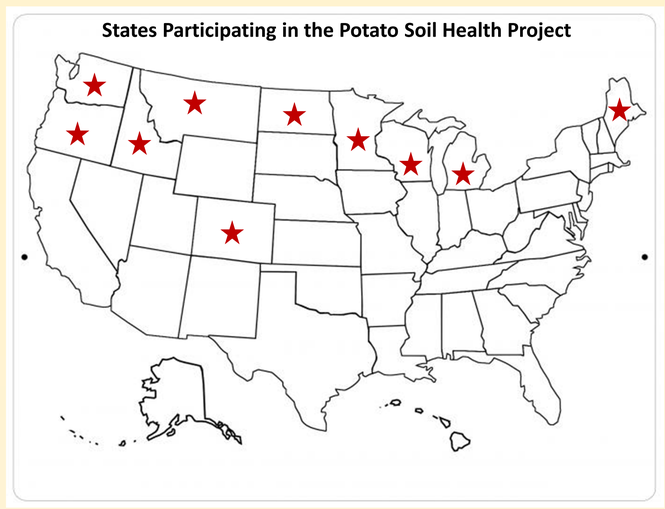
The Potato Soil Health Project Update

Rationale: Improving soil health is an emerging priority in agriculture, however there is not a clear consensus on a scientific definition of "soil health", especially for potato production. There is a need to understand how potato management practices influence the soil microbiota, soil chemistry, and soil structure, and how these characteristics impact potato health and productivity across the U.S.



Progress to date:

1. Established a national experimental platform to characterize the impact of soil management practices on soil microbiomes, physicochemical properties, selected soil health indicators, yield, and soil-borne potato disease severity.
2. Established a national experimental platform in grower's fields to determine *within-field variation* in potato yields, soil microbiomes, selected soil health indicators, soil physicochemical properties, and soil-borne disease severity.
3. Initiated a grower survey on the incorporation and the barriers to incorporation of soil management programs.
4. Developed educational materials on soil health and soil microbiomes.

Main Project Objectives

OBJECTIVE 1: In-field evaluation and optimization of **soil microbiomes** and **physicochemical characteristics** to enhance potato health, productivity, and quality through soil management practices.

Table 1: State mean, median and range of soil physicochemical factors, soil-borne pathogen abundance, and yield for 2019.

Variable	Mean	Median	Range
Total yield (cwt / ac)	383	401	74 – 598
Yield in tubers > 6 oz. (%)	50	53	34 – 64
Verticillium propagules /g soil	2.1	0	0 – 11.6
Root lesion nematodes /100 cc soil	86	2	0 – 340
Soil pH	6.4	6.6	5.0 – 7.9
Soil % organic matter	1.8	1.2	0.7 – 4.1
Soil P concentration (Bray, ppm)	106	110	20 – 194
Soil K concentration	207	183	81 – 369
Soil cation exchange capacity (meq/100g)	6.8	8.0	3.3 – 8.8

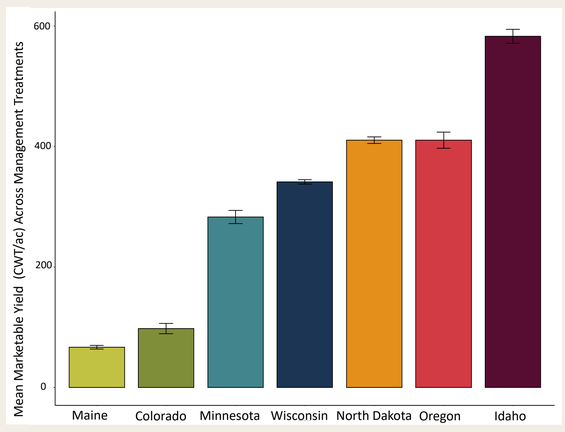


Figure 1. Mean marketable potato yield (CWT/acre) by state (2019) across management treatments. **Excluding Washington and Montana.*

OBJECTIVE 2: **On-farm evaluation of fine-scale spatial variation in soil microbiome and physicochemical** characteristics to determine how crop yield, quality, and disease relate to soil health.

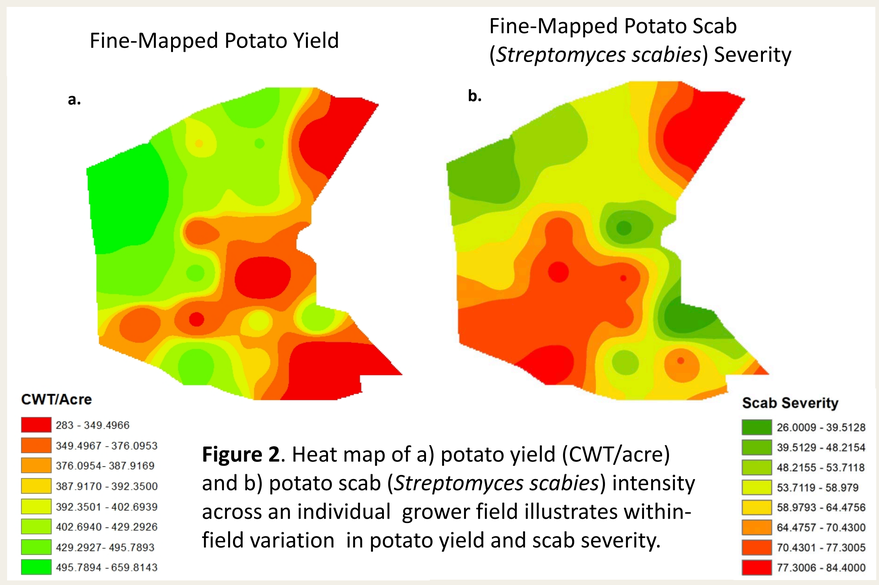


Figure 2. Heat map of a) potato yield (CWT/acre) and b) potato scab (*Streptomyces scabies*) intensity across an individual grower field illustrates within-field variation in potato yield and scab severity.

OBJECTIVE 3: Grower survey and budget analyses to assess the economic viability of managing for soil health and **identify barriers and incentives to grower implementation.**

Seed Growers' Soil Health Practices Survey Results

Dynamic Enterprise Budgets

Discount Rate	4.0%				
Market	Fresh Pack				
Acres	1000				
		Per Acre			
Year	**Crop**	**Annual Revenue**	**Annual Costs**	**Annual Net Returns**	**Total Return (NPV)**
1	Russet Burbank	$3,188	$1,716	$1,471	$1,471,144
2	Spring Wheat	$426	$370	$55	$52,907
3	Russet Burbank	$3,188	$1,716	$1,471	$1,360,155
4	Spring Wheat	$426	$370	$55	$48,915
5	Russet Burbank	$3,188	$1,716	$1,471	$1,257,540
				Total Return	
				NPV : $4,190,661.36	

OBJECTIVE 4: Communicate the most **effective management practices** for soil health management to the potato industry.

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Please scan the QR Code for more educational information:

For a complete list of collaborators, refer to: https://potatosoilhealth.cfans.umn.edu/

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