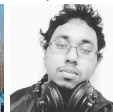
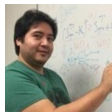
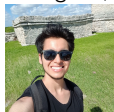


## Analysis of components of food production for sustainability in Canada



Chris Bunio, Cuneyt Akcora.

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# Outline

## 1 Introduction

## 2 Problem

## 3 Why it matters

## 4 Results achieved

## 5 Data analysis

# TheoryMesh and food sustainability challenges

## A bit background

Co-founders:

- Chris Bunio (mentor), Paul Westdal, Sephanie Westdal, Anne Kirk.
- Started 2019.
- Increasing transparency in the food supply chain.

## Vision and Goals

- 1 Provide the platform to integrate data from first inputs to consumer purchase, creating a traceable, efficient and intelligent supply chain.
- 2 Certification.
- 3 Traceability.
- 4 Sustainability.

# Outline

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## The problem proposed

What TheoryMesh is looking for through the PIMS 2021 challenge can be condensed to the following:

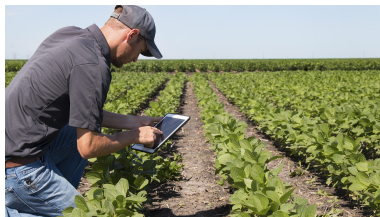
- Develop a model and a system of action using open data to better understand and ideally, predict the environmental impact from agricultural practices.
- Leveraging said model to complement the current TheoryMesh system which is capturing individual operation level impact from farm activities.
- Combining the macro-level environmental indicators from agricultural practices and micro-level data from farm activities and operations, TheoryMesh can, ideally, measure and predict sustainability levels of consumer-level products to better inform the consumers and help companies meet their sustainability goals.

The problem requires us to analyze indicators like air and GHG emissions, fish and meat consumption levels, the impact of organic farming, the usage rate of various types of pesticides and herbicides, the chemical spread on total agricultural land, and many other factors.

# Outline

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## Impact on production and producers



- From data to information.
- Decisions driven by real time analysis.
- A plan of action based on accurate data.
- Identifying trends that could turn into profit.

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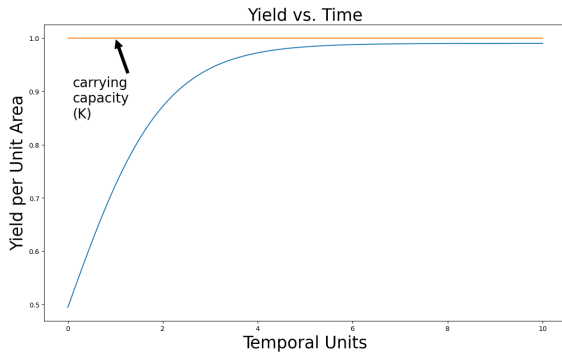


## Availability of information for producers



- Information is power.
- Currently, the relevant information resides in technical journals that is penetrable only for researchers and experts in the field.
- Needs to be available/intelligible to producers.
- The general sentiment conveyed by industry participants:
  - There needs to be a change in the way that information is disseminated.
  - It used to be that the when/where/how questions of crop production were passed by word of mouth: “Do this because it has always worked.”
  - This is no longer tenable with the rapidly changing climate/environmental conditions.
  - Over the coming decades that will span a contemporary producer’s career, they will invariably need to adjust their approaches.

## What can be gleaned from the data?



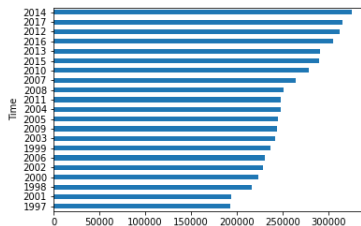
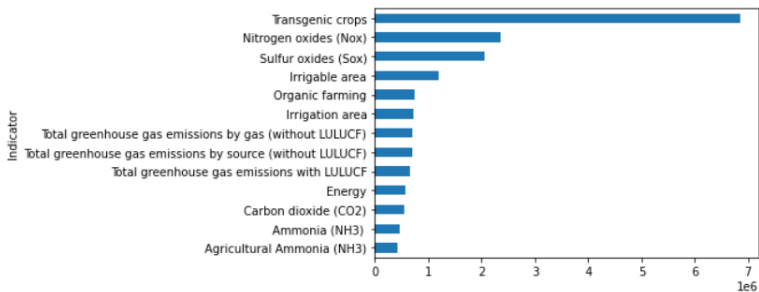
- $K = K(x_1, x_2, \dots, x_n)$ , where no  $x_i$  is a temporal variable.

