Cover Crops-Part of The Road to Regenerative Agriculture

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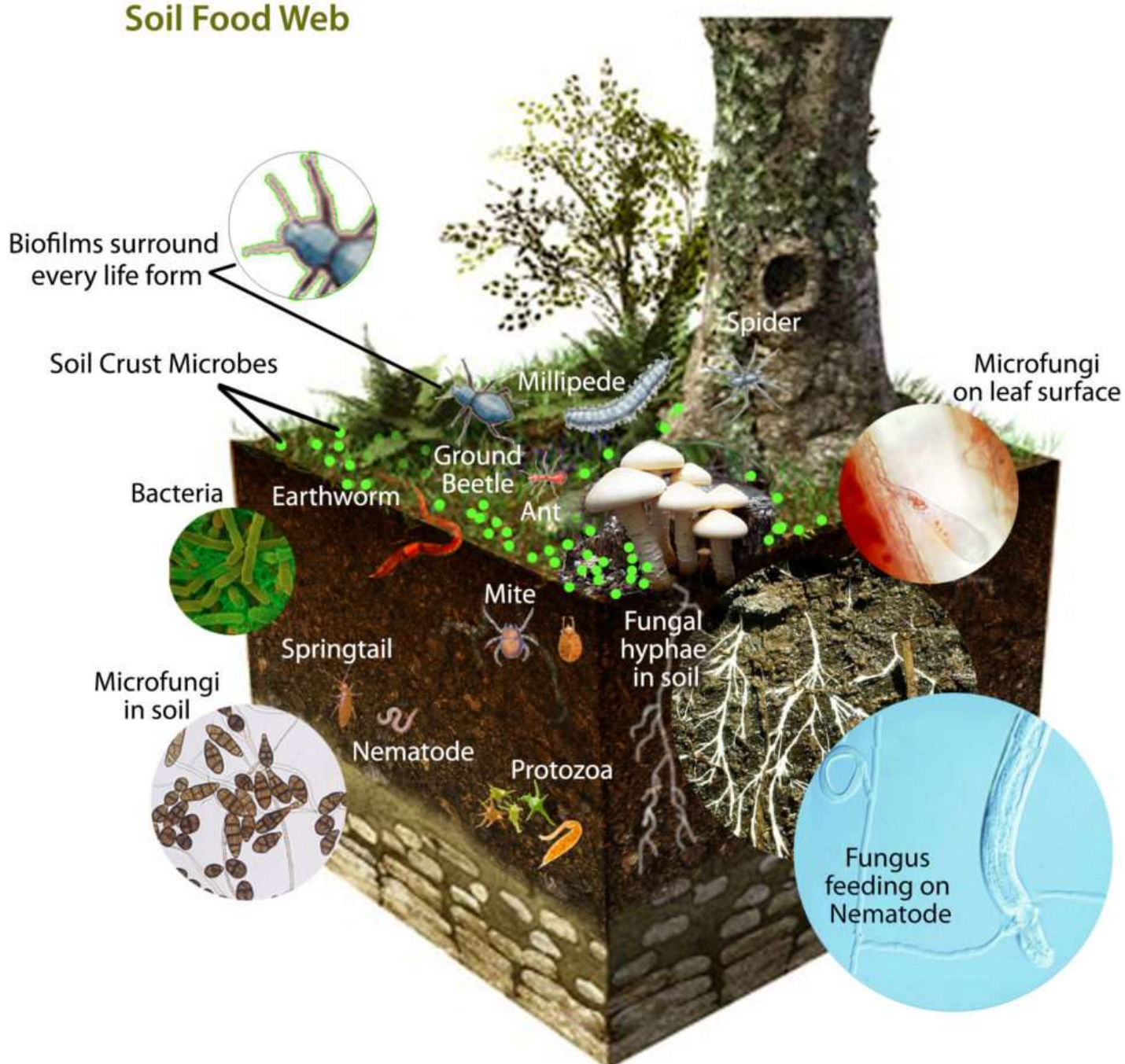
EAS- Enchanted Agromanagement Solutions

Cover crops are an essential part of regenerative agriculture!

Why?

