Most of us love meat....
But is it a fatal attraction?

**GREENHOUSE GASES**

- **Methane**: 39%
- **CO₂**: 5%

**Feed**
- 6.7 Pounds of grains and forage

**Water**
- 52.8 Gallons for drinking water and irrigating feed crops

**Land**
- 74.5 Square feet for grazing and growing feed crops

**Fossil Fuel Energy**
- 1,036 BTUs for feed production and transport. That's enough to power a typical microwave for 18 minutes.
“No challenge poses a greater threat to future generations than climate change”
- Barack Obama 2015
Environmental impact and animal welfare
but also food security risks
More income? More meat!
Global meat demand estimated to increase by 2050
WHAT CAN WE DO
Do nothing
Drivers of change: behaviour and technology

Technology

Replace

Rebuild

Reroute

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THE MEAT REVOLUTION
Replace meat with more sustainable products
Meat analogues are getting better
70 scientists / 5 years
- Large database with fundamental properties of natural plant proteins
- Deconstruct (meat) to molecular level
- Data analysis
- “Recipe building” to match meat properties → designing
- Big investments prior to first introduction (>200 mi. $)
- Introduced in 2017
Meat substitutes grow, but will remain relatively small...
Find truly transformative solutions
Reroute: Tissue Engineered meat
How does it work?

1. Biopsy of a small number of cells
2. Selection of “satellite” cells
3. Feed and nurture the cells so they multiply
4. Maturation and differentiation into muscle cells (fibers)
5. Harvesting and assembling the fibers into a burger

One cell sample taken from a living animal can create tons of cultured beef
How does cultured meat compare?

Environmental impact compared

- Conventionally farmed beef
- Lab grown beef

- Energy use: 55%
- Greenhouse gas emissions: 4%
- Land use: 1%

Source: Environment science and technology journal
Attitudes to in vitro meat: A survey of potential consumers in the United States

Published: February 16, 2017 • http://dx.doi.org/10.1371/journal.pone.0171904

Consumer acceptance

50%
The next steps: continue research towards production

1. Product research
2. Development and piloting
3. Regulatory
4. Construction

Year 0 - Year 4 - Year 6

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To the market ➔ possible scenario

- Small scale, premium, local
- Spreading of the technology
- Gradual development towards cost competitiveness
- Commoditizing, available in retail

2021 ➔ 2026 ➔ 2031 ➔ 2036

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THE MEAT REVOLUTION
We’re not alone……

Clara Foods

Modern Meadow

IMPOSSIBLE™

Hampton Creek

Perfect Day

SuperMeat

Perfect Day

Memphis Meats

Mosaic Meat

The Meat Revolution
Cell-Ag is coming