



FOOD-Security: ebeam's role in securing the world's food supply

EUCARD2, Warsaw, Poland

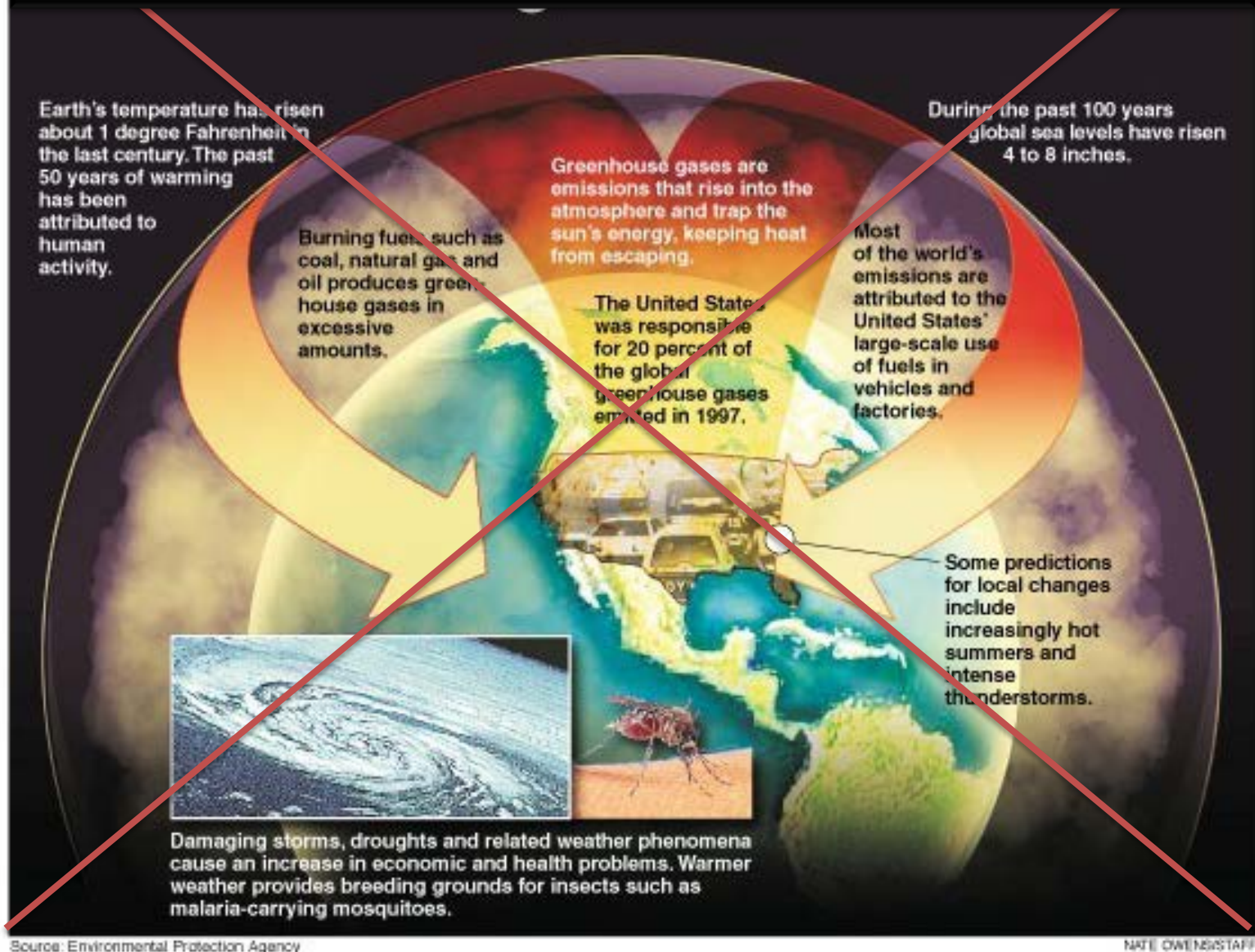
Dr. Gregor Hommes, Business Development Manager

ebeam



Houston, you have a problem!