How?



https://endofite.com/

In every healthy system or watershed, the soil food web is critical to major soil functions

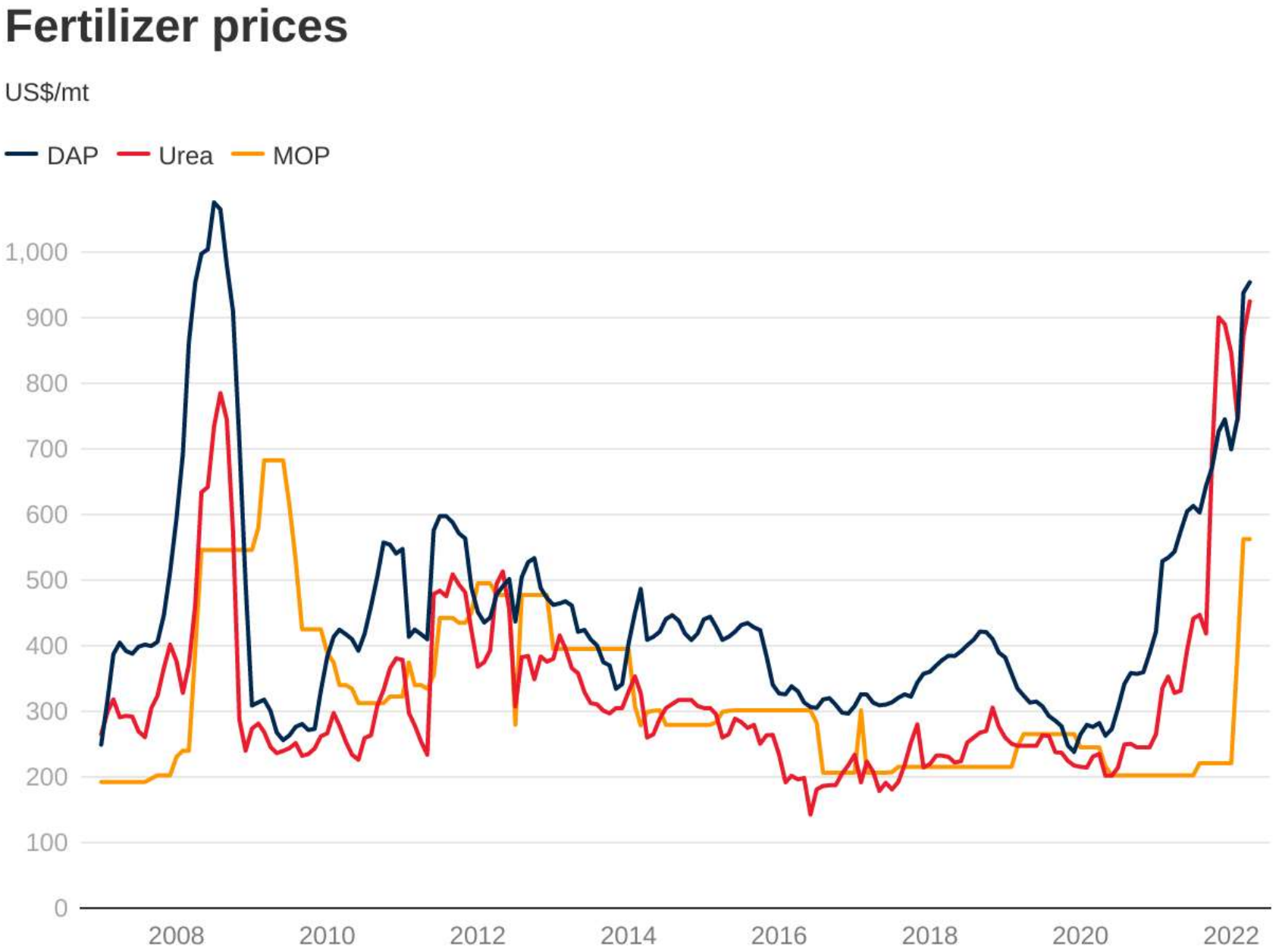
- Sustaining biological activity, diversity, and productivity
- Regulating the flow of water and dissolved nutrients
- Storing and cycling nutrients and other elements

Manage Carbon Cycle and Increase S.O.M.

