

# Saving the Planet: Sustainable Meat Alternatives

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This work was created in an open classroom environment as part of a program within the Sutardja Center for Entrepreneurship & Technology and led by Prof. Ikhlaq Sidhu at UC Berkeley. There should be no proprietary information contained in this work. No information contained in this work is intended to affect or influence public relations with any firm affiliated with any of the authors. The views represented are those of the authors alone.

# Thesis

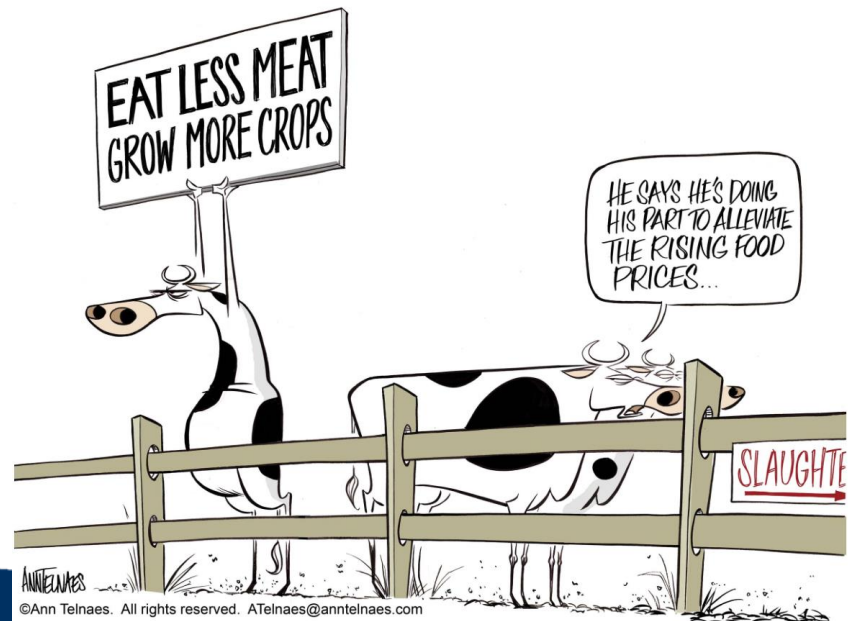
- Meat production is unsustainable at current and projected rates of consumption due to high resource intensity and destructive cost
- This opens a large market for nutritious protein alternatives which can provide comparable taste, texture, and nutrition density



MADE FROM PLANTS!

## THE IMPOSSIBLE CHEESEBURGER

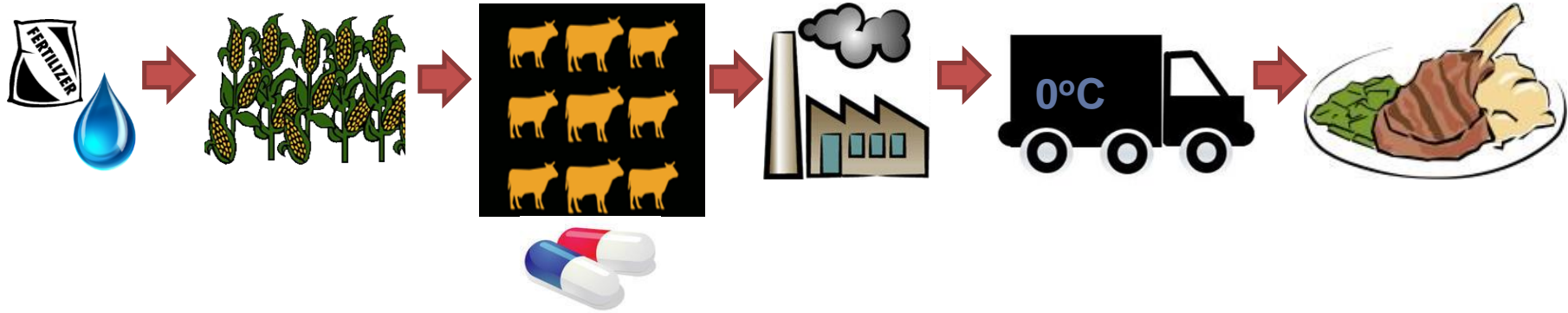
We love meat. We love cheese. And for thousands of years we have relied on animals to make them. Impossible Foods has found a better way. We use plants to make the best meats and cheeses you'll ever eat.