the human species

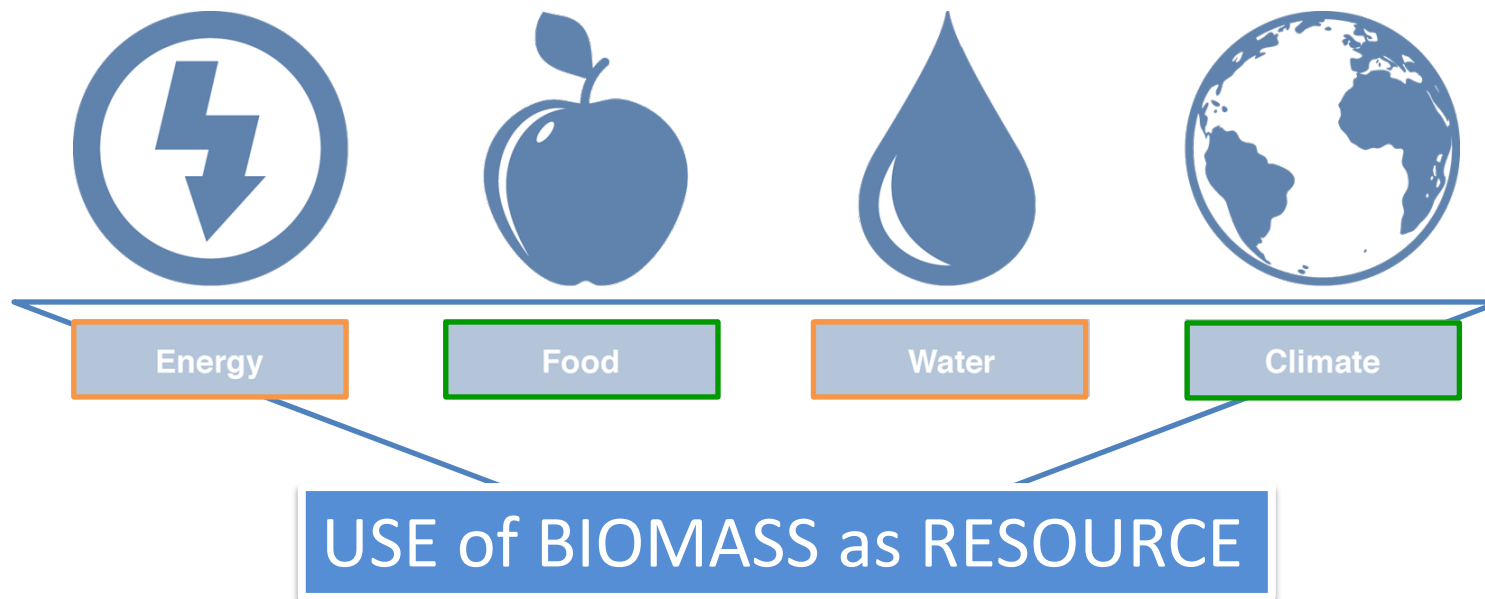


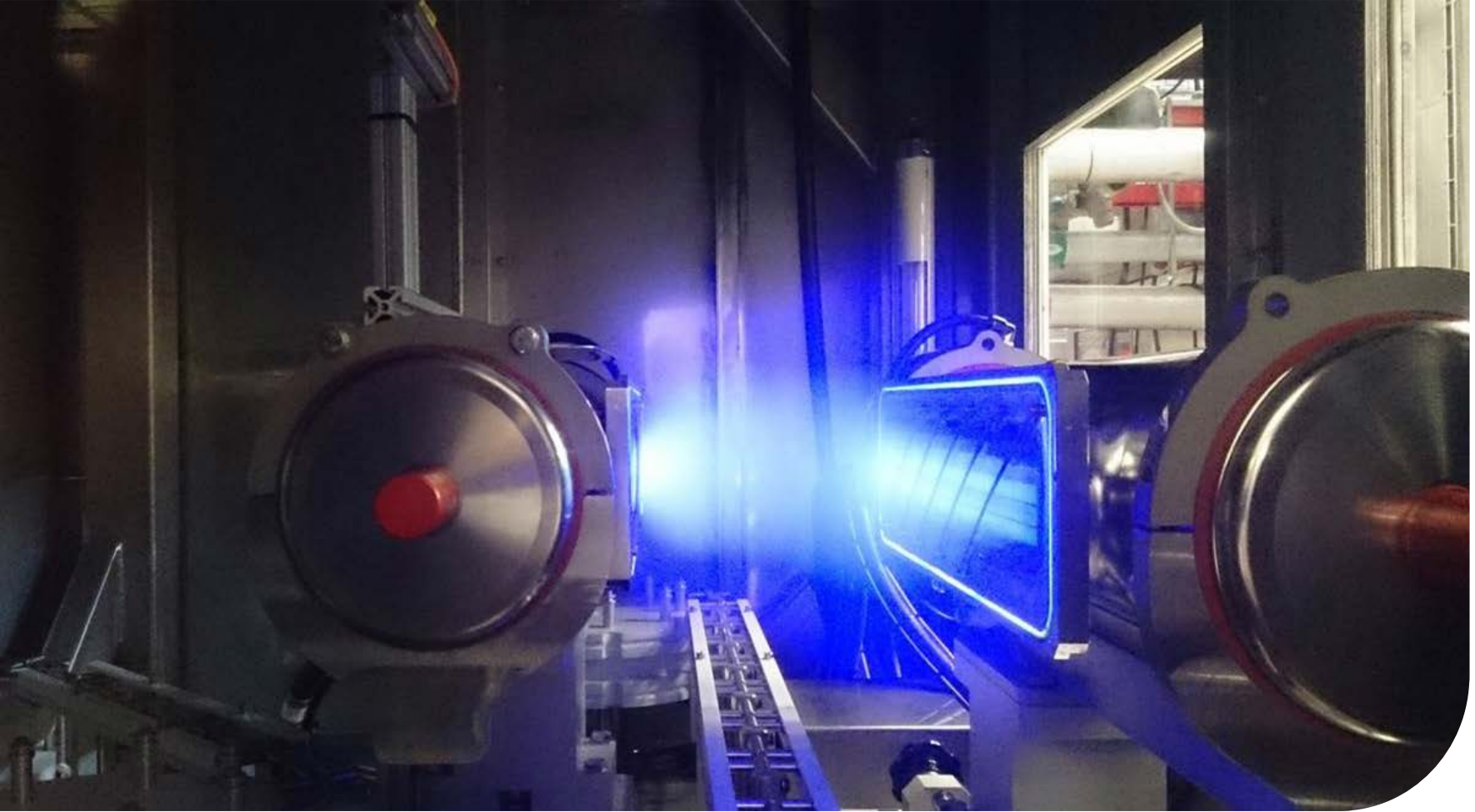
- ~~decrease the number of people~~
- decrease the rate of resource consumption
- protect the biosphere
- increase the production rate of renewable resources
- growth, profit & power

ebeam

Biomass will solve all our problems!?

Megatrend:





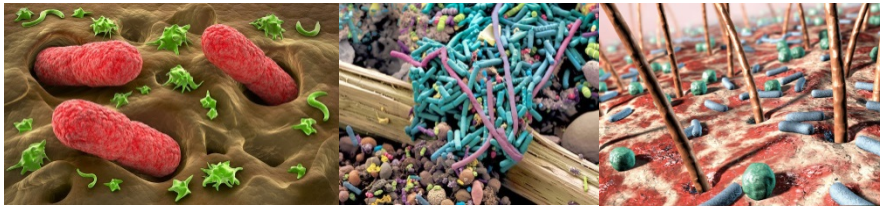
How can ebeam contribute
to sustainable food production

ebeam

Cells & ebeam

Food & Feed-, Bio-, Medical-, Pharma- Technologies

1 Market Driver - Our Race against Pathogens



The matrix of pathogens in our ENVIRONMENT

- a. Livestock production
- b. Human medicine / multi resistance against antibiotics
- c. Environmental hygiene
- d. Global food/feed safety

→ What are the alternative solutions?