- Improve soil structure
- Enhance water holding capacity
- Protect soil from erosion and compaction
- Support a healthy community of soil organisms
- Balance nutrient cycle

Profitability

- Cover Crops can help provide nutrient needs
- Help feed the biology that can improve nutrient uptake
- Improved biology can help crops to yield more or have improved quality



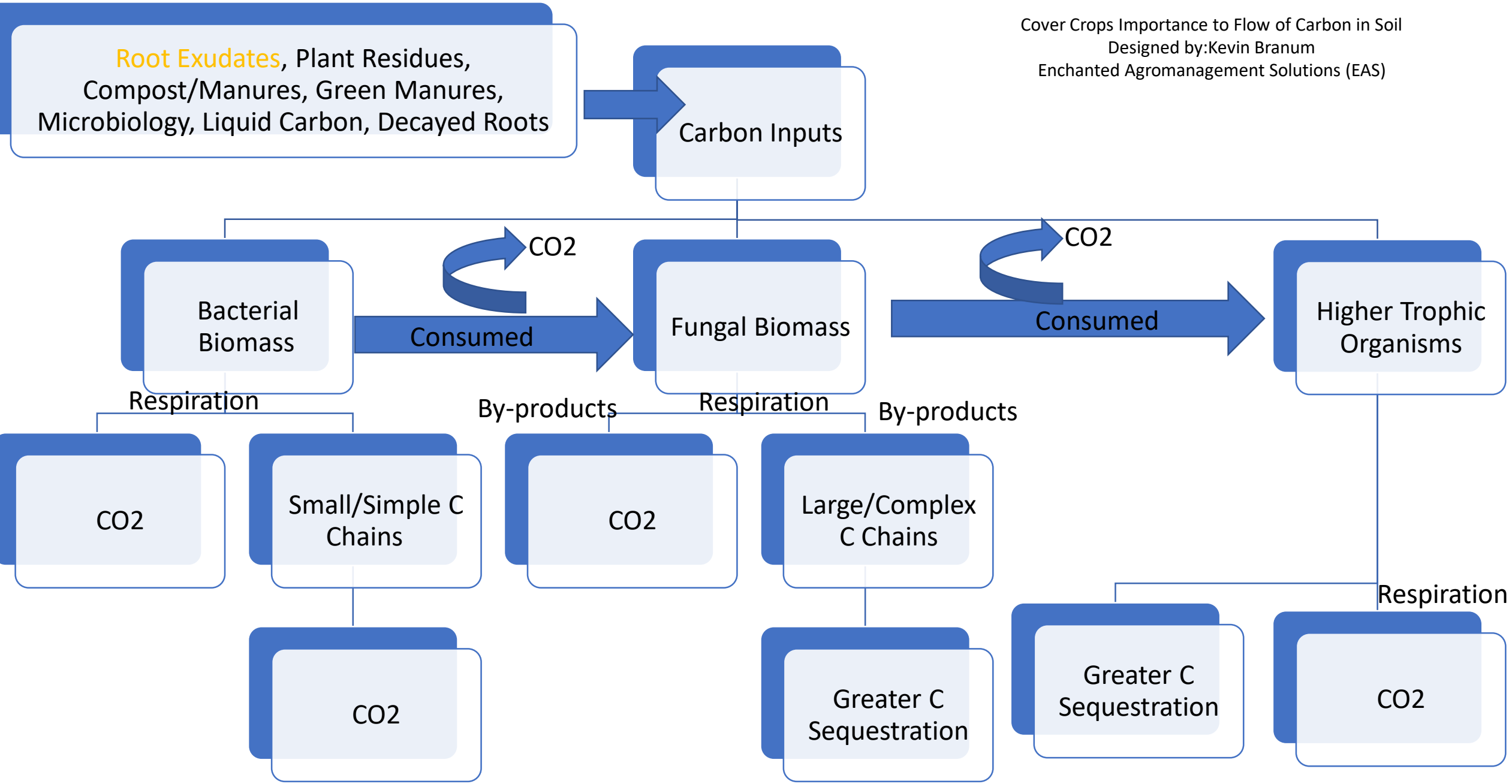
Note: DAP = diammonium phosphate. MOP = muriate of potash. Last observation is April 2022.

Source: Bloomberg; World Bank.

How can we minimize the weather extremes?

Protect the soil surface	Cover crops, manage residues
Increase organic matter in our soils	Reduce tillage, manage residues, rotate crops, cover crops
Increase microbiology in our soils	Reduce tillage, manage residues, feed the biology (cover crops), increase plant diversity
Decrease disturbance to the naturally occurring biological system	Reduce tillage, reduce fertilizer and chemical use, increase diversity, use cover crops

Cover Crops Importance to Flow of Carbon in Soil
Designed by:Kevin Branum
Enchanted Agromanagement Solutions (EAS)



Before You Begin Growing A Cover Crop

- Have a goal in mind
- Have a plan in place
  - How am I going to seed?
  - When am I going to seed it?
  - At what vegetative stage am I going to terminate it?
  - What method will I use to terminate it?

