



FORT HAYS STATE
UNIVERSITY



High Plains
Farm Credit

Plant-Based Proteins



2021-2022 Student Board Research Project

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Overview

- Background Information
- Prevalence of Plant-Based Proteins
- Campus Market Survey

Background Information

- Plant-Based Protein Defined
 - Protein food products made with plant ingredients
 - Competes directly with the livestock industry
 - Intended to look and tastes like actual meat
 - Envisioned to be used anywhere actual meat would be traditionally used



Current and Potential Products

Beyond Meat

- Beyond Burger
- Beyond Beef (ground beef)
- Beyond Sausage Brats
- Beyond Meatballs
- Beyond Breakfast Sausage (patties)
- Beyond Beef Crumbles
- Beyond Chicken Tenders
- Beyond Jerky

Impossible Foods

- Impossible Burger
- Impossible Sausage
- Impossible Chicken Nuggets
- Impossible Meatballs
- Impossible Pork (ground pork, only in select restaurants)

Potential Products

- Variations of pork products (sausage patties, links, variety of brats, ground pork)
- Variations of poultry products (nuggets, tenders, bites)
- Plant-based eggs
- More diversified buying options in terms of quantities

Ingredients

- Majority of plant based products are made up of -
 - Soy, Peas, Beans, Nuts, and Wheat Gluten (Seitan)
- Plant oils are used to replicate juiciness & marbling, along with replicating caramelizing the meat.
 - Coconut oil, Canola oil, and Coconut Butter



Nutritional Analysis

- A healthy alternative?
 - Low Fat, low Cholesterol
 - High Sodium, Less efficient micro nutrients.
- Nutritionally it depend on the person as a healthier alternative.
- People at risk of -
 - High Blood Pressure
 - Heart Conditions
 - Kidney Disease

Regulatory

- What they have in common
 - Labeling
 - All must follow FDCA 402(a)(1), 402(a)(4) & 403(a)(1), 403(b)
 - Max sentence of one year in prison and up to \$10,000 fine
- Plant Based Differences
 - Testing
 - Misbranded Product Conflict

Regulatory Differences

- Misbranded Products
 - Roughly 13 states regulate terms used on labels
 - Different states have different laws
 - Statement before or after name
 - Kansas Bill 2530
 - Withdrawn March 3, 2022

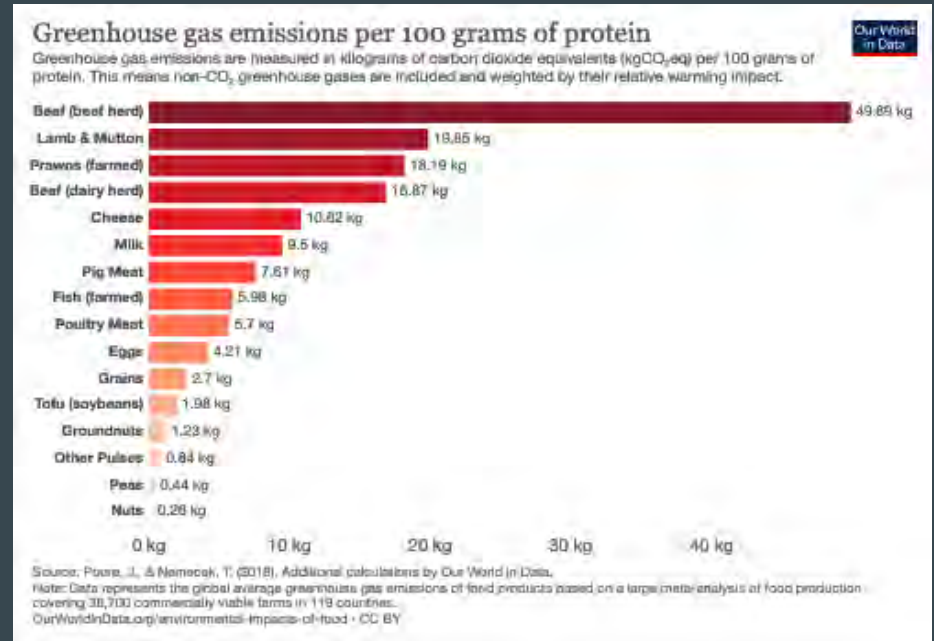


Regulatory Differences

- Meat
 - Storage and handling of products
 - Inspections
 - Labeling
 - 7 U.S.C 1638a
 - Country of Origin
 - Multiple Countries of origin
 - Imported for immediate slaughter
 - Food service establishment exemption

