Got Food?

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Outline

- Motivation & Summary
- Questions & Data
- Data Clean-up & Exploration
- Data Analysis
- Post Moretum
- Key Takeaways
- Q & A

Motivation & Summary

Sustainable Food

Food sustainability is one of the greatest challenges we face in society currently. In order to ensure future generations have access to a nutritious diet, we need to understand our current environmental impact with food production.

Key Words & Phrases

- **Eutrophication**: Excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen.
- **Greenhouse Gas**: Gases in Earth's atmosphere that trap heat. They let sunlight pass through the atmosphere, but they prevent the heat that the sunlight brings from leaving the atmosphere. The main greenhouse gases are: Water vapor & Carbon dioxide.
- **Carbon Footprint:** The amount of carbon dioxide and other carbon compounds emitted due to the consumption of fossil fuels by a particular person, group, etc.

Questions & Data

Sustainable Food Production Data

- Dataset contains the 43 most common foods grown across the globe and 23 columns as their respective land, water usage and carbon footprints.

Questions

What types of food production should be encouraged to consume a nutritious diet in a sustainable way?

1. What is the carbon footprint impact of plant-based foods versus animal-based foods?
2. Which food products have the most negative impact on the environment? Which food products have the least negative impact on the environment?
3. What stage of food production contributes the most to greenhouse gas emission?
4. How do the land footprint of different food products compare? Which foods used the most and least land in their production?

Data Cleanup & Exploration

Data Cleanup & Exploration

Switch to Jupyter Notebook

Data Analysis

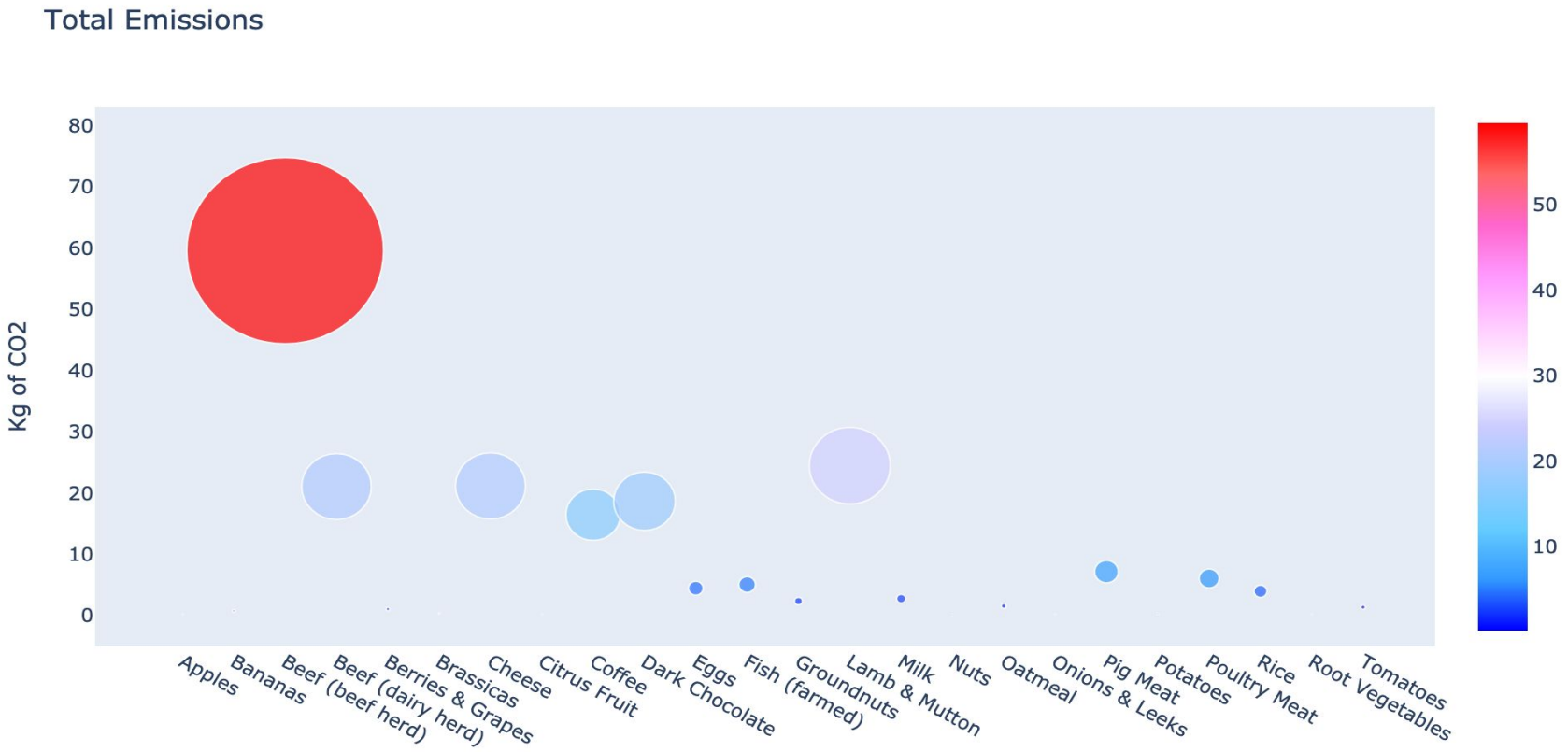
Data Analysis

What is the carbon footprint impact of plant-based foods versus animal-based foods?

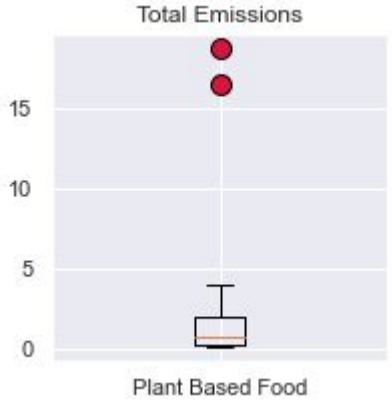
Determined by analyzing:

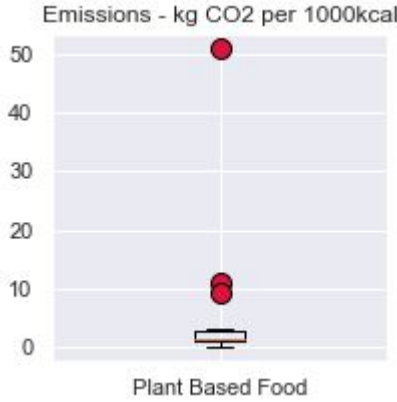
- Greenhouse Gas Emissions per kg Food Product ($kgCO_2$ eq per kg product)
- Greenhouse Gas emissions per 1000kcal ($kgCO_2eq$ per 1000kcal)
- Greenhouse Gas emissions per 100g Protein ($kgCO_2eq$ per 100g protein)