While selecting a cover crop what is your goal:

- Reduce erosion from wind and water
- Introduce diversity to system
- Maintain or increase soil health and organic matter content
- Reduce water quality degradation by utilizing excessive soil nutrients
- Suppress excessive weed pressures and break pest cycles
- Improve soil moisture use efficiency
- Minimize soil compaction
- Provide nutrition to cash crop

How?

4 R's of Cover Crops

Right Plants for Environment

Right Mix for the Job

Right Number of Plants

Right Time in the Rotation

Utilize the technologies available to make the best of it!

Mimic the arid southwest systems

Start with what we know

- Diverse mixture of the right plants at the right density
- Utilize grazing animals
- Reduce the disturbance
- Utilize our weather extremes and moisture to our benefit

Learn more about what we don’t know

- Jump start our microbiology
- Feed our microbiology
- Alter our microbiology to enhance our crops

Key issues to focus on in water limited environment:

- Water requirements of the cover crop - is the demand high or low?
- Drought tolerance of the cover crop - does the cover crop tolerate dry spells and to what extent?
- Is the cover crop easy to manage? - watch out for tendency to become weeds

Key issues to focus on in water limited environment cont.

- Is the cover crop easy to manage? - would the cover crop die easily when sprayed or plowed down?
- How much residue can I get from this cover crop? - high residue or low residue?
- Possibility of harvesting about 70% and leaving 30% as residue?

3 Rules For Starting Into Cover Crops

1

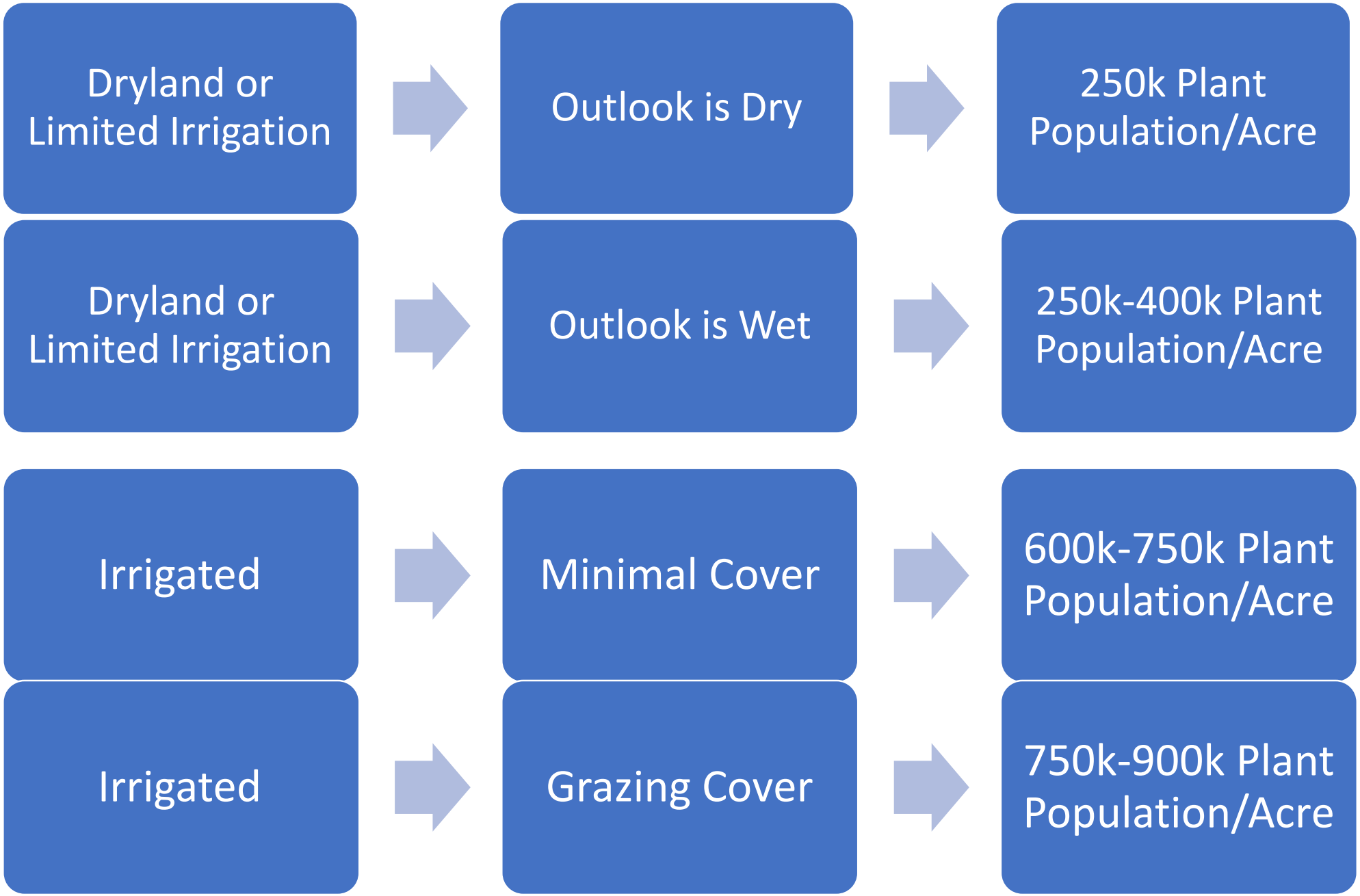
Keep the planting rates down!!