Carbon footprint

- What is carbon footprint?
- Major carbon footprint gasses in the animal industry
 - Carbon dioxide
 - Nitrous oxide
 - methane



Plant Based Protein Carbon Footprint

- Impossible Foods says “switching to plant-based meats can be better than getting solar panels, driving an electric car or avoiding plastic straws”
- Beyond burger vv 1/4 lbs of U.S.. beef
 - 90% less GHG emissions
 - 46% less energy
 - >99% less impact on water scarcity
 - 93% less impact on land use

| Eating this plant-based meat | Instead of this conventional meat | reduces land use (m ² -y/kg) by this much | reduces greenhouse gas emissions (kg-CO ₂ -eq/kg) by this much | reduces water use (L/kg) by this much | reduces aquatic eutrophication potential (g-PO ₄ ³⁻ -eq/kg) by this much |
|---|-----------------------------------|--|---|---------------------------------------|--|
| Impossible Burger 2.0 ¹ | Beef burger* | 96% | 89% | 87% | 91% |
| Beyond Burger | Beef burger** | — | 89% | 99% | — |
| On the Border Original Burger ² | Beef burger* | 93% | 85% | 98% | 77% |
| Spicy Black Bean Burger ³ | Beef burger* | 97% | 89% | 96% | 76% |
| Roasted Garlic & Quinoa Burger ⁴ | Beef burger* | 93% | 88% | 98% | 73% |
| Grillers Crumbles ⁵ | Ground beef** | 99% | 90% | 96% | — |
| Original Sausage Patties ⁶ | Pork sausage patties* | 87% | 90% | 81% | 61% |
| Original Chick Patties ⁷ | Breaded chicken patties* | 84% | 96% | 72% | 75% |

Beef

- Most complex animal production system
- Production stages
 - Cow-calf
 - 65% of GHG
 - Stocker
 - Backgrounding
 - Finishing

Pork

- 4 oz serving of pork prepared and consumed is 2.5lbs of carbon dioxide
- Animal production 62.1%
- Processing 5.6%
- Retail 7.5%
- Consumption 23.4 (includes cooking and refrigeration)
- Packaging 1.3%

Poultry

- 2 types of emissions
- Mechanical emissions
 - Fuel use major
- Nonmechanical emissions
 - Litter handling system