ebeam Technologies

Food & Feed-, Bio-, Medical-, Pharma- Technologies

4

markets, but

1

issue

BIOSAFETY

FOOD



BIO



MED



PHARMA



FOOD & ebeam

post-harvesting losses & global food safety/security

2 main benefits for the planet

Protection of agricultural resources

up to 20% more food
without increasing
the production
intensity

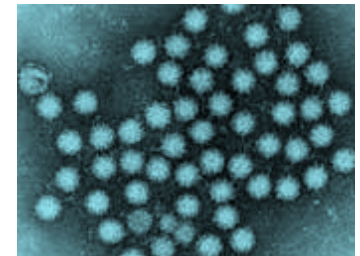
sustainable killing step for

- insects
- bacteria
- fungi
- viruses



Protection of humans & animals

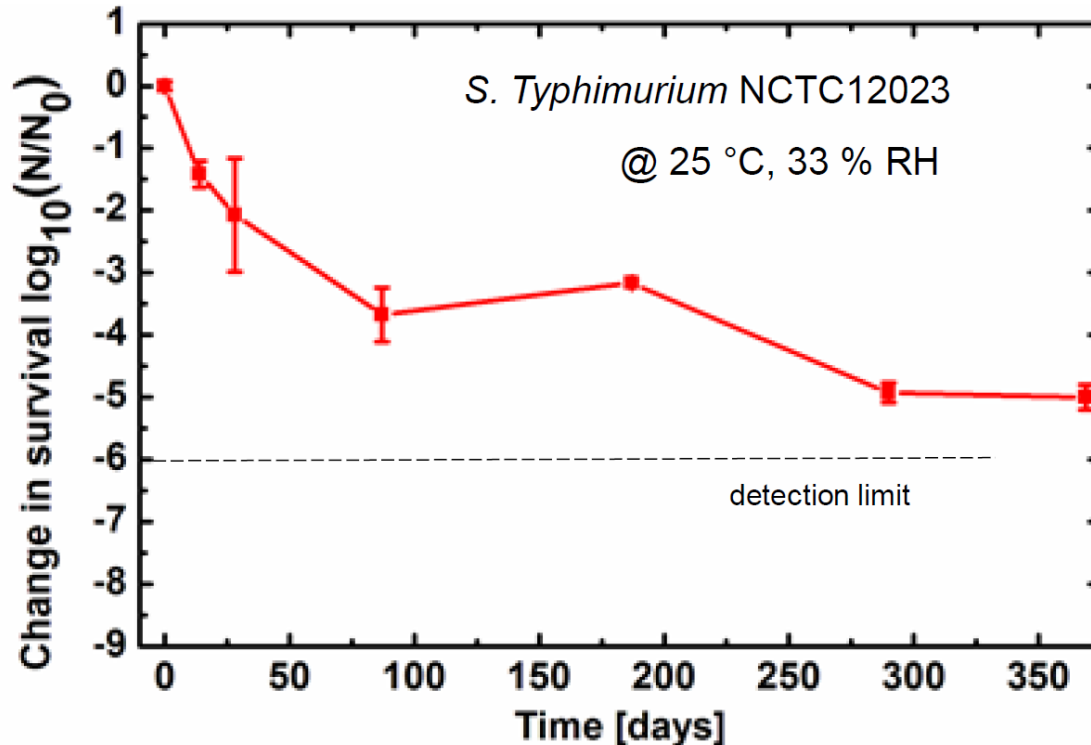
- preventing transmission of human pathogens via global Food & Feed production chains
- improved hygiene standards
- no new development of multi-resistant pathogens



- toxin-free

FOOD & ebeam

do we know all vehicles & carriers for global transmission?



Margas, E., Meneses, N., Conde-Petit, B., Holah, J. and Dodd, C. (2014) Survival and death kinetics of *Salmonella* strains attached to the surfaces. *Journal of Food Microbiology* 187:33–40

S. Typhimurium
is able to survive on
stainless steel

Why not on food and
feed?

If *S. Typhimurium*
can survive, which
pathogens have the
same capabilities?

...and which ones have
even better chances?