2

Keep it to 3-5 species to start with

3

Get an inoculated legume in the mix every time


Dryland or Limited Irrigation
Outlook is Dry
250k Plant Population/Acre
Dryland or Limited Irrigation
Outlook is Wet
250k-400k Plant Population/Acre
Irrigated
Minimal Cover
600k-750k Plant Population/Acre
Irrigated
Grazing Cover
750k-900k Plant Population/Acre

When should I plant them

- Need atleast 6-8 week window
- Plant them when there is moisture or you can use least amount of irrigation
- Make sure species aren’t going to impact the next crop in rotation negatively
- Make sure you aren’t continuing a potential pest problem by having continuous hosts

Species that have shown promise

Wheat	Oats	Rye	Triticale	Millets	Sorghum	Sorghum Sudan
Buckwheat	Sunflower	Austrian Winter Pea	Cowpeas	Forage Collards	Vetch	Mung Beans
	Faba Bean	Lentils	Sunn Hemp	Grazing Radish	Grazing Okra	

Cover crops for organic matter (high C:N): sorghum sudan grass, millets, cereal rye, annu
ryegrass, triticale, oats, wheat, triticale and barley.

Cover crops for nitrogen (low C:N): cowpea, winter pea, red clover, sweet clover, hairy vetcl
alfalfa, faba beans, and mung beans.

Reduce compaction (deep rooted): Sorghum Sudan grass, millets, annual ryegrass, oilseed
tillage radish, turnips, sweet clover, cereal rye, triticale and oats.

Quick forage or can be grazed: oats, forage radishes, turnips, cereal rye, annual ryegras
sorghum sudan grass, triticale and barley.

Start up or enhance no-till: oilseed or tillage radish, turnips, sorghum sudan grass.

Prevent soil erosion: Grasses have fibrous root systems to bind soil, and the best grass cove
crops include cereal rye, annual ryegrass, oats, wheat, triticale and barley. Other cover crop
include buckwheat with a shallow fibrous root system, cowpea, and winter pea.

- **Recapture excess nutrients (nitrogen, phosphorus):** oilseed or tillage radish, turnips, annual ryegrass, cereal rye, oats, wheat, sorghum sudan grass, and buckwheat, sweet clover, winter pea, cowpea, red clover, hairy vetch.

- **Natural herbicides or allelopathic effects for weed suppression:** cereal rye, oilseed or tillage radish, mustards, oats, barley, buckwheat, sorghum sudan grass.

- **Attract beneficial insects:** buckwheat, sweet clover, and red clover.

- **Tolerate wet soils:** sweet clover, red clover, annual ryegrass, cereal rye, wheat, and oats.

- **Tolerate heat and drought:** cowpea, hairy vetch, mung beans, sweet clover, sorghum sudan grass, buckwheat, barley.
- **Cold tolerant:** Cereal rye, wheat, triticale, winter pea, and sweet clover.
- **Broadcast seeding:** sweet clover, red clover, cereal rye, annual rye, oilseed or tillage radish, turnips.
- **Low cost to establish:** Sorghum Sudan grass, oats, cereal rye, sweet clover, red clover, wheat, barley, oilseed or tillage radish.
- **Require little management:** turnips, oilseed or tillage radish, oats, cowpeas.

