

# Speaker Disclosure

- In accordance with the policy of the Thoracic Society of Australia and New Zealand the following presenter has indicated that they have a relationship which could be perceived as a real or apparent conflict of interest. The nature of the conflict is listed:
- The Speaker is an employee of the TriCal Group.  
The TriCal Group manufactures and markets chloropicrin, a product discussed in this presentation.



# Soil Microbiome Analysis, a New Tool to Understand Potato Crop Production

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*The TriCal Group*



**WORLD POTATO  
CONGRESS**



# Topics of Discussion

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- Introduction
- Real World Example
- Results
- Discussion



# Introduction

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- How do we justify the recommendations and actions made for production agriculture?
- Historically, they are deemed “correct” if they help reach the goals set for production – arbitrary (yield, enviro, marketing...)
  - Increase Marketable Yields
  - Reduce offsite movement of agricultural chemicals
  - Maintain or Improve Soil Health (Physical, Chemical, Biological)
- Measurement of crop production system components is key to determining success



# Introduction

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- Recommendations and actions are based on data gained from scientific research
  - Yield and quality
  - Nutrients and pesticides in the plant and in the environment
  - Disease and pest levels in the field and planting material
  - Chemical and physical properties of the soil
- If recommended practices are successful over the long-term, they can be called *Sustainable*
- Commercial revolution in the last 10 years allowing measurement of the soil microbiome



# Introduction

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- Although not perfect, genetic analysis of known soil organisms provides insight into:
  - Microbe diversity and balance
  - Functional pathways (Nutrient Avail, Plant Stress, PGPs...)
- Soil Microbiome Analysis (Next Generation Sequencing)
  - Transforming agriculture by allowing farmers to move beyond a purely chemical/physical understanding of farming
  - Harness power of natural world (biology) to grow healthier crops and improve soil health for future generations (Production System)





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# Real World Example

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## Old World Meets New World

### **Chloropicrin is a soil fumigant:**

Soil fungicide and nematicide

### **Unique agricultural chemistry:**

Used for decades in crop production

Hundreds of scientific publications explaining activity in soil

### **Track record of suppressing pests and diseases...**

Repopulation of native, plant-beneficial micro-organisms in the soil

Supports healthy roots, better water and nutrient-use efficiencies

Less crop stress, larger, better-quality crop yields





# Real World Example

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- Four-year study with Dr. Ken Frost at Oregon State University
  - Russet Burbank planted repeatedly same location for four seasons
  - Replicated study. Soil treatments included no fumigation, chloropicrin, and metam sodium (industry standard)
  - Bulk soil samples taken at Full Flower and Harvest in year 1 and 4 sent to Biome Makers (Davis, California) for microbiome analysis
  - Biome Makers analyzed data providing diversity, uniqueness and functional pathway analysis



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# Results - Diversity

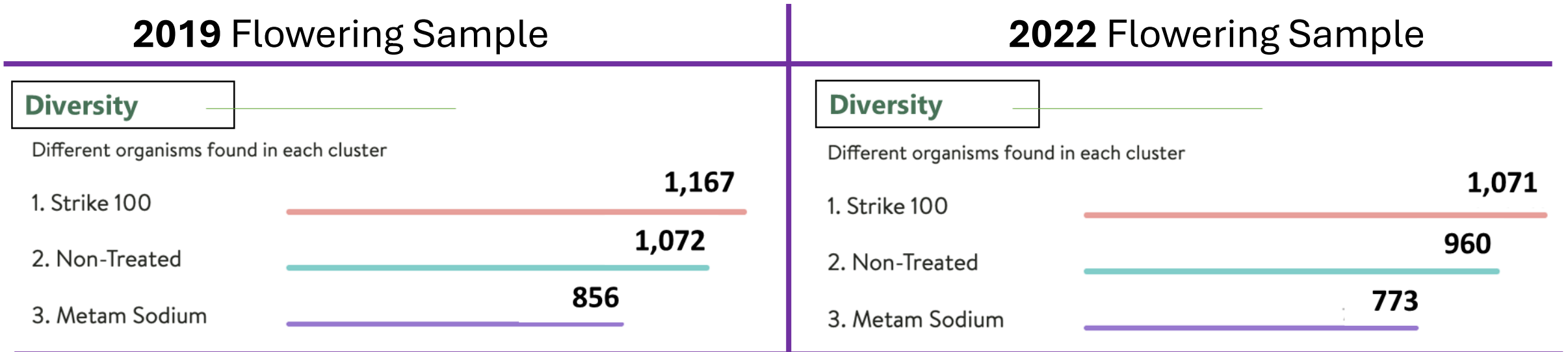


FIG 1. Chloropicrin (Strike 100), Non-Treated, and Metam Sodium soil organism “diversity” measured in soil at Full Flower