# Presentation Summary

- Impacts of industrialized meat production
- Total meat market vs. meat alternatives market
- Current players in meat alternatives space
- Barriers to entry
- Conclusions

# Industrialized Meat Production



1 hamburger =  
660 gallons of  
water

Conversion  
Rate:  
6 to 20 pounds  
of corn to 1  
pound of Beef

Mono-cropping  
& GMO trends

Government  
Subsidies hide  
true production  
cost

Reliance on  
Hormones and  
Antibiotics for  
higher yield

Waste from a  
farm of 2500  
dairy cows =  
Waste from a  
city of 411000  
people

Additional  
energy,  
chemicals &  
preservatives  
for processing

Pollution and  
waste

High demand  
requires global  
distribution.

Many heads of  
cattle feed into  
a single batch  
of meat

Diseased  
animals hard to  
contain and  
track

Preservatives &  
Hormones  
affect Health &  
Obesity Rates.

# The Numbers

Livestock generates **~8%** of GHG emissions

Consumes **36%** of the world's crop calories:

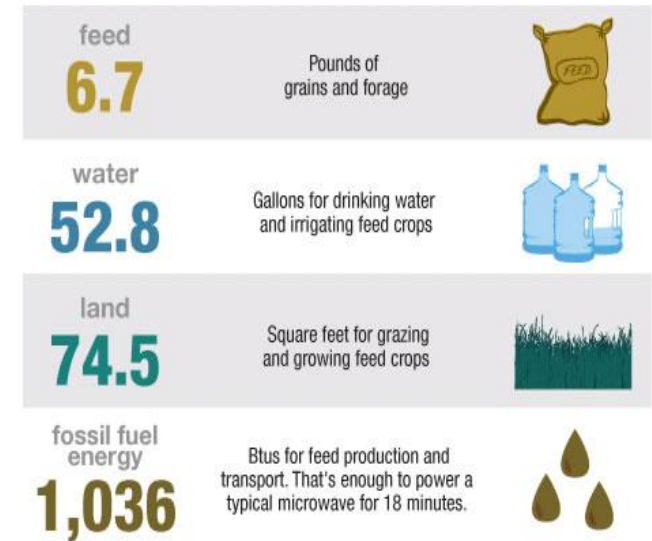
- 1 cal beef requires 11 plant-derived cal
- 1 cal poultry requires 4 cal

Antibiotic-resistant bacteria in meat:

- infects **3.6M** annually, killing 1000+
- **62%** of samples in one FDA study tested positive for resistant Enterococcus