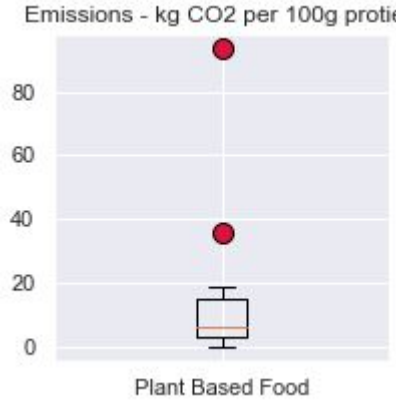
Total CO_2 Emissions

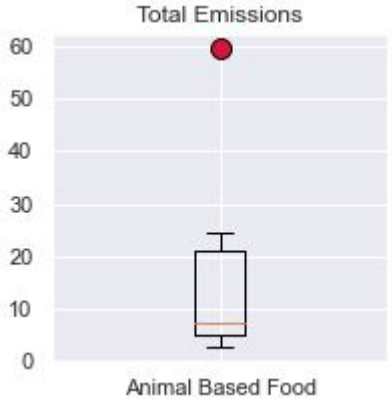


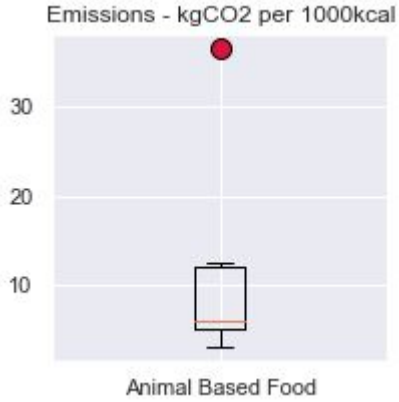
Analyzing Data

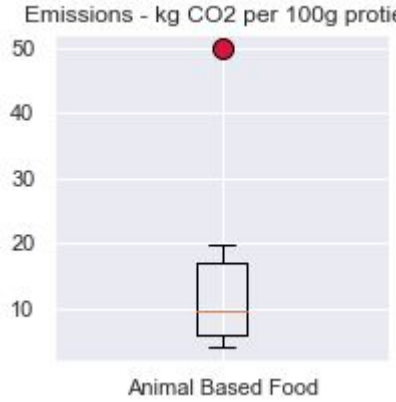






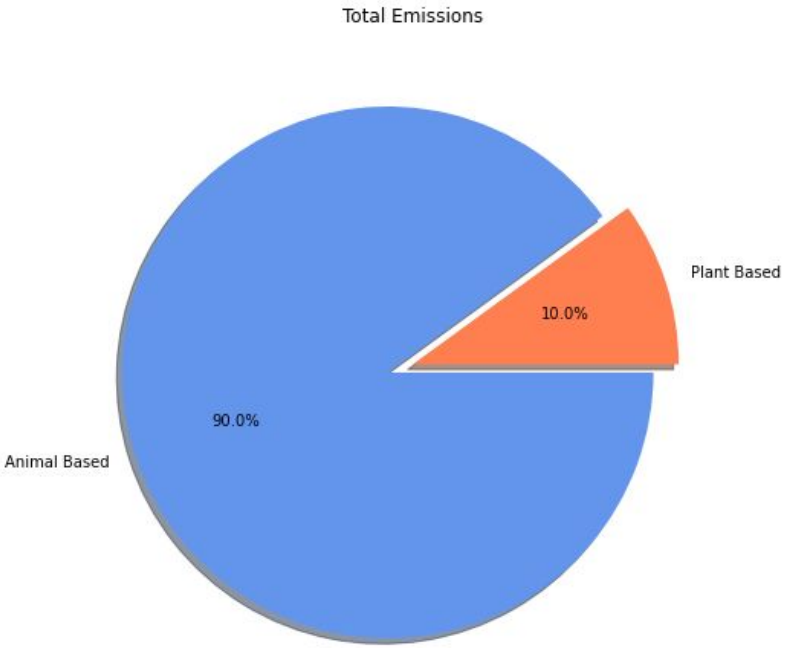






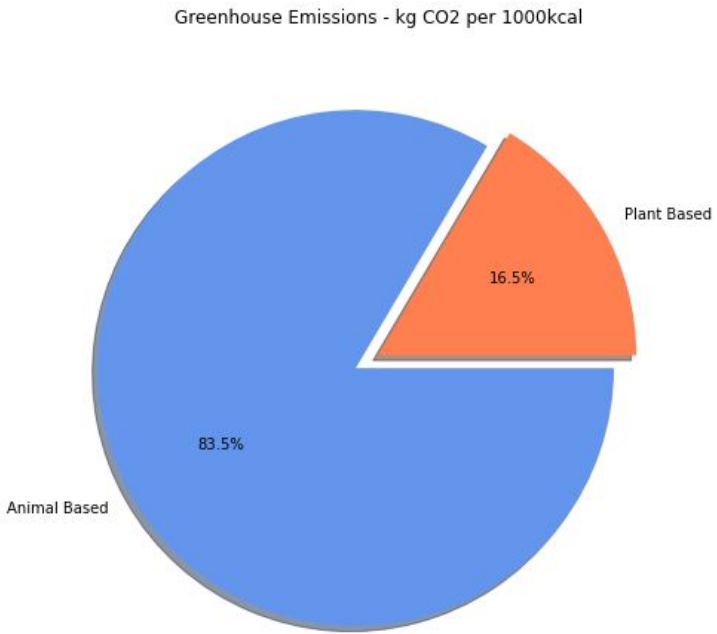
Using Box Plots to visualize outliers in our data.

Total Emissions Plant vs Animal ($kgCO_2$ per kg food)



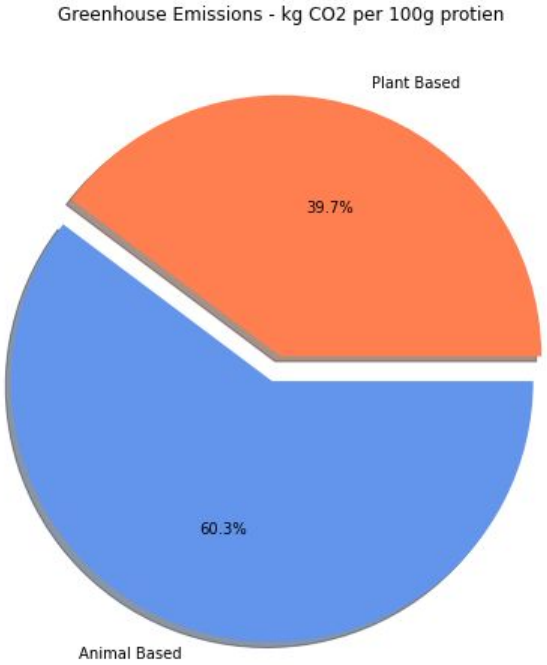
Using a Pie Plot to show the relationship between median values of total emissions

Greenhouse Emissions (kgCO_2 per 1000kcal)



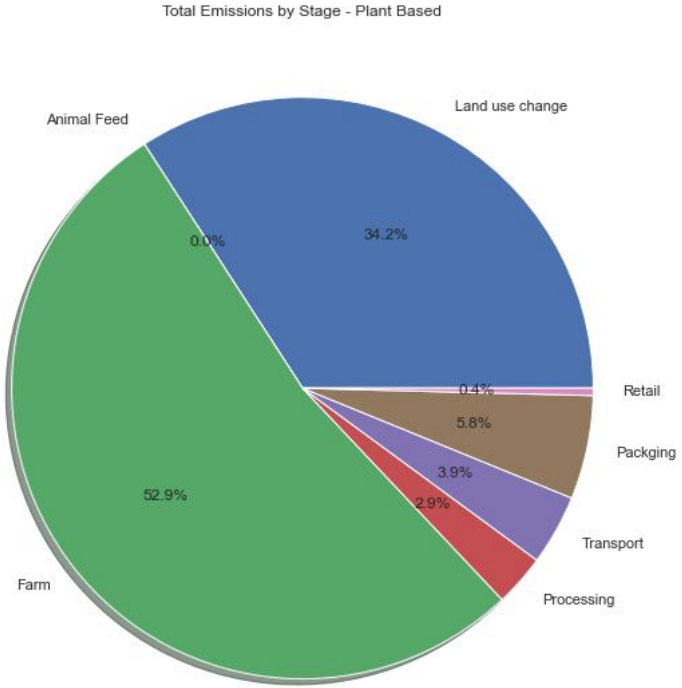
Using a Pie Plot to show the relationship between median values of greenhouse emissions kgCO_2per100kcal

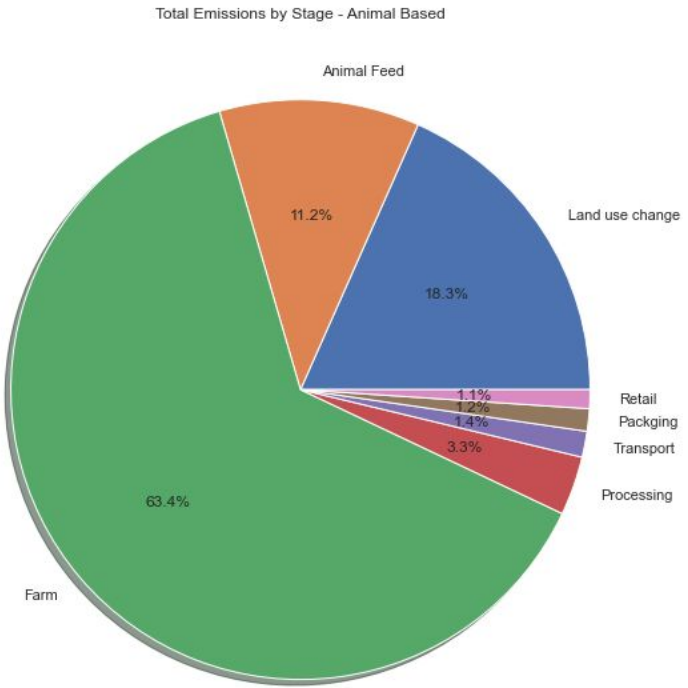
Greenhouse Emissions (kgCO_2 per 100g protein)



