

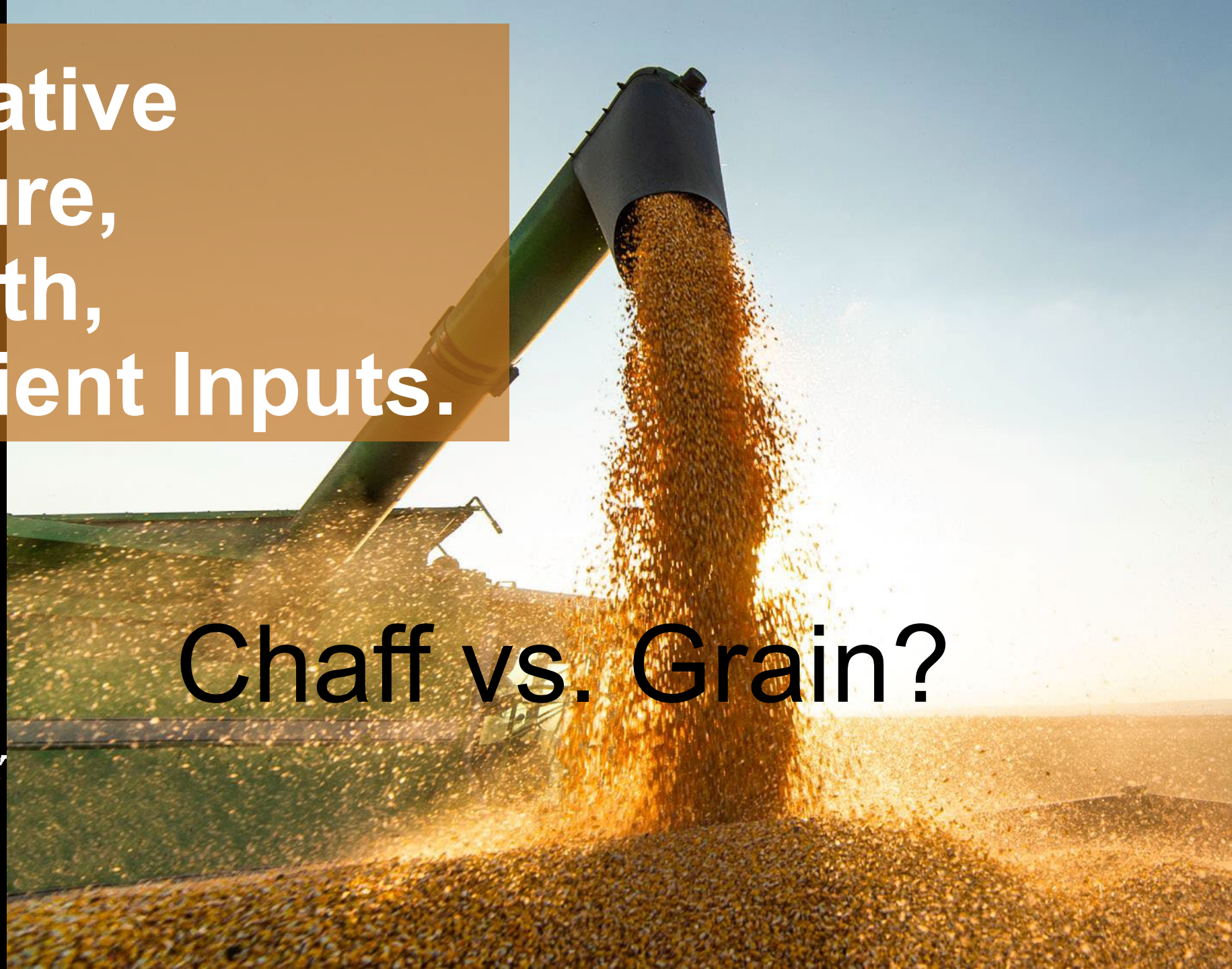
Regenerative Agriculture, Soil Health, and Nutrient Inputs.

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EXTENSION

Chaff vs. Grain?



CSANR

Center for Sustaining Agriculture and Natural Resources

Regenerative Agriculture: Solid Principles, Extraordinary Claims

Posted by Andrew McGuire | April 4, 2018



CLAIM



What do research results suggest?