Meat-rich diets generate a **2X-3X** higher “foodprint” over vegetarian diets

## What It Takes To Make A Quarter-Pound Hamburger



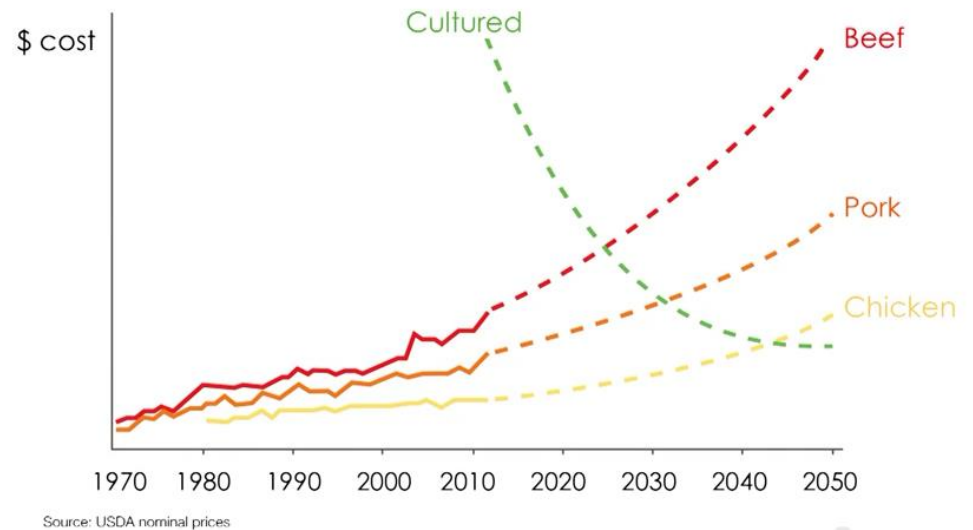
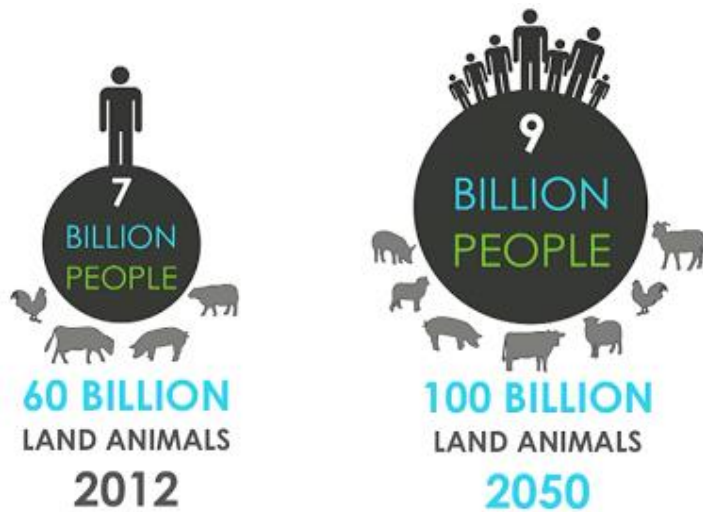
Source: J.L. Capper, *Journal of Animal Science*, July, 2011.

Credit: Producers: Eliza Barclay, Jessica Stoller-Conrad; Designer: Kevin Uhrmacher/NPR

# This is Unsustainable

Agriculture uses 37% of land mass, 70% of freshwater.

Extrapolating to 2050, we need **63%** of land mass, **118%** of freshwater.





# Market for Meat

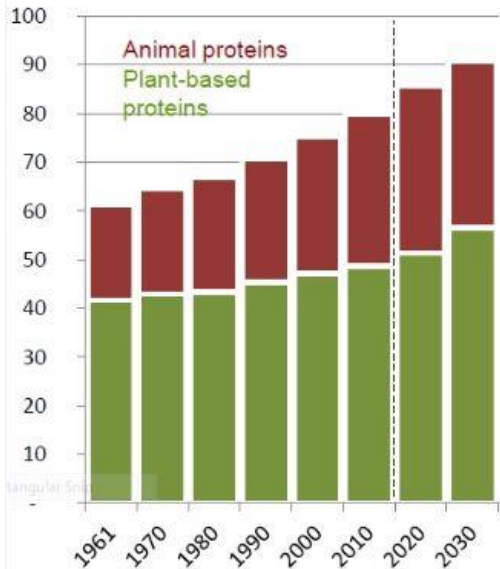
<a href="#">US 2014 Meat and Poultry Sales = \$212B</a>	Assume 5-10% conversion - Target ~\$10-20B
Global Market for Wheat and Soy based substitutes	<a href="#">Estimated \$5.17B by 2020 at a CAGR of 6.4% from 2015</a>
<a href="#">US 2014 Ripple Effects = \$864B</a>	Additional downstream markets