# Results - Uniqueness

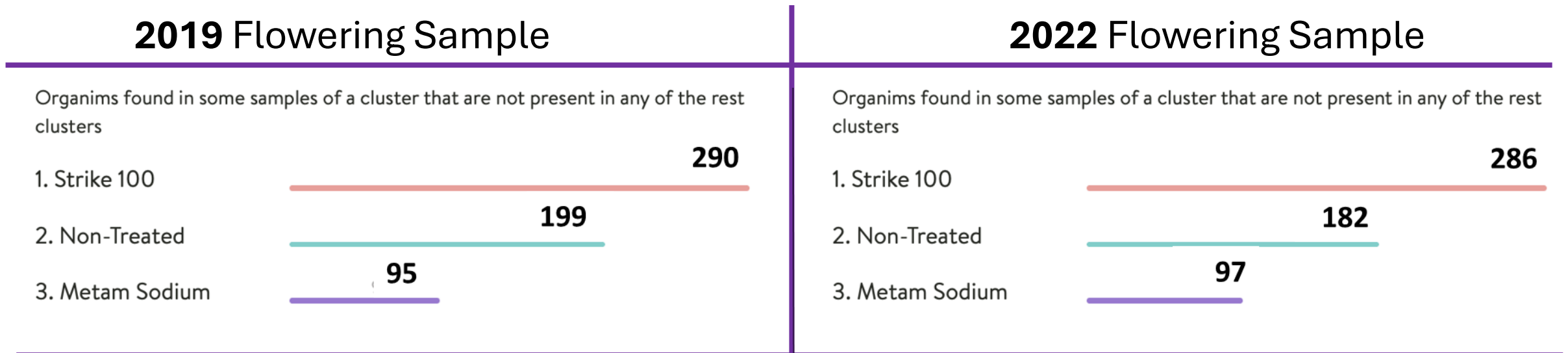
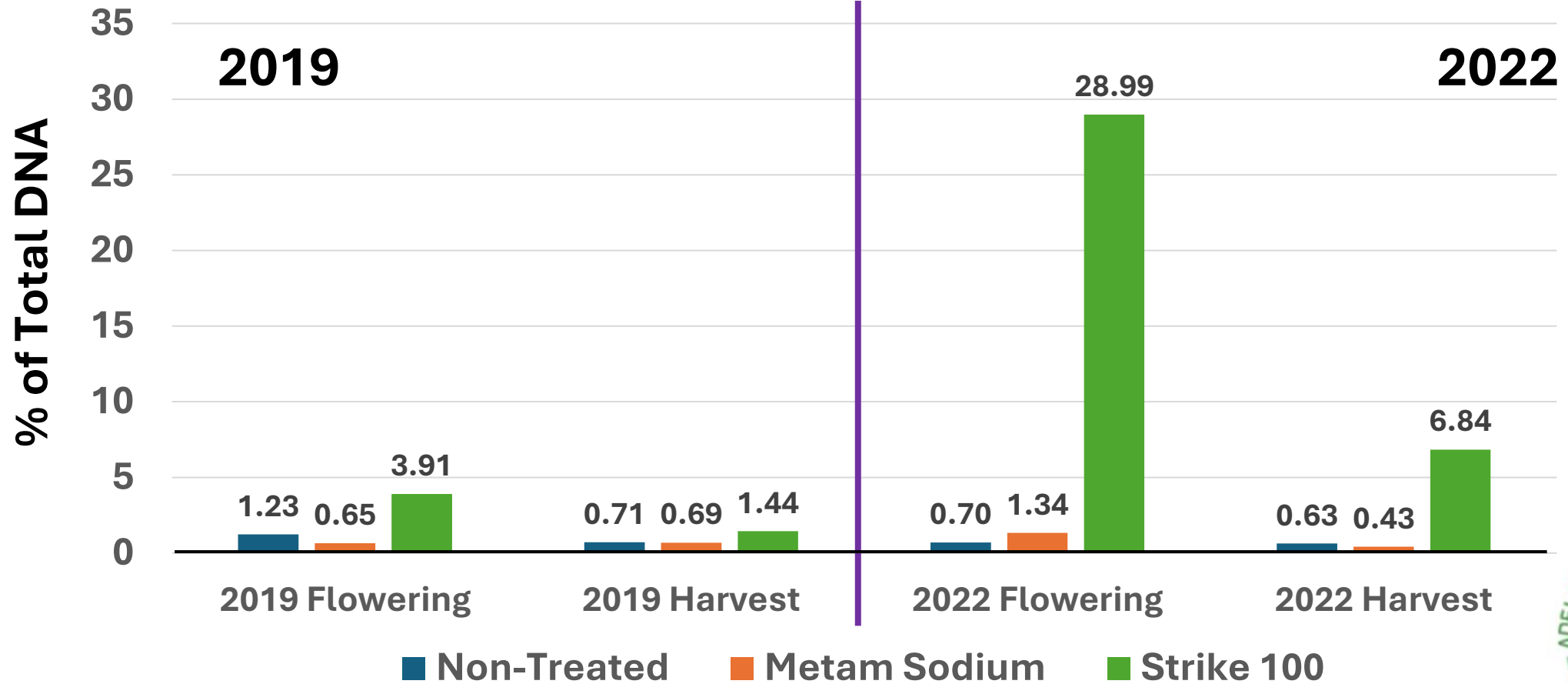