FOOD & ebeam

global food safety/security

TOP 5 of food born illnesses

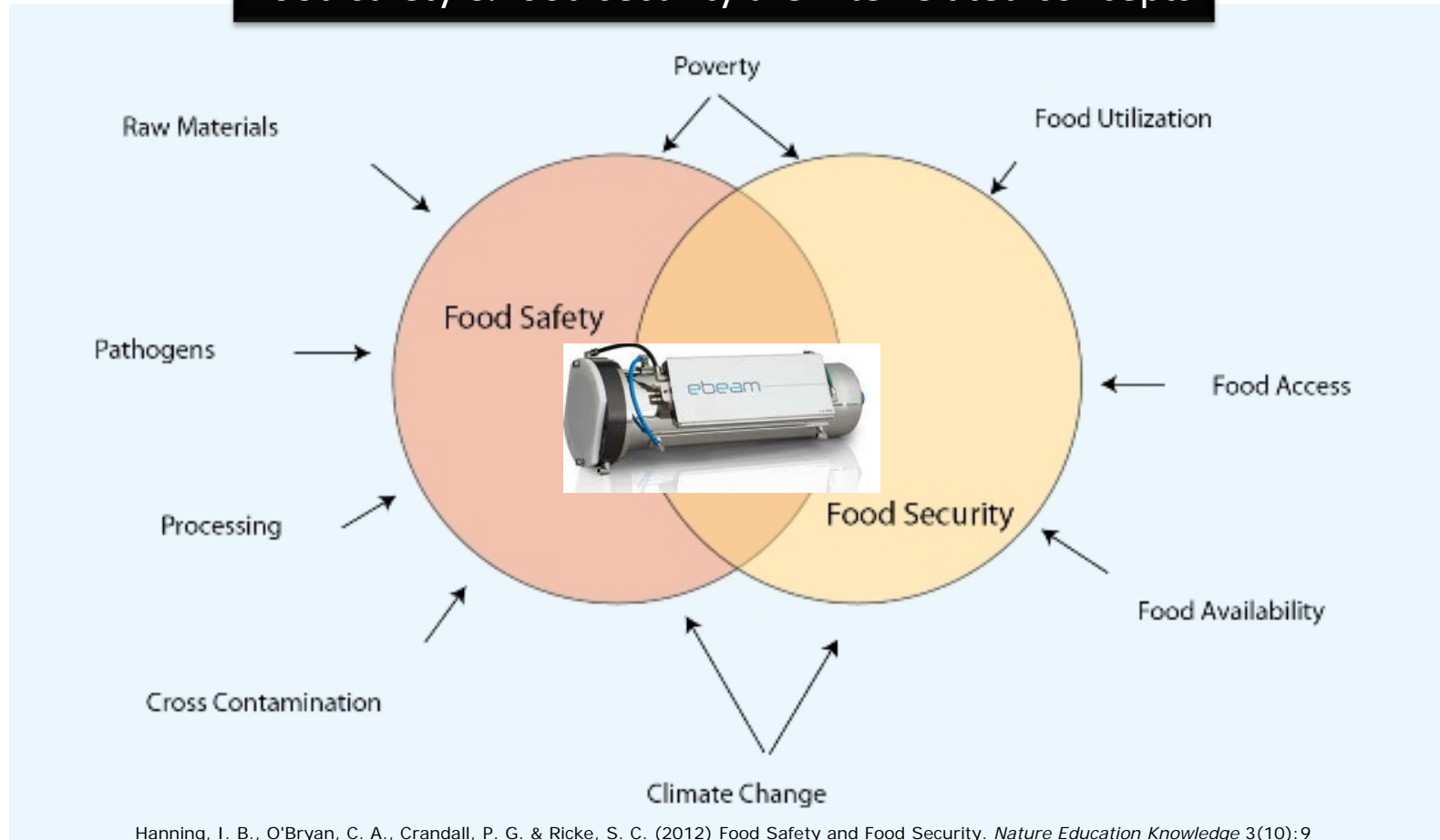
Pathogen	Estimated number of illnesses	%
Norovirus	5,461,731	58
<i>Salmonella</i>	1,027,561	11
<i>Clostridium perfringens</i>	965,958	10
<i>Campylobacter spp.</i>	845,024	9
<i>Staphylococcus aureus</i>	241,148	3
Subtotal	USA, annually	91