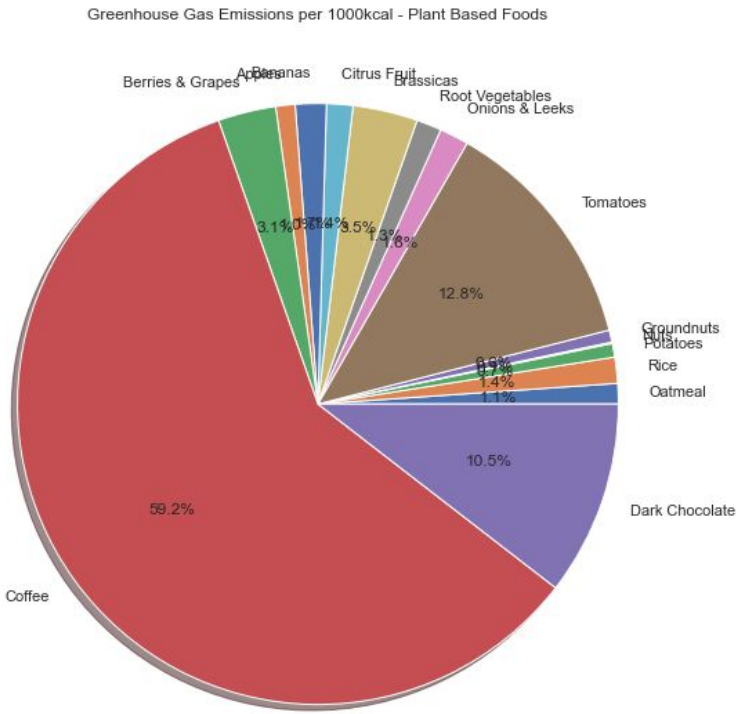
Using a Pie Plot to show the relationship between median values of greenhouse emissions kgCO_2per100g protein

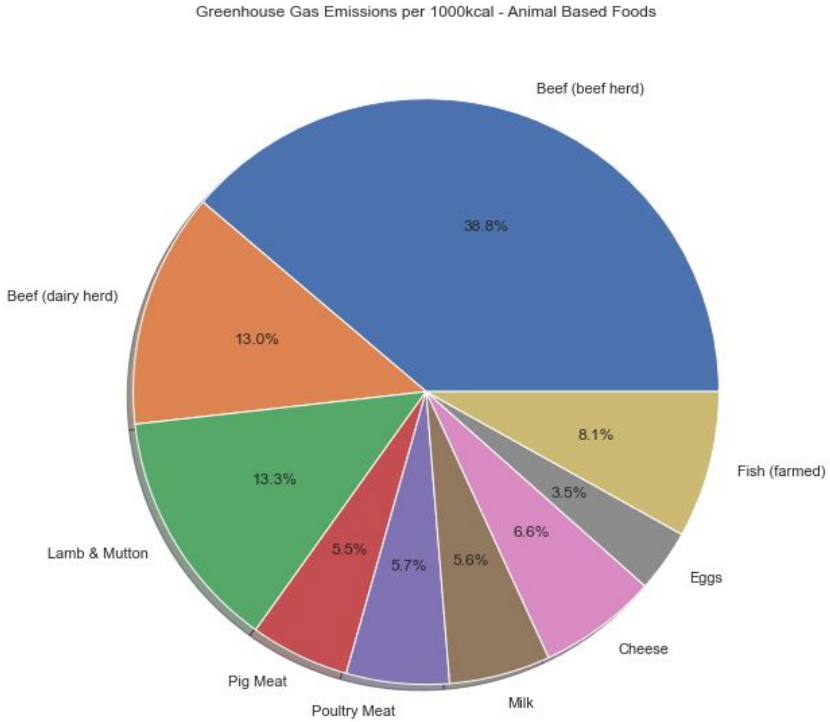
Total CO_2 Emissions



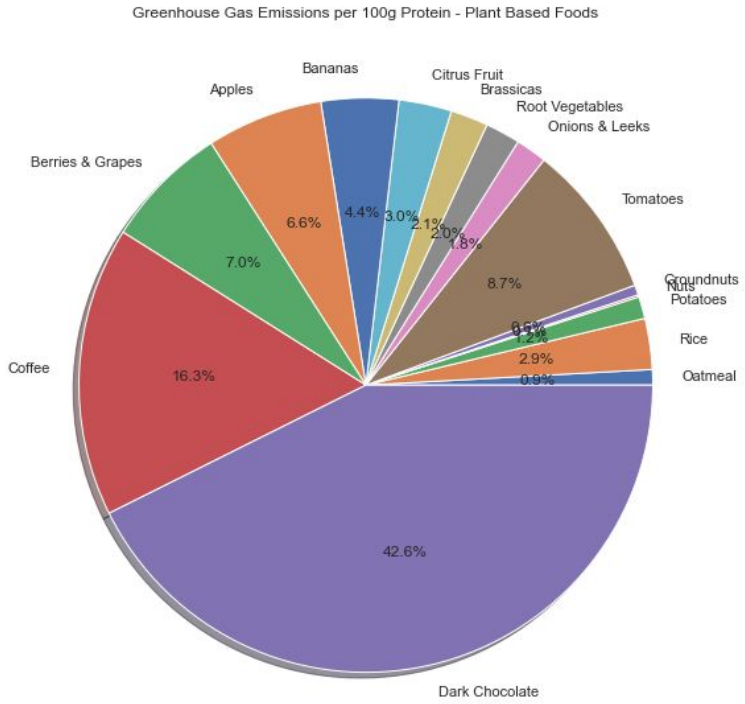


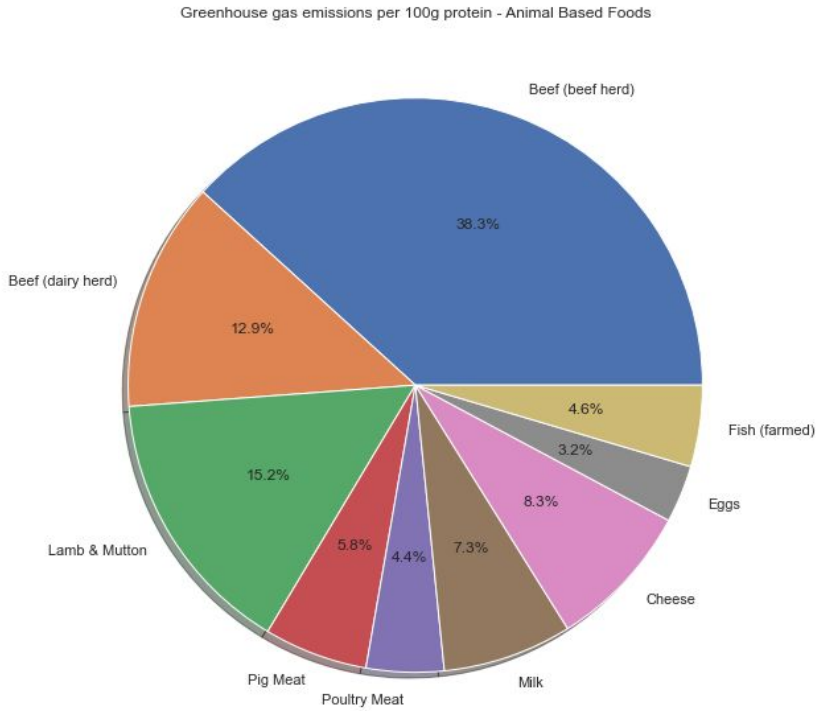
Greenhouse Emissions (kgCO_2 per 1000kcal) Plant





Greenhouse Emissions (kgCO_2eq per 100g protein)