Traditional Meat Emissions

Figure 1

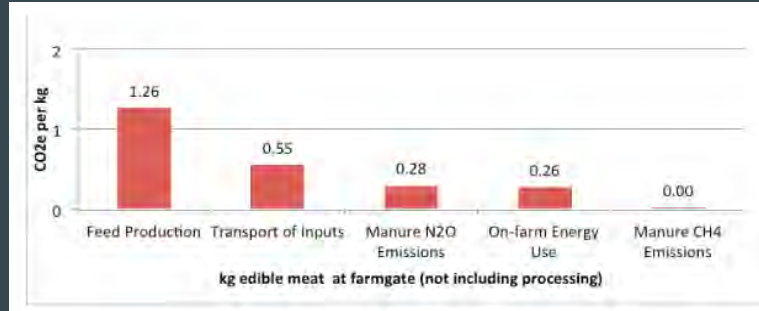


Figure 3

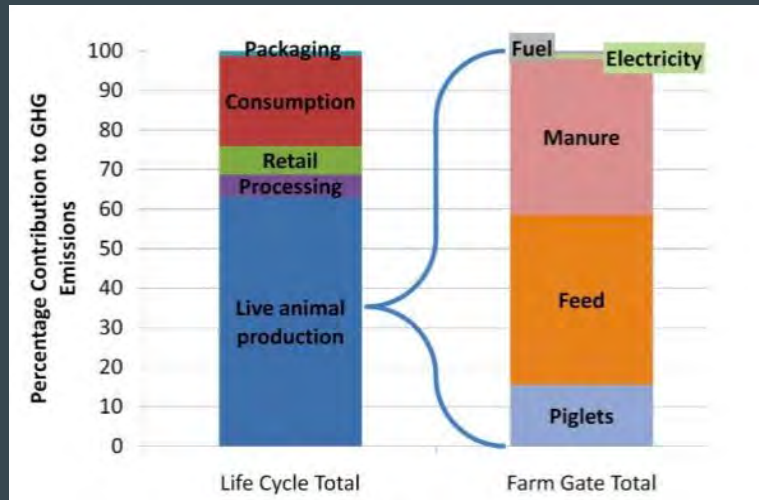


Figure 2

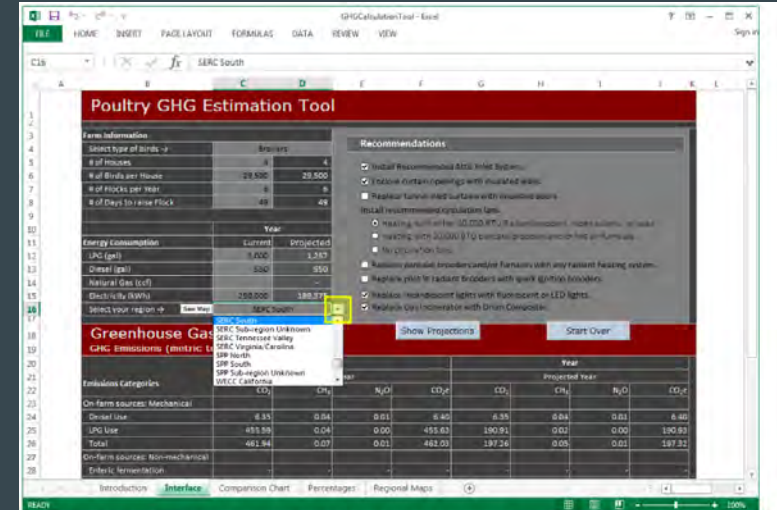


Figure 2. The data input section of the “Interface” tab. The drop-down box for selecting the user’s region is indicated.

Figure 1: Environmental Working Group Meat Eaters Guide: Methodology 2011

Figure 2: UGU extension GHG calculation tool

Figure 3: Do We Know the Carbon Footprint of the Pork Industry? By: Lpelc admin

Prevalence of Plant-Based Proteins

- Past

- 12-15 years old
- Beef consumption is consistently dynamic
 - 1978: 48% of per capita meat consumption
 - 2015: 26% of per capita meat consumption

- Present

- Trends in quality improvement & product diversification in plant-based industry
- Consumers are three times more likely to purchase beef versus plant-based alternative
- Plant-based proteins: 1-2% protein market share

Future of Plant-Based Proteins

- Consumer Dynamics

- 75% of consumers prefer beef in binary choice
- In reality, consumers of PBPs have beef and other livestock-based products in the same basket
- Beef still has a more positive consumer perception relative to plant-based meat
 - Taste
 - Appearance
 - Price
 - Naturalness

- Potential Market share

- Compound Annual Growth Rate of PB meat market: 19.3% from 2022-2030
- Projected to slow - “Steep cooldown” by 2025
- If trends continue, projected to capture 4% of global protein market by 2025

Market Trends

- Organic Foods
 - Niche market in 1970's
 - No statutory definition, but regulated
 - Compound Annual Growth Rate of 9.7%
- Seltzer Market
 - Market took off about three years ago
 - Double digit growth rates (48.8% growth in 2021)
 - Facing oversaturation, consumer disillusion, and low profitability
- Plant-Based Proteins
 - Showing early signs of mimicking seltzer market versus organic market
 - Decreasing consumer propensity to try, indicative of lower uptake

Milk Industry Comparison

- Industry Conditions
 - Regulatory bodies
 - Product allergens & dietary restrictions
 - Cost of dairy vs. alternative production
- Similar Short Term Trends
 - Oatmilk experiencing triple digit growth
 - Compound Annual Growth Rate of alternative meat compared to organic market

