livestock Principles & Guidelines

- Mimic healthy ecosystems.
- Create disturbance that improves ecosystem function.
- Maximize diversity.
- Keep soil covered.
- Provide multiple food sources for the whole soil food web.
- Minimize soil disturbance
- Improve or maintain soil structure.

The Tool is Not the Goal

- What is your goal? What is your context?
- Soil health
- Profitability
- Biodiversity
- Quality of life
- Resilience

- Model, Trial, Collaborate!