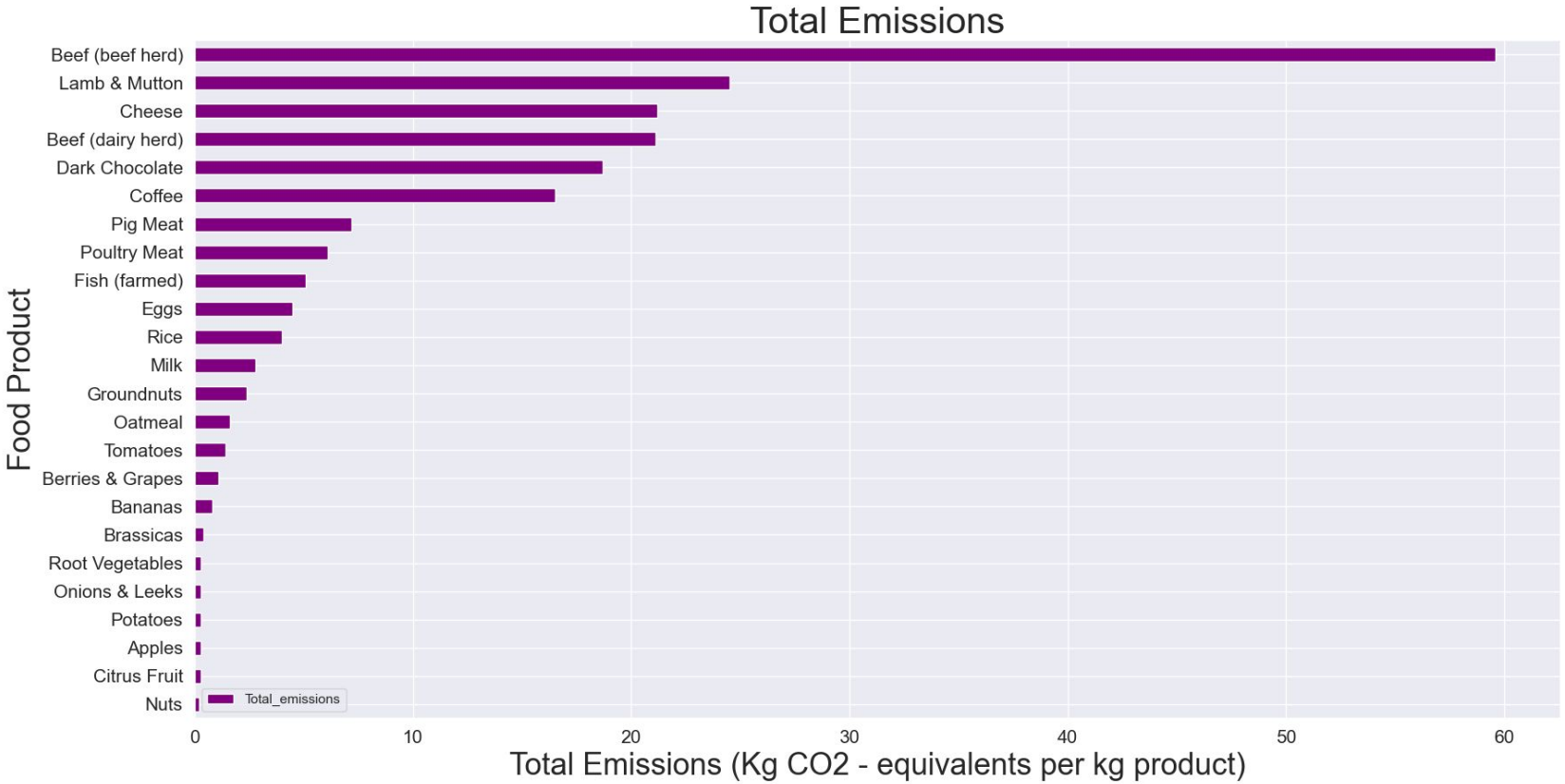
Data Analysis

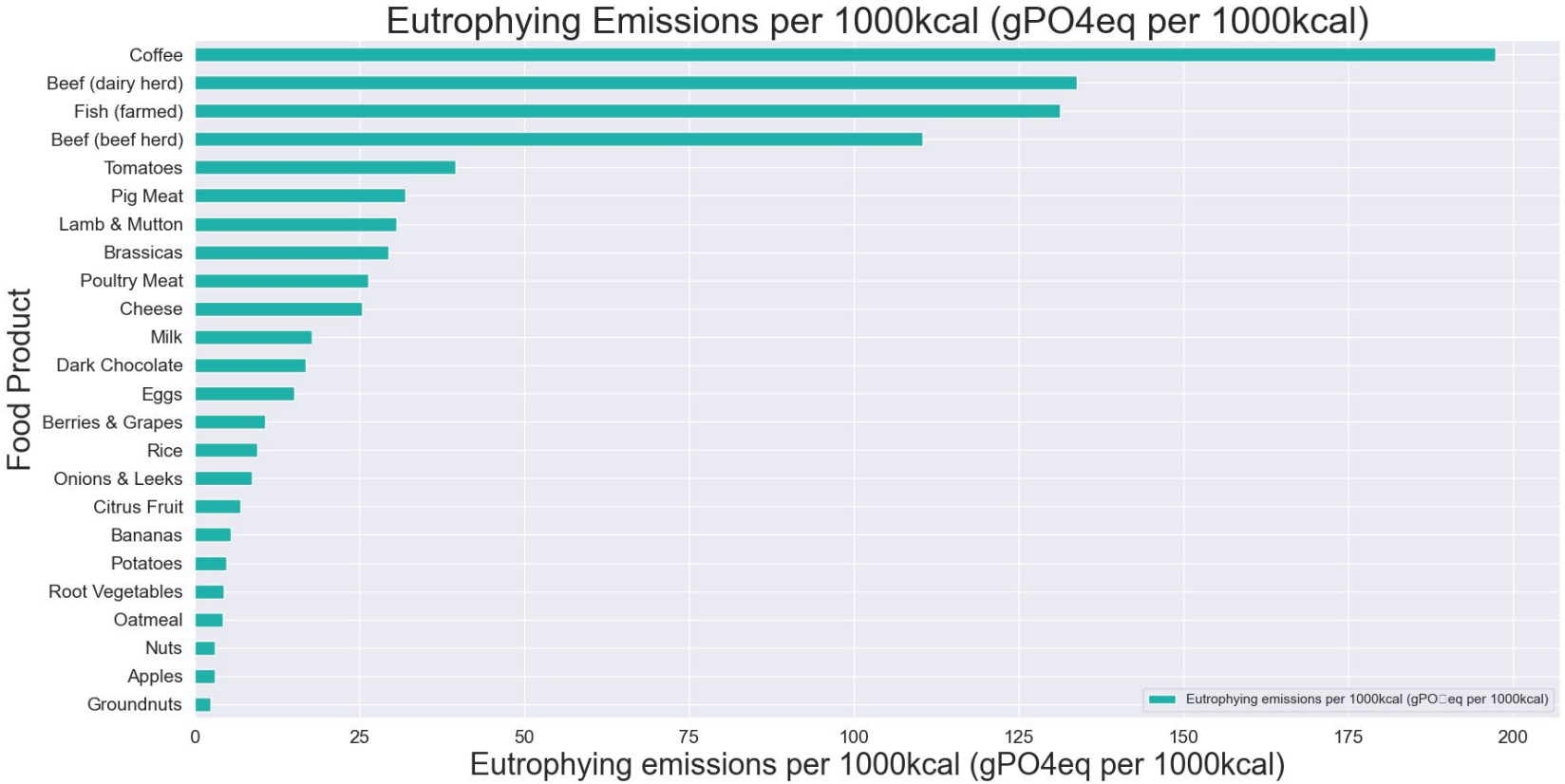
Which food products have the most negative impact on the environment?
Which food products have the least negative impact on the environment?