Competitive Advantages of Plant-Based Protein

- Environmental Benefits
 - Plant Versus Animal Production
 - Less Environmental Impact
- Consumer Perception
 - Health Benefits
 - “Green”
 - Animal Friendly
- Celebrity Endorsements
 - Liza Koshy - KFC
 - Snoop Dogg - Beyond Meat



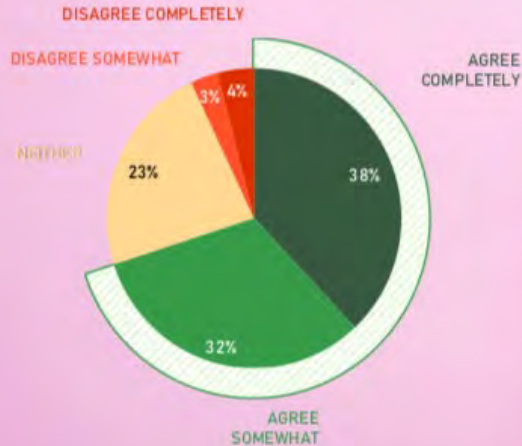
Consumer Perceptions

Plant-forward eating seems better to consumers.

If society reduced consumption of meat and increased consumption of plant-based foods...

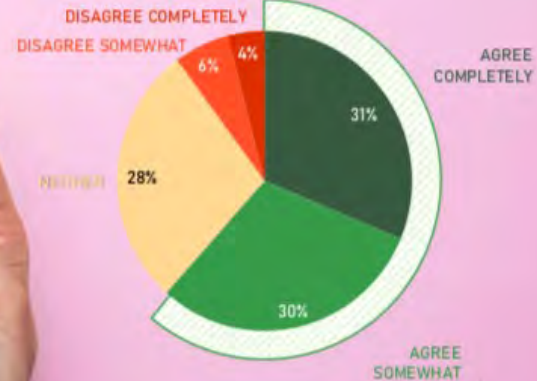
70%


OF CONSUMERS AGREE
WE WOULD BE HEALTHIER



62%

OF CONSUMERS AGREE
WE WOULD HAVE LESS OF
A NEGATIVE IMPACT ON
THE ENVIRONMENT



 DATASENTIAL

Major Competitors

- Top Two Competitors

- Beyond Meat
- Impossible Foods



- Other Major Competitors

- Cargill
- Kellogg
- Nestle
- Hormel





- Founded in 2009 in Los Angeles, CA by Ethan Brown
- Publicly traded
- Subway, KFC, Dunkin' Donuts, A&W in Canada, McDonald's, Pizza Hut
- Use plant proteins, including pea, brown rice, mung bean and faba bean
- Non-GMO products

IMPOSSIBLE™

- Founded in 2011 in Redwood City, CA by Patrick O. Brown
- Burger King, Qdoba, Starbucks, Applebee's
- Soy based
- Genetically engineered ingredients



- Plant-based nuggets with KFC in 2020 in China
- Launched PlantEver in 2020 in China and plans to in Thailand
 - Chicken-alternative nuggets and beef-alternative patties
- Partnership with PURIS foods to produce and sell pea protein
 - Supplies raw material to other companies including Beyond Meat
- Co-branded products with Lawson, a Japan-based convenience store
 - Plant-based scallop alternative and chicken-alternative tender
- Plant-Based Protein Products: Prolia Soy Flour, Prosante Textured Soy Flour, Puris Pea Protein, Corn Protein, Vital Wheat Gluten
- CEO David MacLennan: "Our analysis is that in ...three to four years plant-based will be perhaps 10 percent of the market. We're a large beef producer and that is a big part of our portfolio. So there's some cannibalization that will occur" (June, 2021)





- MorningStar Farms
 - Veggie Products
- Incogmeato (2019) - MorningStar Farms
 - Sweet BBQ Plant-Based Chik'n Tenders
 - Plant-Based Original Bratwurst
 - Plant-Based Ground Breakfast Sausage
 - Italian Plant-Based Sausage
 - Plant-Based Chik'n Nuggets
 - Mickey Mouse Shaped Plant-Based Chik'n Nuggets
 - Plant-Based Ground
- Kashi
 - Cereals
- Gardenburger
 - Black Bean Chipotle Veggie Burgers
 - Original Burgers