FIG 1. Chloropicrin (Strike 100), Non-Treated, and Metam Sodium soil organism “uniqueness” measured in soil at Full Flower



# Results - Trichoderma

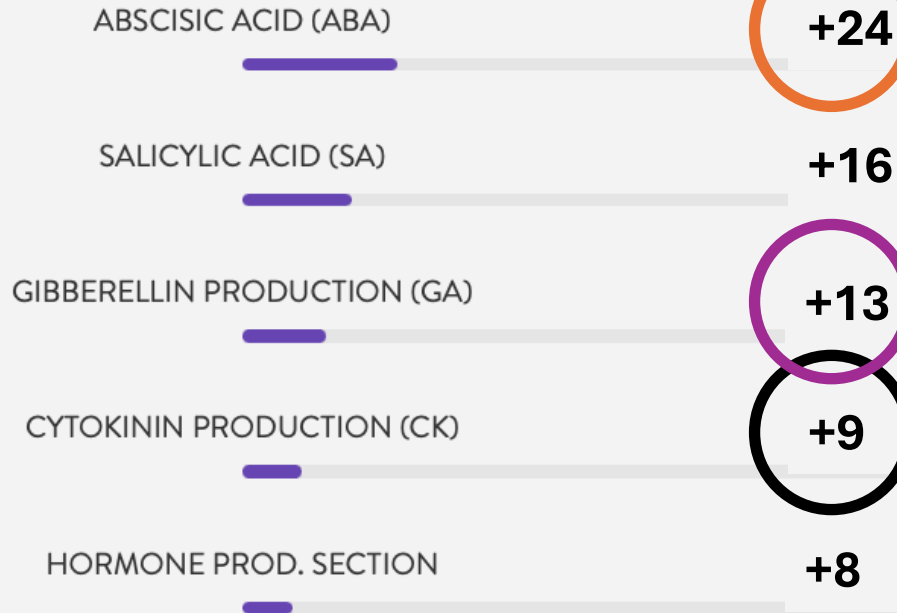
Trichoderma DNA (Percent of Total) Isolated in a Four Year Potato Trial in 2019 and 2022