Reduced water and fertilizer use by more than 50% during the growing season

“We ended up producing quite a bit! Everybody thought the cover crop was a big success. I will be contacting you for more cover crop seeds next year. Thank You”

Schwebach Farms Summer Cover No Irrigation

Summer Mix

Species	Lbs Per Acre
Walken Oats	7
Weathermaster Wheat	7
813 Triticale	7
Driller Radish	1
Iron/Clay Cowpeas	3

Cuba SWCD- Healthy Soils Grant

Spring Mix Per Acre:	4lbs cowpeas (Iron and Clay)
	7 lbs Barley (Lavina Beardless Forage)
	7 lbs Black Oats (Cosaque)
	7 lbs Triticatle (Spring Thor)
Fall Mix Per Acre:	4lbs Austrian Winter Pea
	7lbs Cereal Rye (Elbon)
	7lbs Winter Wheat (Gore Beardless)
	7lbs Winter Triticale (SY TF 813)

Deming Producer Mix-NRCS Project

Species	Lbs Per Acre
Cowpeas Iron and Clay	6
Mung Bean	3
White Proso Millet	13
Forage Sorghum	.5
Forage Collards	1.5
Smart Radish	1
Golden Flax	29.5
Black Oil Sunflower	.5

Fort Sumner Producer-Soil Starter

Quantity	Description
2	WSLG030 - Mung Beans
8	CSLG020 - 4010 Spring Forage Pea
2	CSLG173 - Frosty Berseem Clover - Nitro Coat OMRI
2	WSGR010 - Tilfleaf III Hybrid Pearl Millet
8	CSGR010 - Elbon Cereal Rye
10	CSGR042 - Lavina Beardless Spring Forage Barley
2	WSGR180 - Egyptian Wheat Sorghum - TRT
10	CSGR075 - Surge Spring Tritical- PVP Unauthorized reproduction prohibited
2	WSGR071 - 2120 MS Forage Sorghum - UN
2	CSBR030 - Impact Forage Collards
2	CSBL011 - Golden Flax
2	NOC010 - Micro Noc: Multi Spectrum (OMRI)

Zia Pueblo-Native Grass w/cover

Species	Lbs Per Acre
Hachita Blue Grama	1.1
Sideoats Grama, El Reno	1.31
Sand Dropseed	.26
Western Wheatgrass	1.39
Monida Oats	15

Species	Lbs Per Acre
Austrian Winter Peas	5
Berseem Clover	2
Winter Oats:Bob	13
Cereal Rye:Rymin	13
Winter Triticale:TF 813	13
Collards:Impact Forage	4

Combination of pasture grasses and cover crops to help get grasses established

White Clover: Ladino "OMRI" CS-B | Full: 7 | 502.5k/lb | $2.80/lb	1
Yellow Clover: Yellow Sweet Clover "OMRI" CS-B | Full: 8 | 174.2k/lb | $2.05/lb	1
Spring Pea: 4010 CS-B | Full: 59 | 3.2k/lb | $0.39/lb	6
Sainfoin: Shoshone "Certified" CS-B | Full: 18 | 18.5k/lb | $2.55/lb	3
Spring Oats: Hayden CS-G | Full: 98 | 15k/lb | $0.25/lb	8
Teff Grass: VNS Uncoated WS-G | Full: 8 | 1350k/lb | $1.75/lb	0.5
Grazing Corn: BMR90 WS-G | Full: 24 | 1.9k/lb | $0.40/lb	3
Orchard Grass: VNS CS-G | Full: 18 | 100k/lb | $3.25/lb	2
Tall Fescue: Kentucky 32 CS-G | Full: 20 | 230k/lb | $1.90/lb	0.5

14 Species Mix
Millets
Buckwheat
Cowpeas
Vetch

Common Name	Suggested Cultivar	Percent of Seed Mix	Crop Type	Min Germ Temp (°F)	Seeding Depth (in)		Irrigated Drill Seed Rate (lb/ac)
					min	max	
Millet, foxtail		15	A-WSG	60	0.50	0.75	0.9
Millet, pearl		10	A/P-WSG	60	0.50	0.75	2.0
Millet. Proso		10	A-WSG	60	0.50	0.75	2.0
Sorghum, forage, grain		20	A-WSG	64	0.75	1.00	2.0
Cowpea, black eyed pea		4	A-WSL	58	1.00	1.50	2.0
Guar, Clusterbean		8	A-WSL	70	1.00	1.50	1.0
Mungbean		8	A-WSL	58	1.50	3.00	2.0
Buckwheat		5	A-WSB	50	0.50	1.50	2.0
Sunnhemp, Indian hemp		4	A-WSL	60	0.50	1.00	2.3