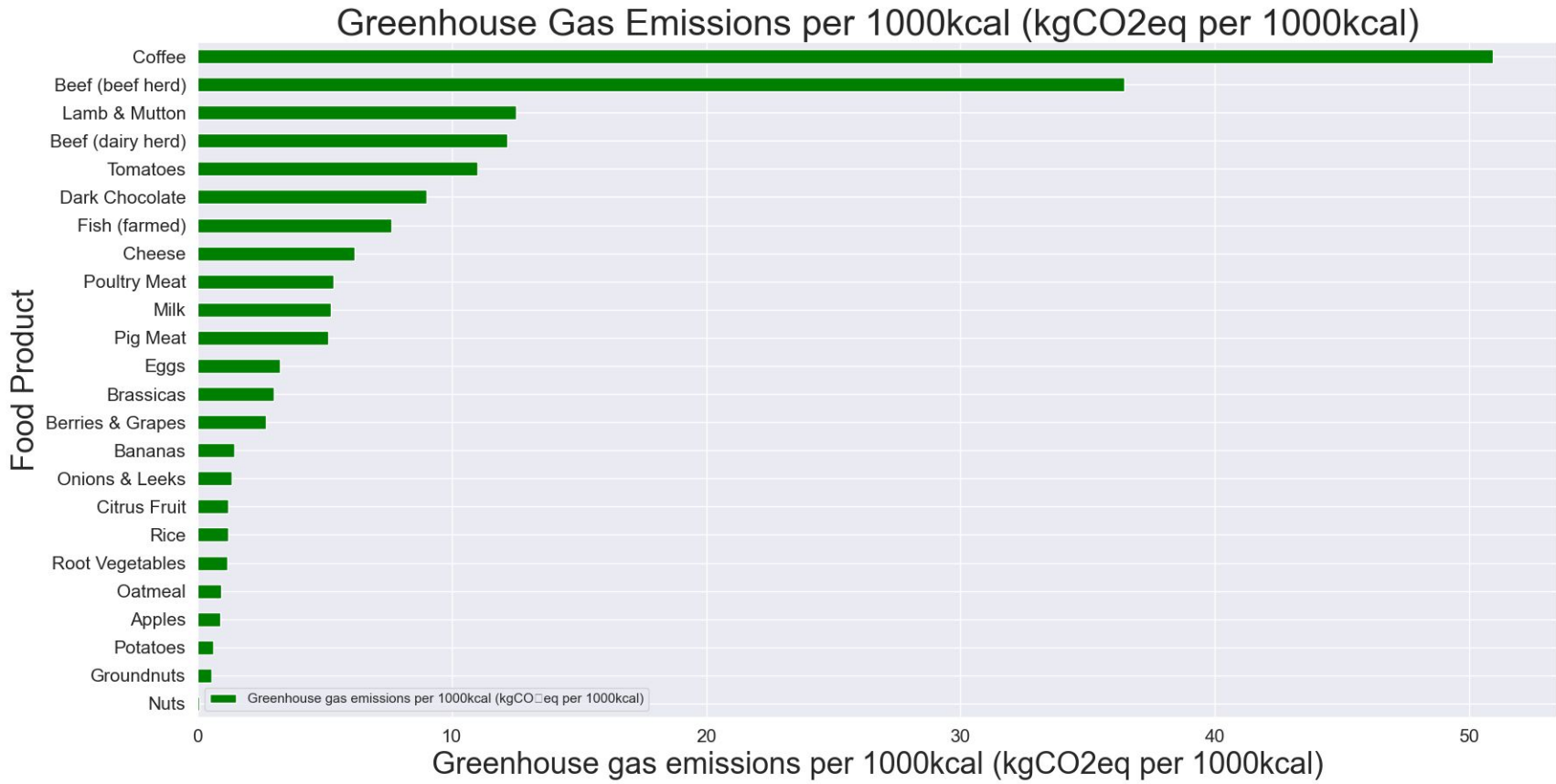
Determined by analyzing:

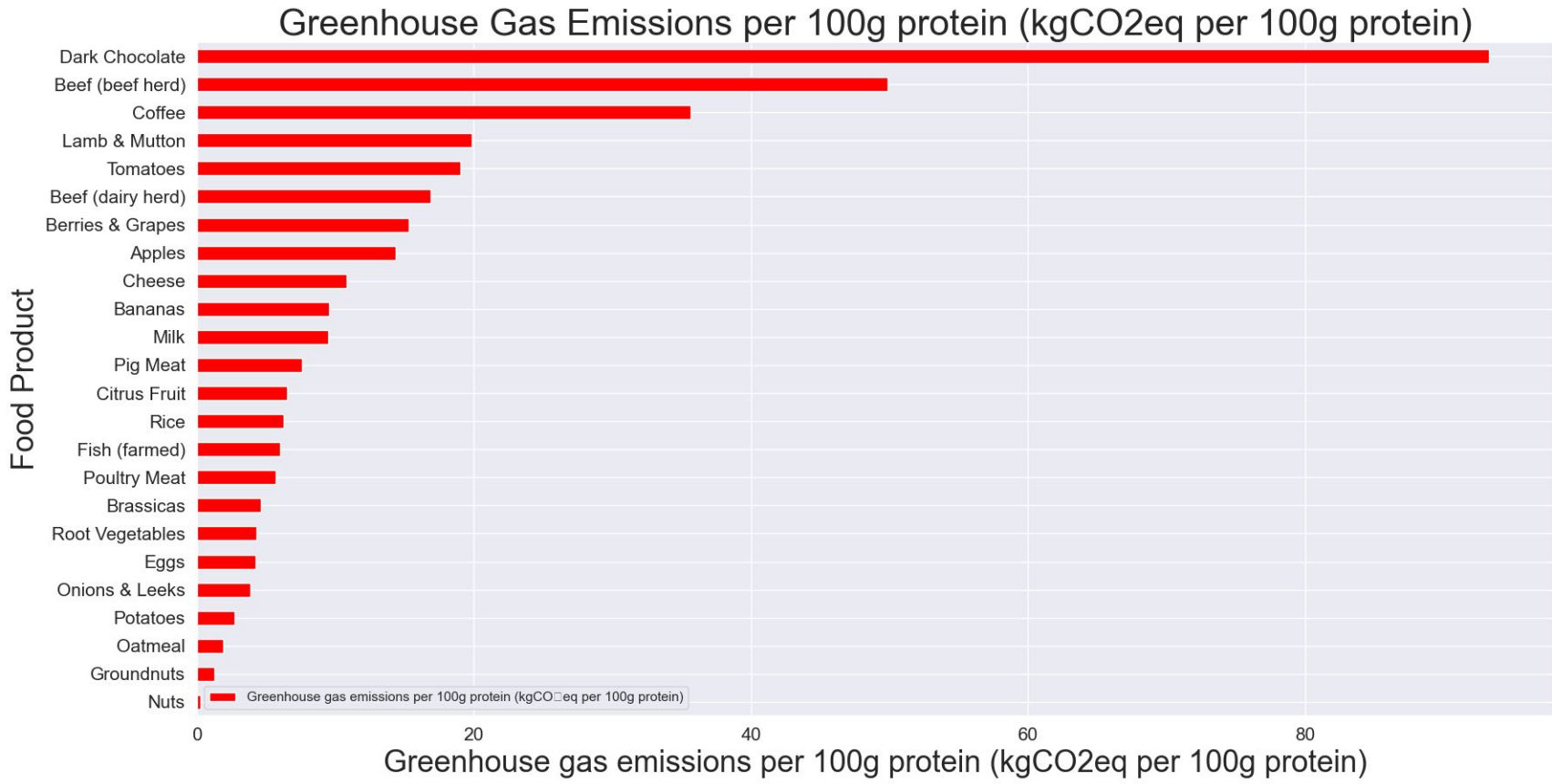
- Total emission levels
- Eutrophying emission levels
- Greenhouse emission gas levels

amongst all the food products.