**Very
Unlikely**

Unlikely

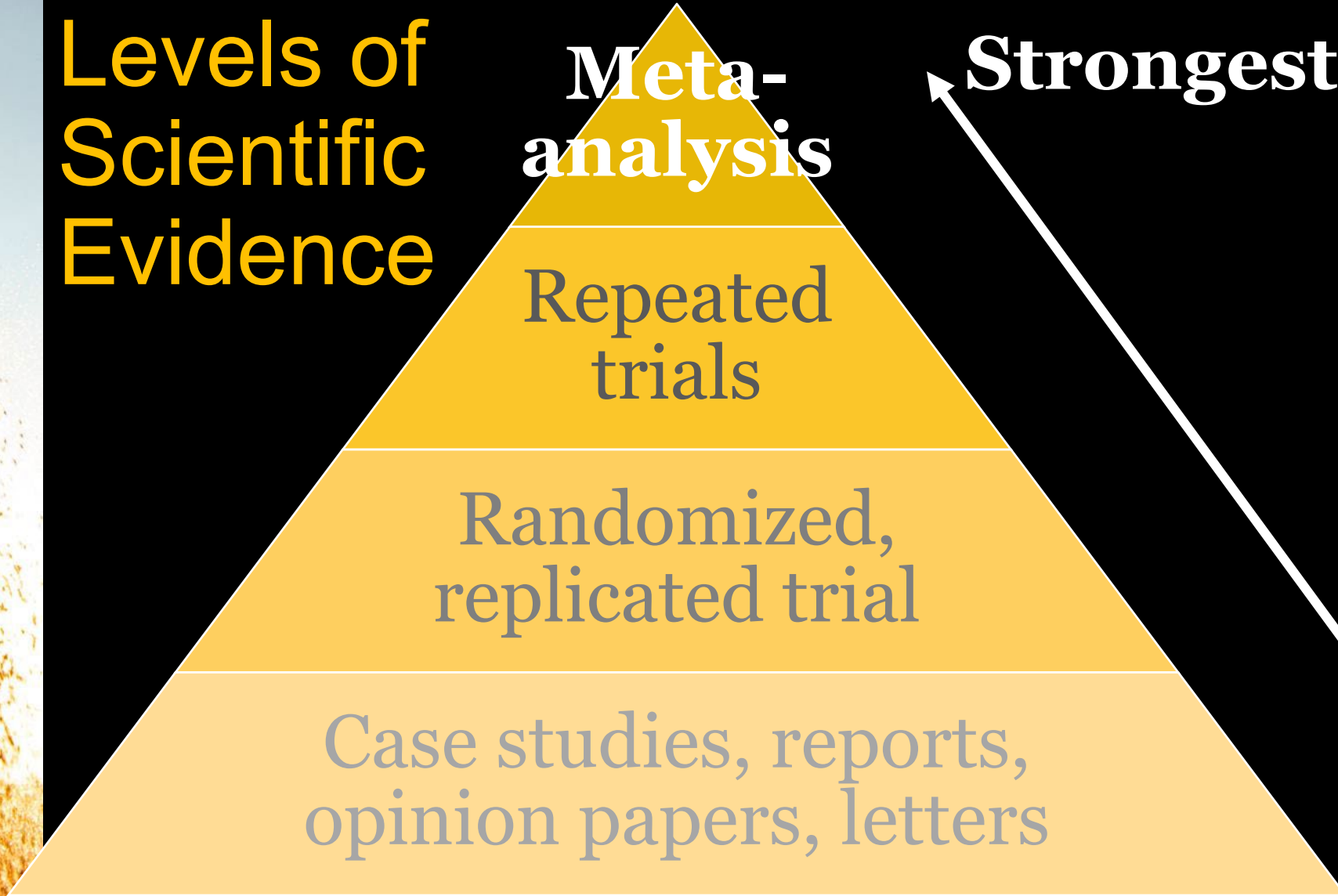
Possible

Likely

**Very
Likely**



Levels of Scientific Evidence



Not Scientific Evidence:

- YouTube videos
- Personal stories
- Comparing photos
- Gut feelings
- Websites
- Marketing



A lush, dense tropical rainforest scene. In the foreground on the left, a large, moss-covered tree trunk stands prominently. The rest of the image is filled with a thick canopy of various green plants, including palm-like leaves and ferns. Sunlight filters through the leaves, creating a dappled light effect. The overall atmosphere is vibrant and natural.