Wheat
Rye
Triticale
Austrian
Winter Peas
Forage Radish
Forage Turnip

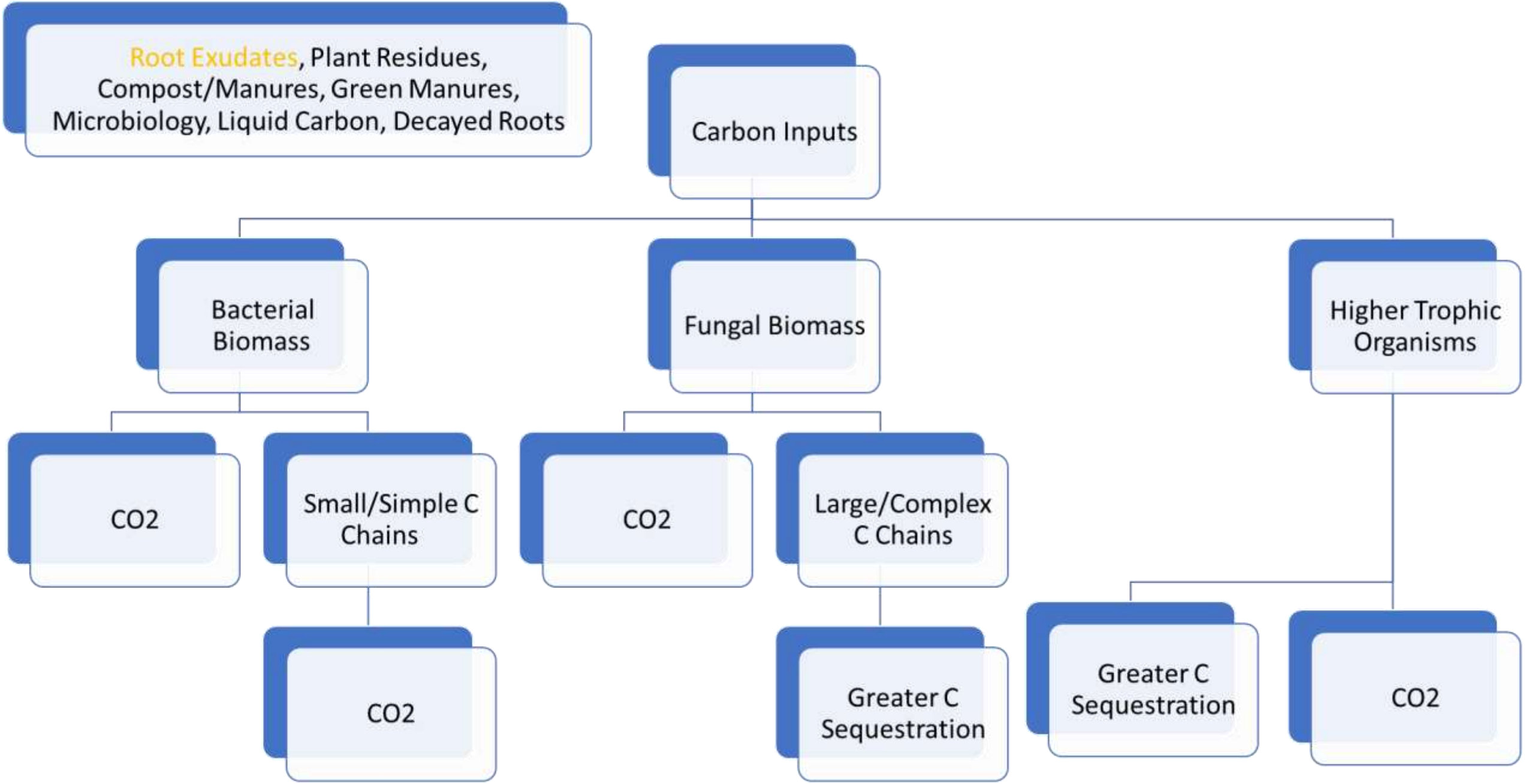
Sublime Pastures
Tome NM

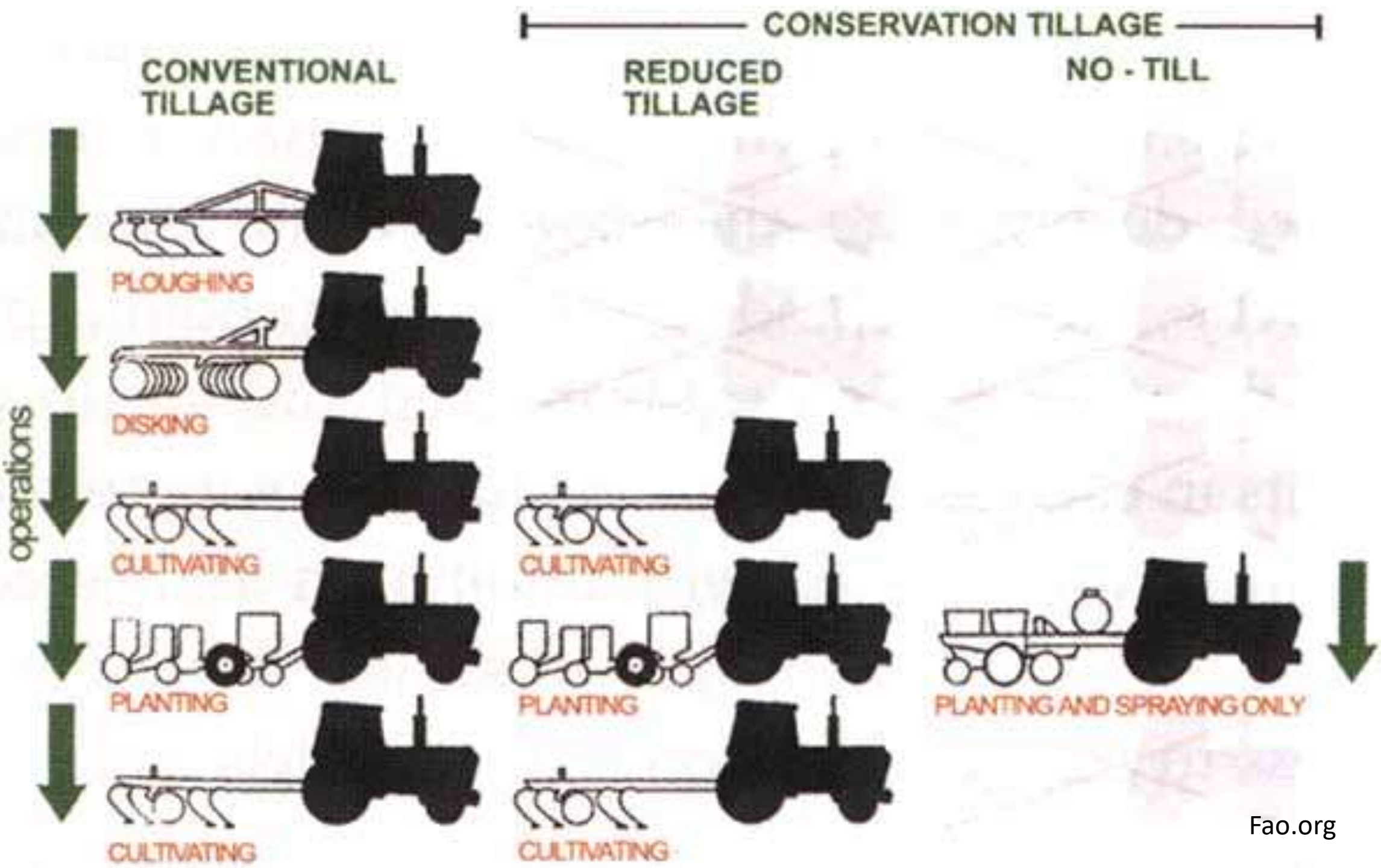
Three Crosses Farms-Grants, NM

Tillage and Soil Biology

- Some systems require disturbance
  - Minimize the disturbance as much as possible

Left: Soil from long-term no-till field. Right: Soil from conventionally managed field that included tillage and crop residue removal.


Root Exudates, Plant Residues, Compost/Manures, Green Manures, Microbiology, Liquid Carbon, Decayed Roots
Carbon Inputs
Bacterial Biomass
Fungal Biomass
Higher Trophic Organisms
CO2
Small/Simple C Chains
CO2
Large/Complex C Chains
CO2
Greater C Sequestration
Greater C Sequestration
CO2


CONSERVATION TILLAGE
CONVENTIONAL TILLAGE
REDUCED TILLAGE
NO - TILL
operations
PLOUGHING
DISKING
CULTIVATING
PLANTING
CULTIVATING
CULTIVATING
PLANTING
CULTIVATING
PLANTING AND SPRAYING ONLY

Fao.org

Tillage Options

- Conservation Tillage
- No Till Systems
- Strip Till Systems
- Vertical Tillage

4 R's of Cover Crops

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- Right Mix for the Job
- Right Number of Plants
- Right Time in the Rotation
- Utilize the technologies available to make the best of it!

ENCHANTED AGROMANAGEMENT SOLUTIONS

Making Management Solutions EAS-Y!

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