economic impact

ebeam – our position within the FOOD industry

Food safety & Food security

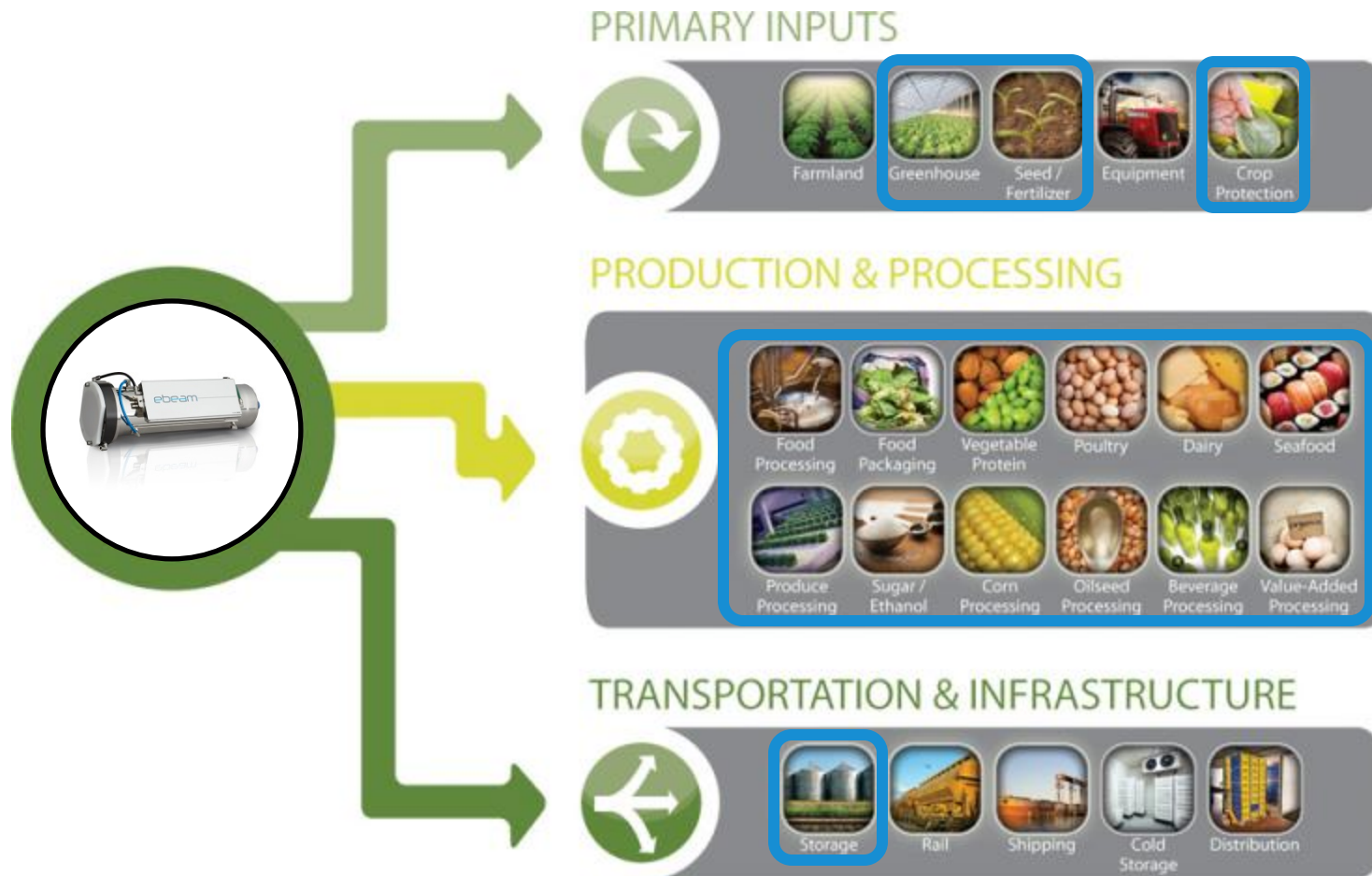
Food safety & food security are interrelated concepts



Hanning, I. B., O'Bryan, C. A., Crandall, P. G. & Ricke, S. C. (2012) Food Safety and Food Security. *Nature Education Knowledge* 3(10):9