- Acquired Sweet Earth in 2017
 - Plant-Based Awesome Burger
 - Awesome Grounds Plant-Based
 - Mindful Chik'n Plant Based
- Vuna: Plant-Based Tuna



- GoodNes: Sweet Earth
 - Awesome Burger
 - Awesome Grounds
 - Plant-Based Bacon
 - Worldly Frozen Bowls
 - Burritos
 - Pizza
 - Plant-Based Burgers and Grounds
 - Plant-Based Seitan
 - Plant-Based Chik'n
 - Plant-Based Deli Slices (Turkey, Pepperoni, Ham)
 - Plant-Based Hot Dogs and Sausages



- Plant-based alternatives under Happy Little Plants brand
 - Free of antibiotics and hormones
 - Reduced sodium and fat content
 - Sausage patty for breakfasts
 - Pizza Toppings
 - Pepperoni Topping
 - Italian style Crumbles
 - Chorizo Style Crumbles
 - Meatball Style Topping
- The Better Meat Co.
 - Meat Enhancement
 - Beef, fish, pork, crab
 - Meat Alternatives
 - Fish, crab, chicken, steak, burger



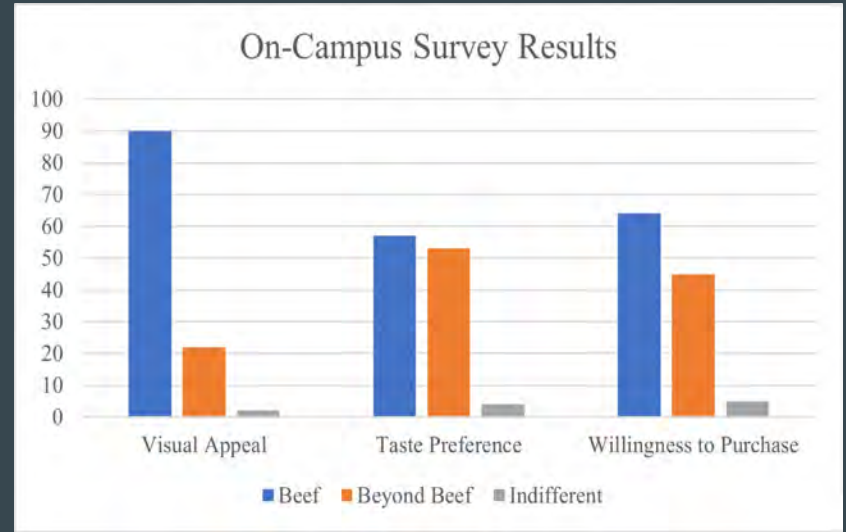
Rhiza from The Better Meat Co:



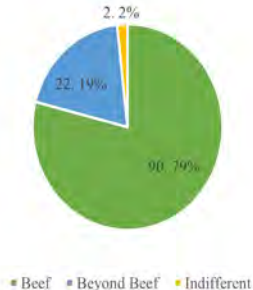
Rhiza from the fermenter: 'It looks a bit like chicken...' Picture credit: The Better Meat Co

On-Campus Survey

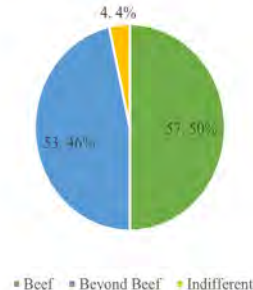
- Results
- Notable Factors
 - Product differences
 - Demographic variables
 - Participant reactions



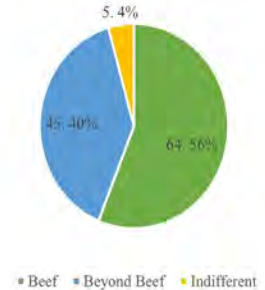
Visual Appeal



Taste Preference



Willingness to Purchase



Conclusion

- Questions
- Thank you!

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