**“Nobody fertilizes the
rainforest”**

“The collective simplification of agroecosystems has led to a loss of biodiversity and to reductions in the supply of key ecosystem services to and from agriculture. Without these ecosystem services, monocultures become dependent on off-farm inputs.”

Claim: Healthy soils provide sufficient natural nutrients.

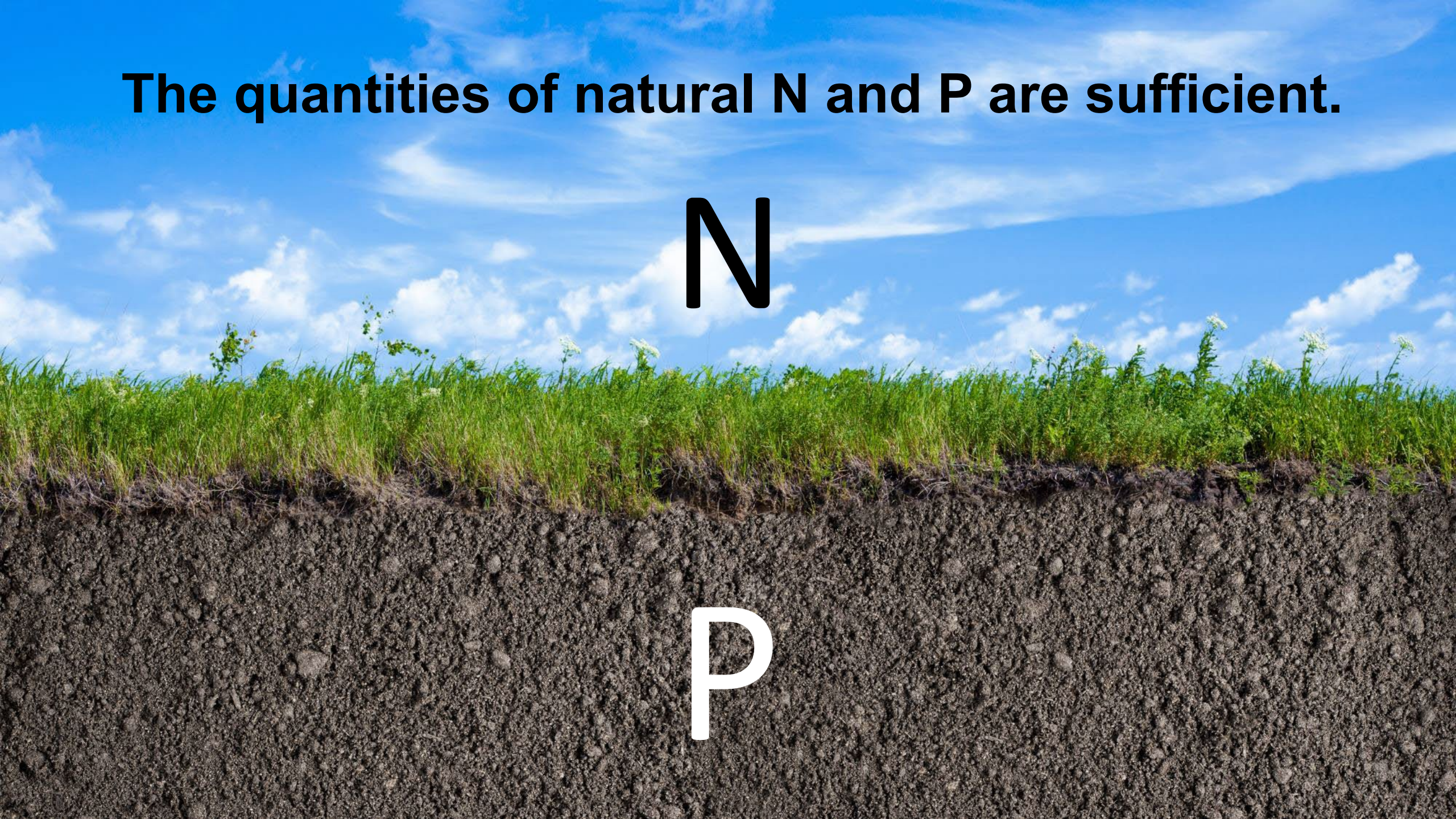
- *soil biology*
- *soil biodiversity*
- *soil health.*



The quantities of natural N and P are sufficient.