- The world wide meat industry is [dominated by just 10 firms](#)  
Given the high levels of government subsidy (e.g. US \$22B, OECD \$53B) the industry is susceptible to disruption ... by both policy changes and individual choice  
[Climate driven disruptions](#) (e.g. in feed supply) could lead to a shock that further drives the market for alternatives Meat alternatives [grew to \\$553M in 2012, 8% growth from 2010 to 2012](#)  
[Bloomberg reports](#) that VC Funds see increasing promise in lab created eco foods

# Market for Meat Alternatives



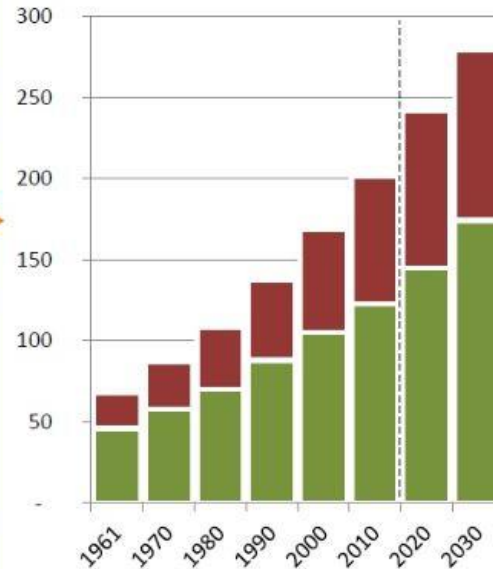
Daily worldwide demand for plant-based and animal proteins (in g/person/day)



Source: BIPE based on FAO data

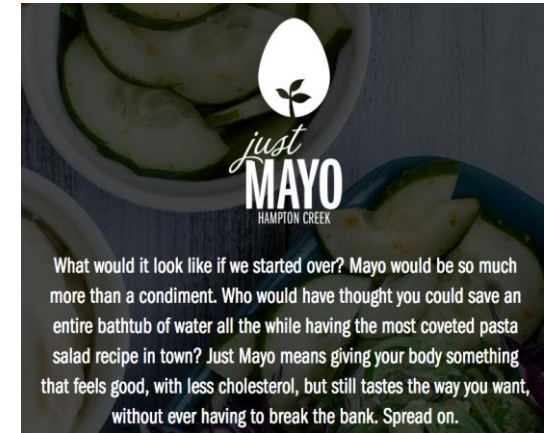


Annual worldwide demand for plant-based and animal proteins (in millions of tonnes/year)



Source: BIPE based on FAO data

- ◆ Increasing Consumer demand means that alternatives to meat & fish could claim up to 33% of the world's protein market by 2054





# Current Players

## Soy/Plant based



- Founded in 2003
- Acquired by Pinnacle foods for \$155M in Nov, 2014
- Most popular soy based meat alternative brand



- Founded in 2009
- [\\$17M funding in 2 rounds](#)
- Products found in several grocery stores
- Well known food critics have been fooled ([Bill Gates blog](#))

### Others:

Impossible Foods  
FoodsKraft(Boca)  
Kellog(Worthington)  
Pulmone(Wildwood)

## Lab grown meat



- Founded in 2014
- [\\$10M funding in Series A](#)
- Currently focusing on producing lab grown leather
- Working on R&D to produce lab grown meat

### Others:

Dr. Mark Post, a professor at Maastricht University, Netherlands produced a five-ounce hamburger using lab grown meat  
[How it works \(video\)](#)

# Barriers to Entry

- Culture of meat eating and ingrained habits
- Taste and texture of meat - hard to replace
- Understanding chemical composition of meat alternatives
  - FDA regulations compliance
  - Known & unknown health impact
- Political roadblocks by meat industry lobbyists

# Conclusions

- Industrialized meat production is unsustainable with growing population demands
- Over time it is natural for a conversion from meat towards sustainably produced alternatives
- Meat alternatives are viable, sustainable and profitable