# Factors Affecting $K$

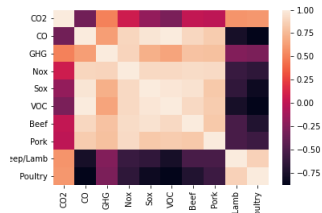


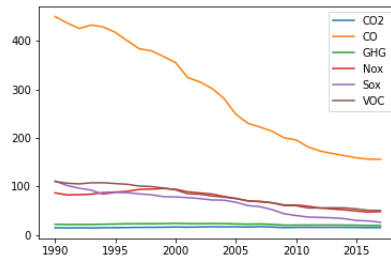
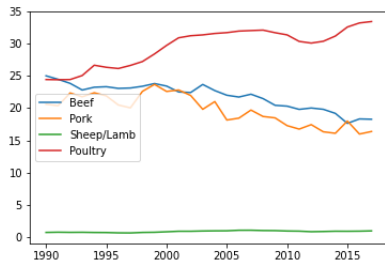
# Outline

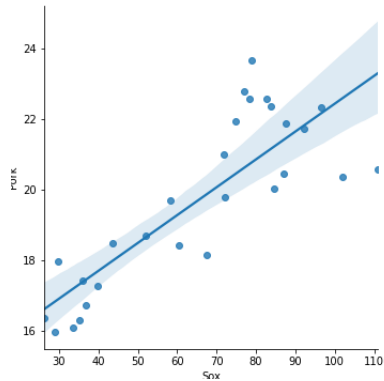
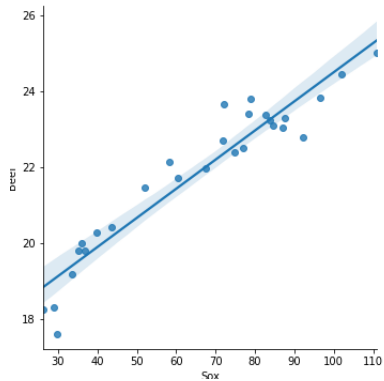
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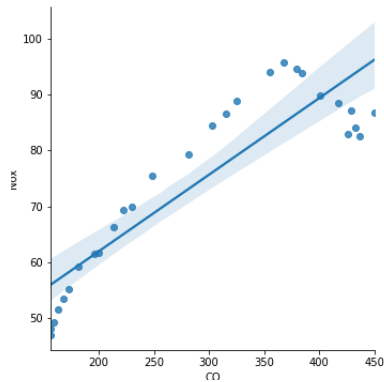
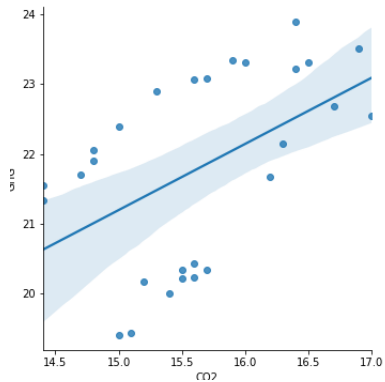
	CO2	CO	GHG	Nox	Sox	VOC	Beef	Pork	Sheep/Lamb	Poultry
CO2	1.00	-0.34	0.50	0.07	-0.19	-0.30	0.02	-0.00	0.59	0.60
CO	-0.34	1.00	0.63	0.89	0.97	1.00	0.90	0.84	-0.77	-0.88
GHG	0.50	0.63	1.00	0.89	0.71	0.66	0.80	0.79	-0.26	-0.29
Nox	0.07	0.89	0.89	1.00	0.91	0.91	0.93	0.91	-0.60	-0.65
Sox	-0.19	0.97	0.71	0.91	1.00	0.97	0.95	0.83	-0.64	-0.82
VOC	-0.30	1.00	0.66	0.91	0.97	1.00	0.91	0.85	-0.77	-0.88
Beef	0.02	0.90	0.80	0.93	0.95	0.91	1.00	0.82	-0.52	-0.72
Pork	-0.00	0.84	0.79	0.91	0.83	0.85	0.82	1.00	-0.53	-0.58
Sheep/Lamb	0.59	-0.77	-0.26	-0.60	-0.64	-0.77	-0.52	-0.53	1.00	0.87
Poultry	0.60	-0.88	-0.29	-0.65	-0.82	-0.88	-0.72	-0.58	0.87	1.00











## References



DMCI STRATEGIES, D. McInnes (2003), Agri-food sustainability targets. A selected overview,



OECD PUBLISHING, K. Parris et-al. (2010), Sustainable management of water resources in agriculture.