N

P



Slash and Burn agriculture works...
given enough time



The rate of legume-fixed N is sufficient
for legume crops.



Legume-fixed N is not sufficient for food
production.

The rate of natural N release from organic matter is NOT sufficient.



To maintain soil health, organic matter must be maintained.

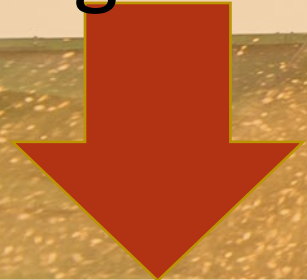
The rate of N fixed by soil biology is not sufficient.



Biological N fixation: <1 to 19 lb../ac per year

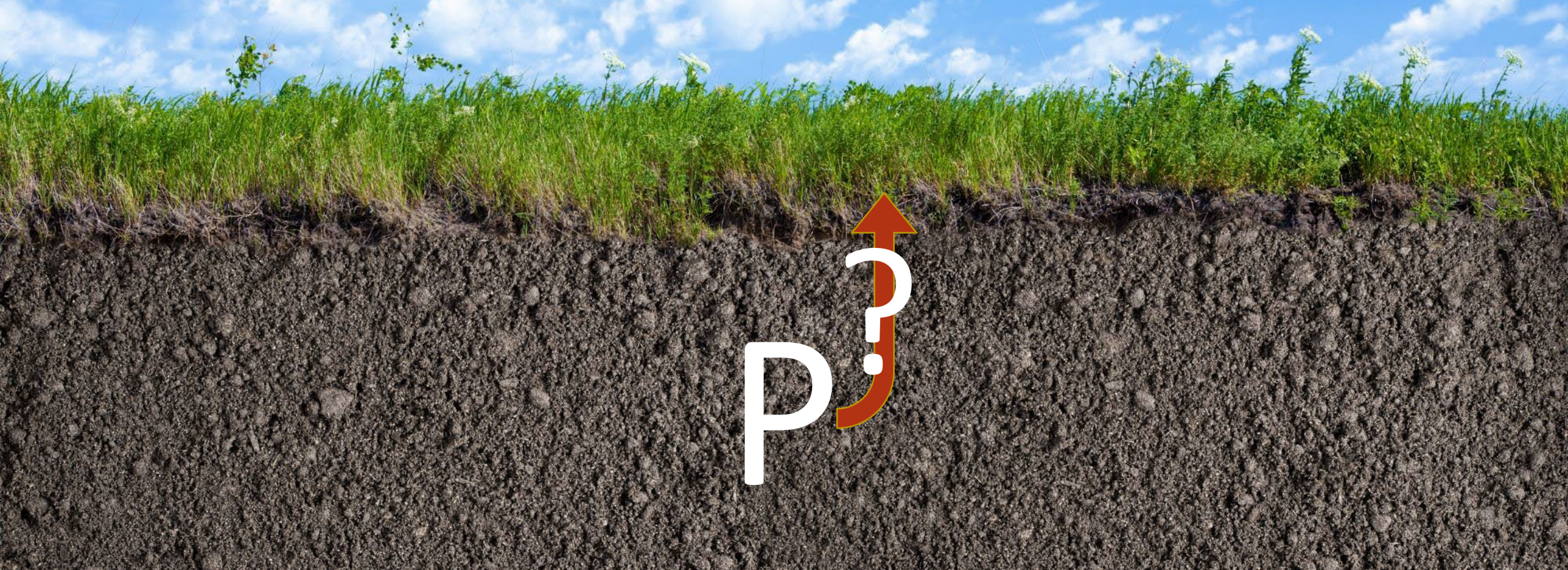
Claim: Regenerative ag & Soil health can replace N fertilizer inputs.