Total Emissions
Beef (beef herd)
Lamb & Mutton
Cheese
Beef (dairy herd)
Dark Chocolate
Coffee
Pig Meat
Poultry Meat
Fish (farmed)
Eggs
Rice
Milk
Groundnuts
Oatmeal
Tomatoes
Berries & Grapes
Bananas
Brassicas
Root Vegetables
Onions & Leeks
Potatoes
Apples
Citrus Fruit
Nuts
Food Product
Total_emissions
0
10
20
30
40
50
60
Total Emissions (Kg CO2 - equivalents per kg product)


Eutrophying Emissions per 1000kcal (gPO4eq per 1000kcal)
Coffee
Beef (dairy herd)
Fish (farmed)
Beef (beef herd)
Tomatoes
Pig Meat
Lamb & Mutton
Brassicas
Poultry Meat
Cheese
Milk
Dark Chocolate
Eggs
Berries & Grapes
Rice
Onions & Leeks
Citrus Fruit
Bananas
Potatoes
Root Vegetables
Oatmeal
Nuts
Apples
Groundnuts
Food Product
0
25
50
75
100
125
150
175
200
Eutrophying emissions per 1000kcal (gPO4eq per 1000kcal)
Eutrophying emissions per 1000kcal (gPO□eq per 1000kcal)


Greenhouse Gas Emissions per 1000kcal (kgCO2eq per 1000kcal)
Food Product
Coffee
Beef (beef herd)
Lamb & Mutton
Beef (dairy herd)
Tomatoes
Dark Chocolate
Fish (farmed)
Cheese
Poultry Meat
Milk
Pig Meat
Eggs
Brassicas
Berries & Grapes
Bananas
Onions & Leeks
Citrus Fruit
Rice
Root Vegetables
Oatmeal
Apples
Potatoes
Groundnuts
Nuts
Greenhouse gas emissions per 1000kcal (kgCO□eq per 1000kcal)
0
10
20
30
40
50
Greenhouse gas emissions per 1000kcal (kgCO2eq per 1000kcal)


Greenhouse Gas Emissions per 100g protein (kgCO2eq per 100g protein)
Dark Chocolate
Beef (beef herd)
Coffee
Lamb & Mutton
Tomatoes
Beef (dairy herd)
Berries & Grapes
Apples
Cheese
Bananas
Milk
Pig Meat
Citrus Fruit
Rice
Fish (farmed)
Poultry Meat
Brassicas
Root Vegetables
Eggs
Onions & Leeks
Potatoes
Oatmeal
Groundnuts
Nuts
Food Product
Greenhouse gas emissions per 100g protein (kgCO□eq per 100g protein)
0
20
40
60
80
Greenhouse gas emissions per 100g protein (kgCO2eq per 100g protein)

Which food products have the most negative impact on the environment? Which food products have the least negative impact on the environment?

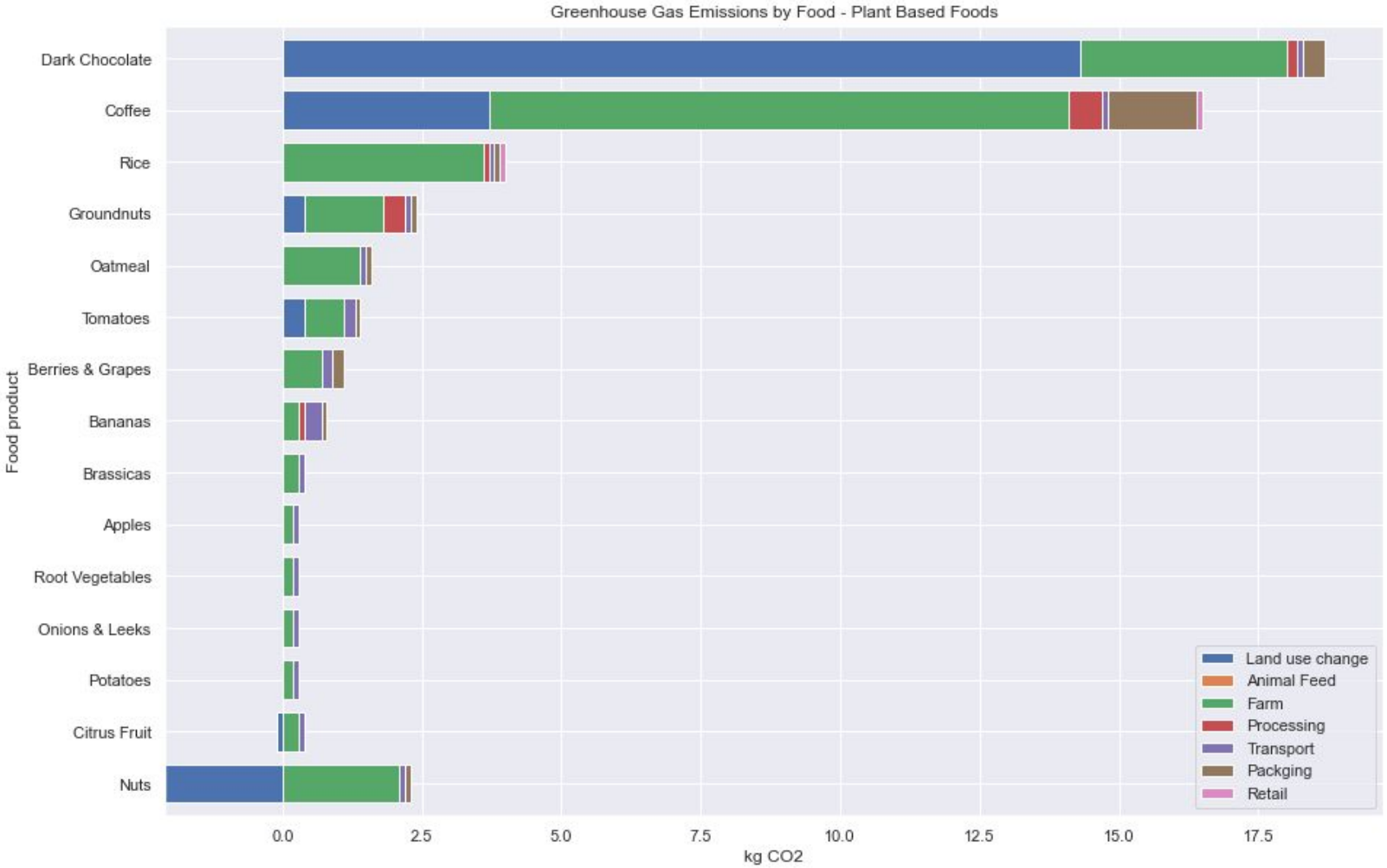
	Most Negative Impact	**Least Negative Impact**
Total Emissions (Kg CO2 - equivalents per kg product)	Beef (beef herd) - 59.6	Nuts - 0.2
Eutrophying Emissions per 1000kcal (gPO4eq per 1000kcal)	Coffee - 197.36	Groundnuts - 2.44
Greenhouse Gas Emissions per 1000kcal (kgCO2eq per 1000kcal)	Coffee - 50.95	Nuts - 0.67
Greenhouse Gas Emissions per 100g protein (kgCO_2eq per 100g protein)	Dark Chocolate - 93.3	Nuts - 0.26