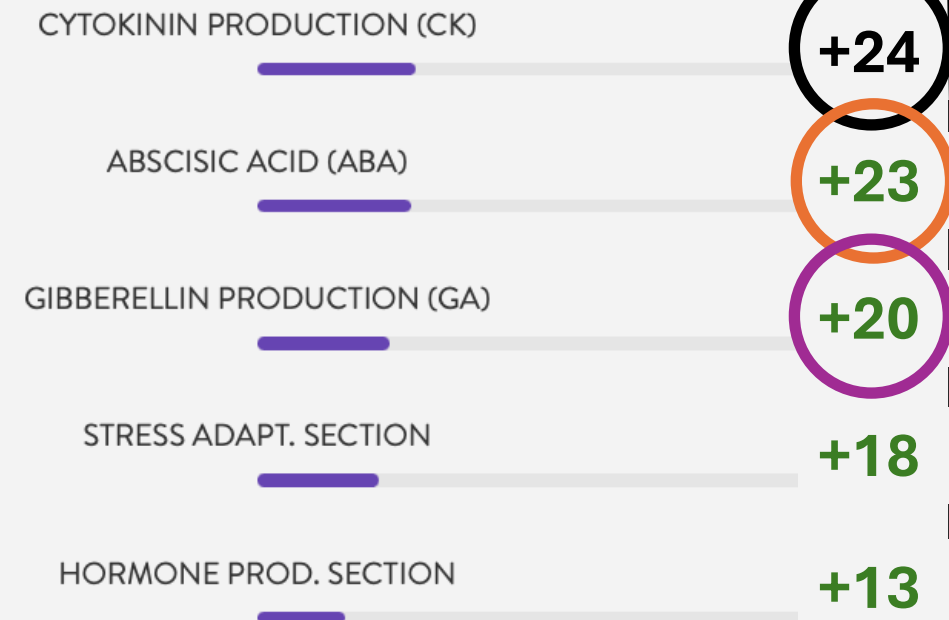
# Results – Functional Pathways (PGP)

2019

Higher in Metam Sodium ← | → Higher in Strike 100



Higher in Metam Sodium ← | → Higher in Strike 100





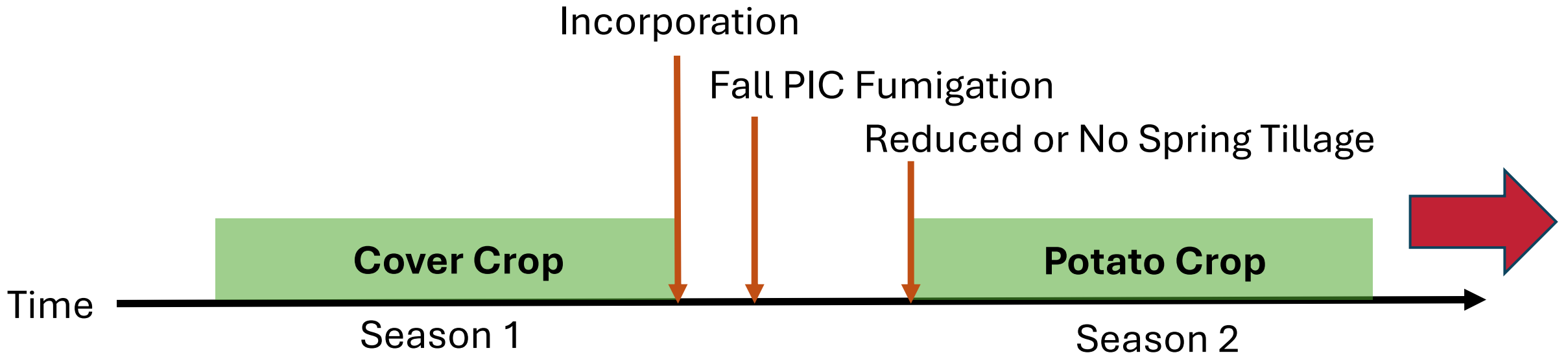
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# Discussion



## Build a production system to compliment the soil biology the system is giving

Cover crop is purposely grown to feed saprophytes

Saprophytes promoted by fall fumigation "fix" carbon, cycle nutrients, PGPs, induced resistance

Raised-row application, limited or no spring tillage

Reduced disease (larger root system), improved soil health/yield, less waste

**Use Soil Health Testing to document positive changes to soil microbiome**



# Discussion

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- Can't go back in time and recreate native soil
- Must make the soil biology work for production goals
- The most sustainable farming practice is not farming new ground but producing more on the ground in production
- Revolutionary soil biology analysis tools
  - Monitor soil microbiome in near real time
  - Use these tools to develop beneficial crop production systems based on science
  - *Produce more with less – Functional Sustainability*





# Thank you!

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