Annual and non-legume forage crops

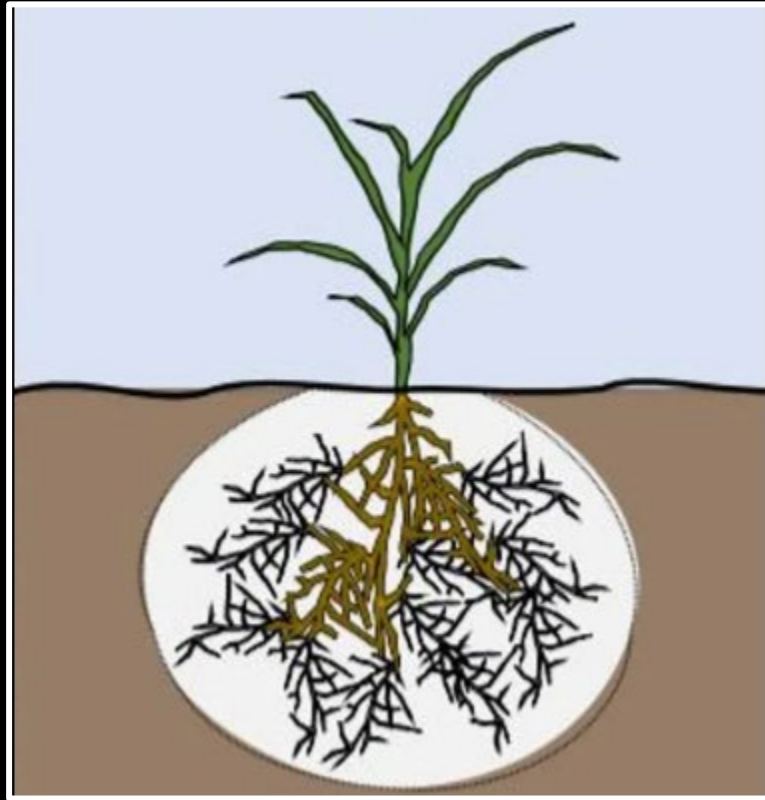


Very Unlikely	Unlikely	Possible	Likely	Very Likely
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Is the rate of natural P release sufficient?



Fungal networks help plants extend their range and **EXTRACT** more P.



Mycorrhiza

The rate of natural P is not sufficient.

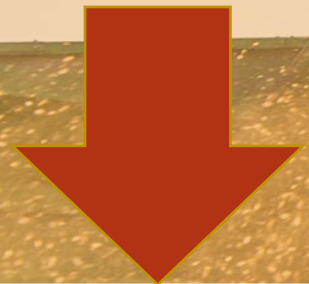
Biological + weathering
= ~5 lb. P/ac per year

P



Claim: Regenerative ag & Soil health can replace P fertilizer inputs.

Research
Says



Very Unlikely	Unlikely	Possible	Likely	Very Likely
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An aerial photograph of a large agricultural field. The field is divided into several rectangular plots by thin lines. The central plot is a darker shade of green, indicating it might be a different crop or treatment. The surrounding areas are a lighter green, suggesting grass or hay. The field is bordered by a dense line of trees on the left and right sides. In the background, there are more trees and a small building. The overall scene is a rural agricultural landscape.

Long-term experiments show long-term unfertilized yields are low.

Hay: 1.2 tons per acre

Corn: 36 bu. per acre

THE MORROW PLOTS
AMERICA'S OLDEST EXPERIMENTAL FIELD
ESTABLISHED IN 1876
RESULTS DEMONSTRATE THAT USE OF
SCIENCE AND TECHNOLOGY
HAS INCREASED CROP PRODUCTIVITY
OVER FOUR-FOLD.

Improved soil biological health increases corn grain yield in N fertilized systems across the Corn Belt

[Jordon Wade](#) , [Steve W. Culman](#), [Jessica A. R. Logan](#), [Hanna Poffenbarger](#), [M. Scott Demyan](#), [John H.](#)

- Soil health had NO EFFECT on yields from unfertilized plots.
- Climate (temperature and water) = largest factor affecting yield.
- Effect of soil health on corn yield was about 1/5th of that from N fertilizer.

