Can we feed 9 billion people sustainably in 2050?

Ian Roberts
Together we feed
~4 billion people per day
The cost of feeding the world today

- 24% of global GHG emissions is from agriculture
- 69% of total Water usage come from agriculture
- 1/3 of global energy goes into food production from field to table
- 1/3 of all food produced is waste
We have exceeded the limits of our planet for 2016

1.6 X
the resources that our planet can restore.

Our planet provides a finite amount of sustainable resources, including water, CO2 sequestration capacity, and land use. The day this finite amount is utilised is Earth overshoot day.

http://www.overshootday.org/portfolio/creditor-debtor
Every year we ‘achieve’ this earlier and earlier

Months until we overshoot by Year.

Carbon Sequestration: Inclusion of inorganic/atmospheric carbon (CO2) into organic compounds.

http://www.overshootday.org/portfolio/creditor-debtor
Global warming

**Atmospheric CO₂**

![Atmospheric CO₂](atmospheric_co2.png)

**Year-to-Date Global Temperature**

![Year-to-Date Global Temperature](year_to_date_global_temperature.png)

Scripps Institution of Oceanography NOAA Earth System Research Laboratory

www.esrl.noaa.gov
Food waste as key greenhouse gas emitter
Countries vs. food waste, 2005:

If Food Waste was a country, it would be the world's 3rd biggest CO2 emitter.

Undernutrition

159 m stunted Children, 90% of whom live in low and middle income countries
2.8% of global GDP
USD 2 trillion
Protein gap: 50% protein production increase necessary until 2050
Antibiotic resistance to become a major issue

50,000 deaths/y in EU & USA

2/3 of global antibiotic use is in livestock production

USD 100 trillions
GDP loss due to antibiotic resistance by 2050
The world population growth

9 bn by 2050

11 bn by 2100
We can not wait for politics
We must drive equitable growth

40% rise in global GDP 2010-2020

24% of world population are now middle class

80 richest people own as much as the poorest 3.5bn

65 m forcibly displaced people in 2016
Industry must step up to the challenge

Develop sustainable businesses by leading for future generations.
Solutions

- Nutrition
- Food Safety
- Sustainability
- Internet of Things
Why we will have a protein challenge in future.

Today, we produce 525 mio t primary proteins

- We lose 45% through animal conversion
- We need 50% more protein in 2050
- Meat consumption
- Arable land per capita

Today, we produce 525 mio t primary proteins
It needs a systemic change.

- **Plant proteins**
  - 50% environmental impact

- **Insects**
  - 70% nutrient recycling from waste

- **Algae**
  - 6x more protein per hectare

**Plant-based diet**

**Eliminate waste**

**Sustainable feed**
How do we feed our gut microbiome?

• 1-3 % of body weight
• 500 - 1000 types in healthy people
• 36000 different types
• highly influenced by diet
• metagenomic patterns for auto immune conditions
  (ulcerative colitis, crohns disease or celiacs)
Food safety steps to future

GMP/Hygienic Design
Reduce risk and clean efficiently

Validation of processes & Kill Steps

Non-Thermal Processing
Maintain the nutrition

Selective Kill Steps
Maintain the good bacteria

Bühler Networking Days 2016
25% of global crops impacted by mycotoxins

Food and Nutrition Sciences, 2011, 2, 751-758

Occurrence of Fungi and Mycotoxins in Some Commercial Baby Foods in North Africa

Agriculture | Storage | Transportation | Mill | Food processor | Retailer | Consumer
30% of food is lost or wasted
Energy efficient drying solutions make the difference
The digital opportunity enables disruptive business models
Sensors, low cost data storage, massive connectivity

MyBühler
The dawning of autonomous systems.

Gimball
Flyability

3D microelectronics printer
Voxel8

Sawyer
Rethink Robotics
How big data will change business and life

> 10% business productivity

14 billion connected devices by 2022

90% of internet users bank online

65% of kids today will do jobs that haven’t been invented yet
Collaborative Innovation Model
Up to 5% of our turnover are invested in Research & Development.

Strategic partnerships

Entrepreneurial employees
- 4'000 registered
- 2'000 voted
- 50 trained
- 2 new products and 2 services developed

Urs Bühler Innovation Fund

Integration of customers and suppliers

Global academic networks

Bühler Networking Days 2016
The global talent pool is already connected
The millennials are coming.
Can we feed 9 billion people sustainably by 2050?

Agriculture  Storage  Transportation  Mill  Food processor  Retailer  Consumer

New technologies  New business models  High transparency  Collaboration
Innovations for a better world.