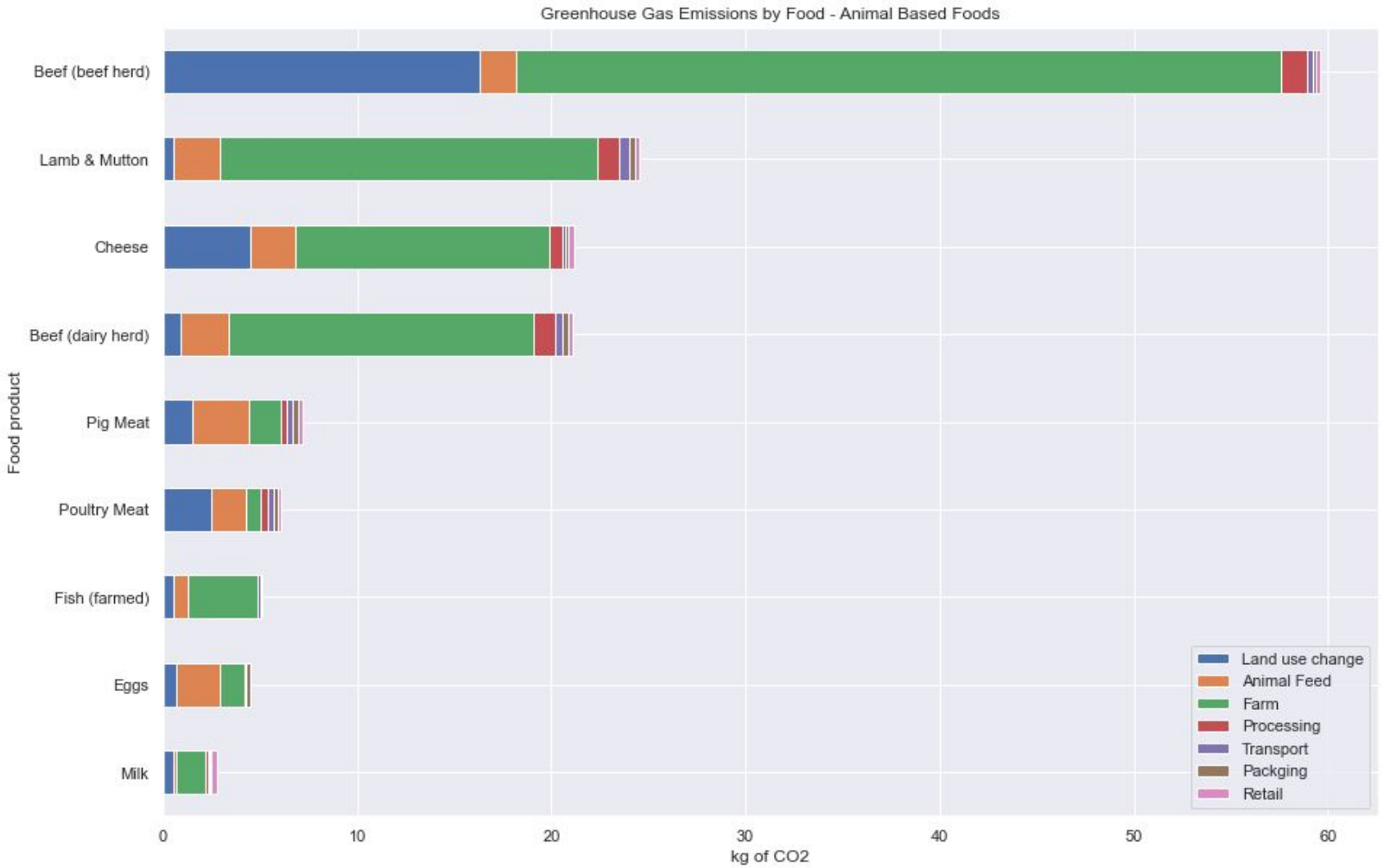
Data Analysis

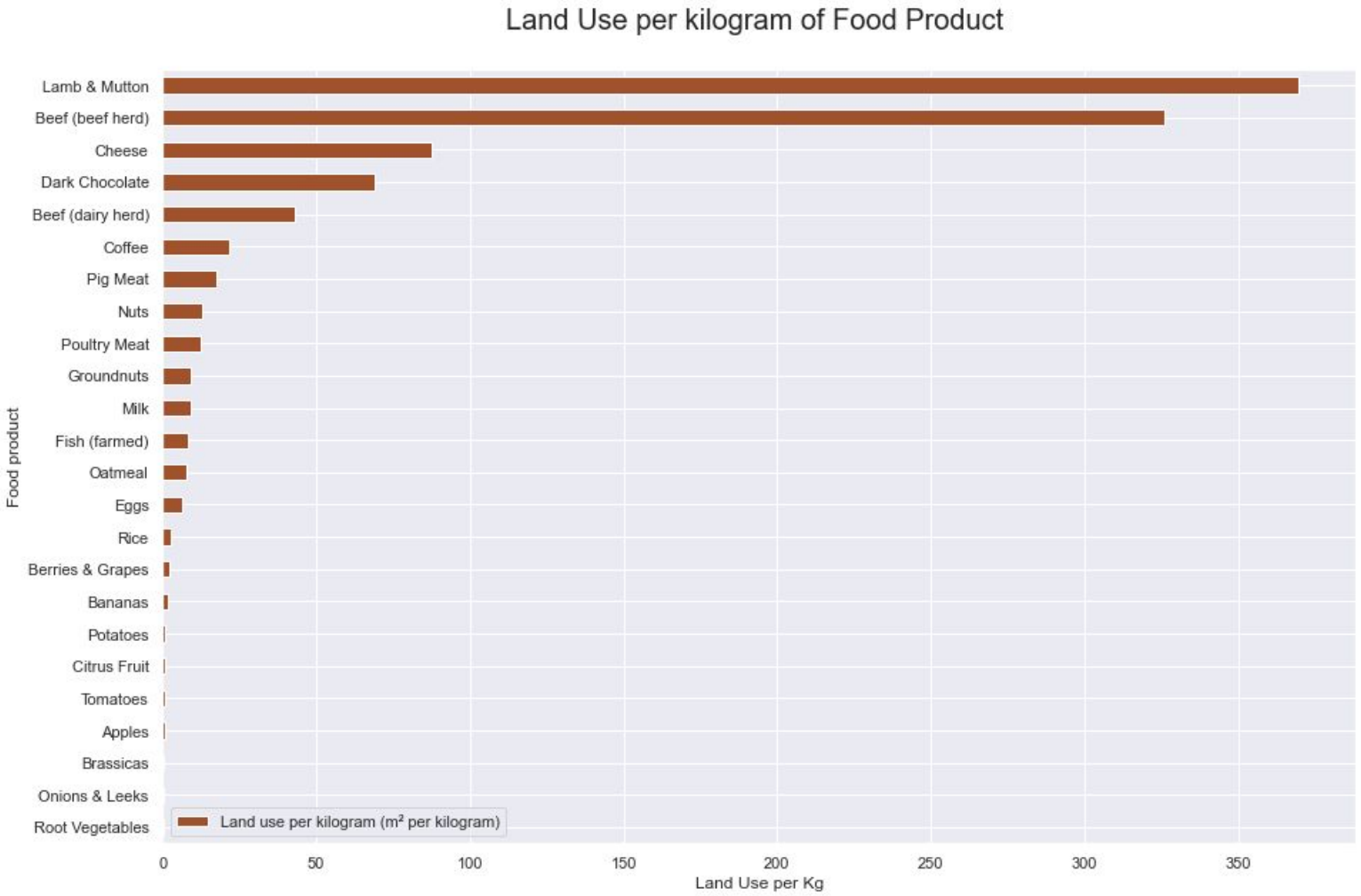
What stage of food production contributes the most to greenhouse gas emission?

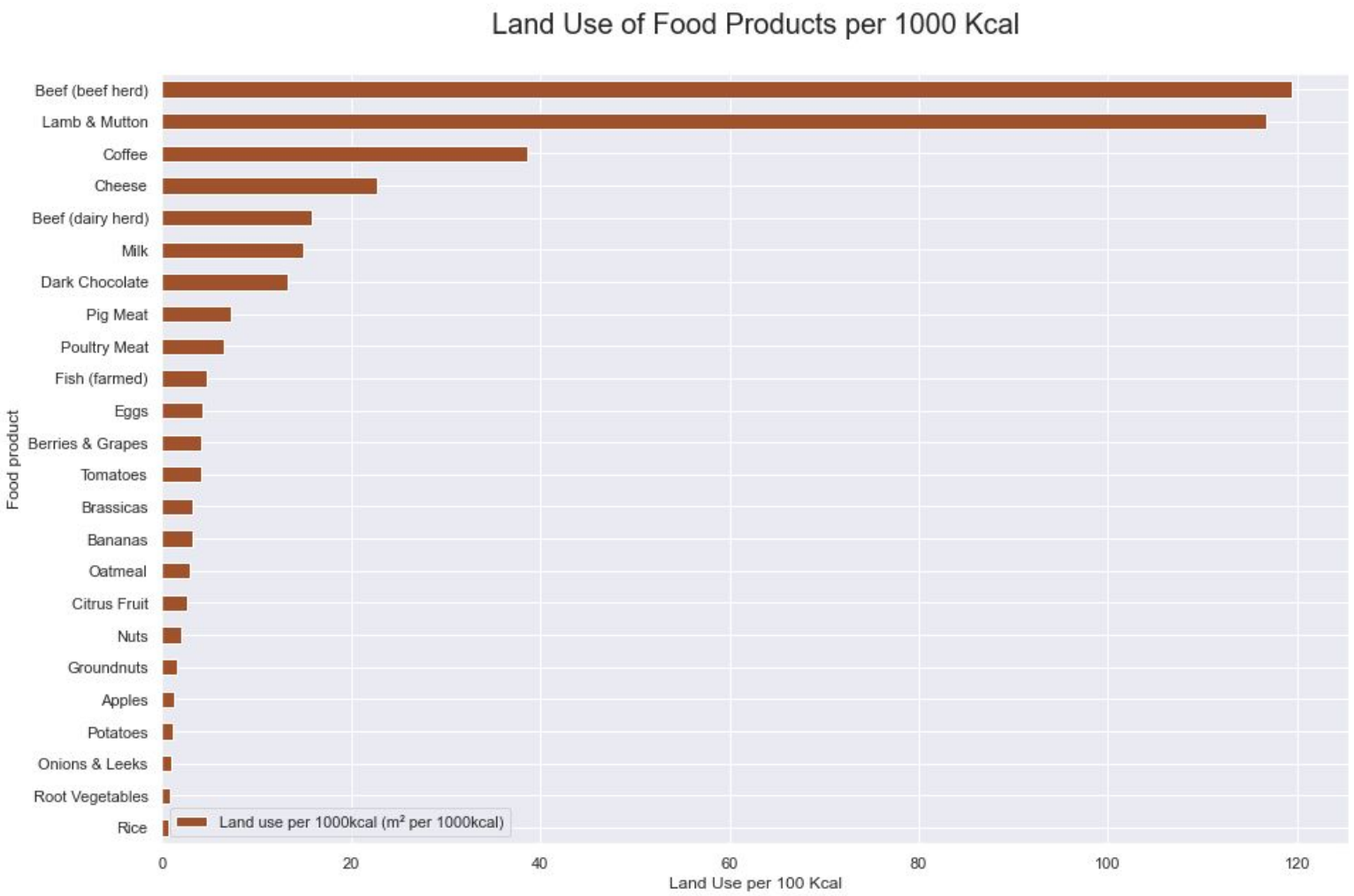
Determined by analyzing:

- Greenhouse gas emissions across the supply chain: animal vs plant
- Land use by food per 1000 Kcal
- Land use by food per Kg


Greenhouse Gas Emissions by Food - Plant Based Foods
Dark Chocolate
Coffee
Rice
Groundnuts
Oatmeal
Tomatoes
Berries & Grapes
Bananas
Brassicas
Apples
Root Vegetables
Onions & Leeks
Potatoes
Citrus Fruit
Nuts
Food product
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
kg CO2
Land use change
Animal Feed
Farm
Processing
Transport
Packging
Retail


Greenhouse Gas Emissions by Food - Animal Based Foods
Beef (beef herd)
Lamb & Mutton
Cheese
Beef (dairy herd)
Pig Meat
Poultry Meat
Fish (farmed)
Eggs
Milk
Food product
0
10
20
30
40
50
60
kg of CO2
Land use change
Animal Feed
Farm
Processing
Transport
Packging
Retail


Land Use per kilogram of Food Product
Lamb & Mutton
Beef (beef herd)
Cheese
Dark Chocolate
Beef (dairy herd)
Coffee
Pig Meat
Nuts
Poultry Meat
Groundnuts
Milk
Fish (farmed)
Oatmeal
Eggs
Rice
Berries & Grapes
Bananas
Potatoes
Citrus Fruit
Tomatoes
Apples
Brassicas
Onions & Leeks
Root Vegetables
Food product
Land use per kilogram (m² per kilogram)
0
50
100
150
200
250
300
350
Land Use per Kg


Land Use of Food Products per 1000 Kcal
Beef (beef herd)
Lamb & Mutton
Coffee
Cheese
Beef (dairy herd)
Milk
Dark Chocolate
Pig Meat
Poultry Meat
Fish (farmed)
Eggs
Berries & Grapes
Tomatoes
Brassicas
Bananas
Oatmeal
Citrus Fruit
Nuts
Groundnuts
Apples
Potatoes
Onions & Leeks
Root Vegetables
Rice
Food product
Land use per 1000kcal (m² per 1000kcal)
0
20
40
60
80
100
120
Land Use per 100 Kcal

Post Mortem

Post Mortem

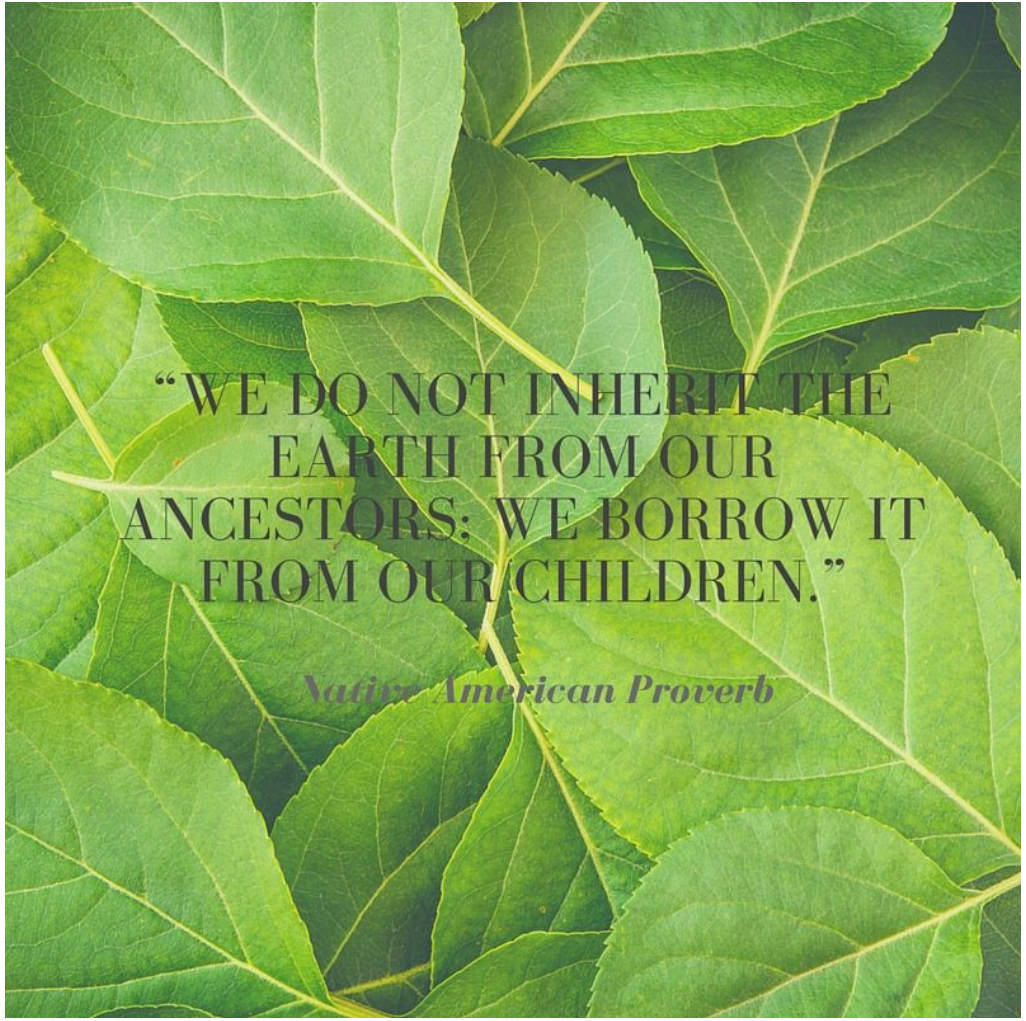
- Difficulties that arose
  - Understanding vocabulary and environmental terminology
  - Writing the code in the correct syntax
- Additional questions to look into with dataset
  - Water usage and which foods use the most/least
  - Further analysis with different food groups (comparing oils, nuts, etc.)
- What would we research next?
  - Pesticides and GMO environmental impact in regards to food sustainability
  - Nutritional value associated with food products

Key Takeaways

Key Takeaways

What types of food production should be encouraged to consume a nutritious diet in a sustainable way?

- Nuts have a low environmental impact and should be encouraged.
- Cattle, both beef & dairy, should be avoided.
- Agricultural innovators should focus on the land usage and farming stages of the supply chain to reduce the greenhouse gas.


“WE DO NOT INHERIT THE EARTH FROM OUR ANCESTORS; WE BORROW IT FROM OUR CHILDREN.”
Native American Proverb

Any questions?