Nutrient Management

Soil Health



Claim: Healthy soils don't need fertilizer.

Research Says

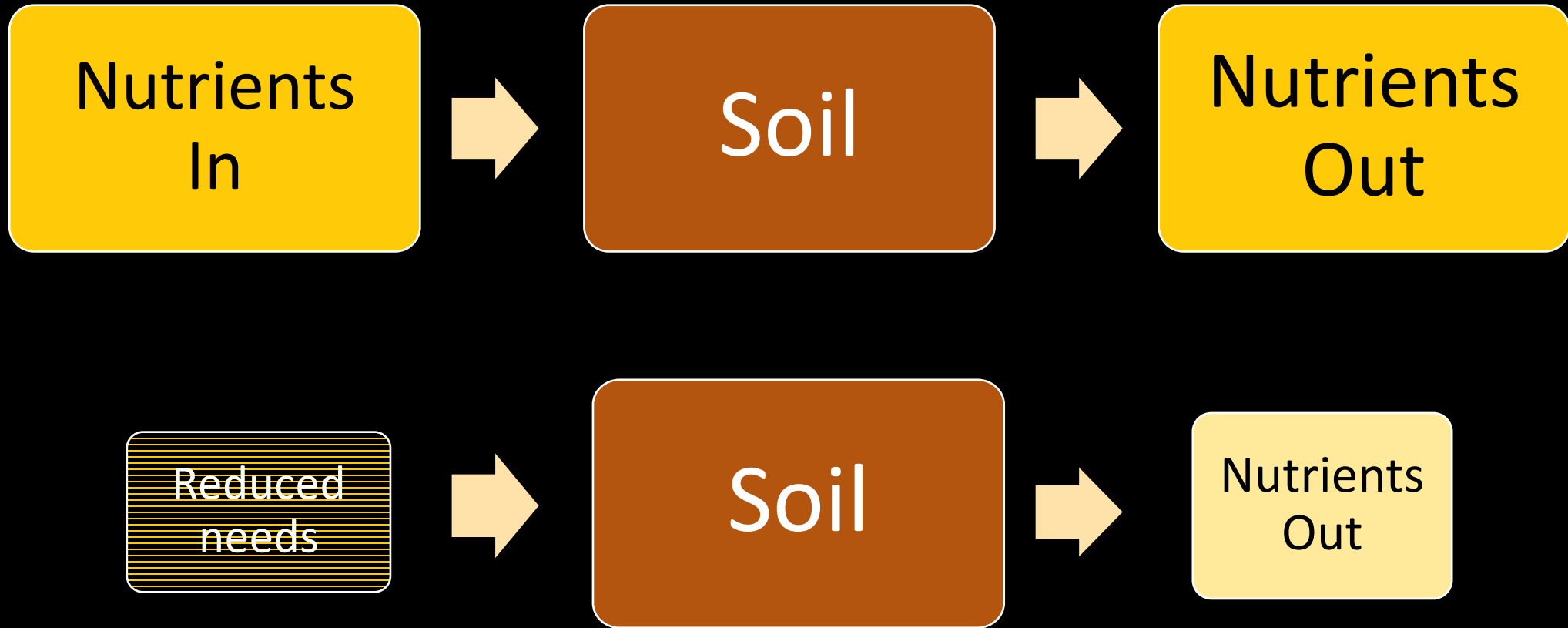


Very Unlikely	Unlikely	Possible	Likely	Very Likely
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Agriculture exports at least 5x more nutrients than nature does.



“Reduce your exports to reduce your inputs”



Residual P from past applications can be used.

Residual-P



Agriculture is not Nature

- Inputs
- Outputs
- Output quality
- Types of plants
- etc.

Other “Unlikely” practices/claims from regenerative agriculture and soil health

- Cover crop mixtures
- Soil biodiversity
- Need to add soil microbe species
- Fungal:Bacterial ratios
- A healthy soil produces healthy crops

Very Unlikely	Unlikely	Possible	Likely	Very Likely
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Link to all blog
posts with all
references:

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