ebeam – our position within the FOOD industry

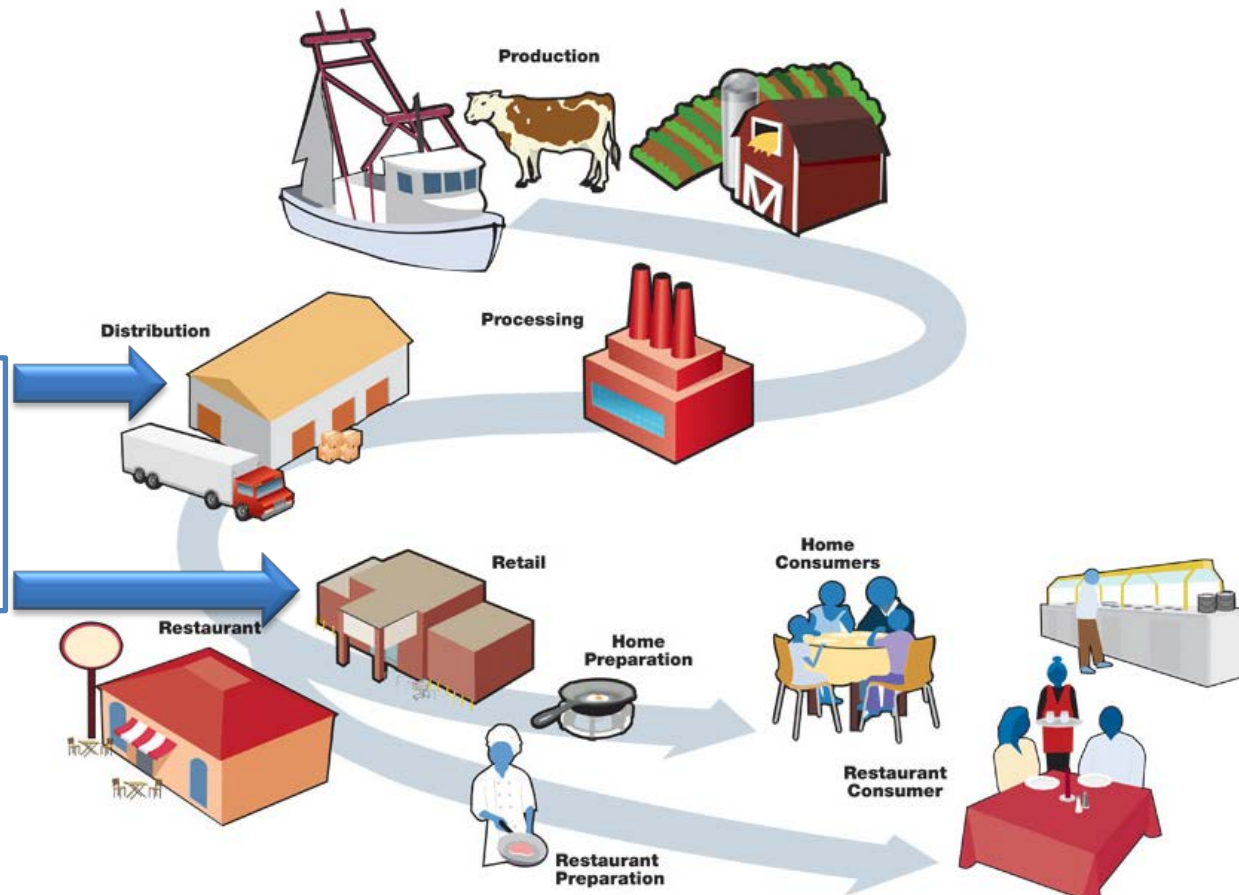
sustainable Food & Feed production



ebeam

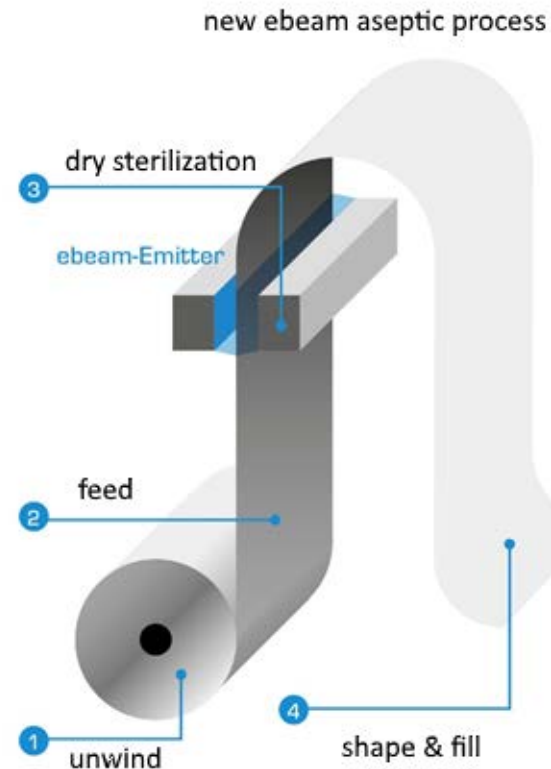
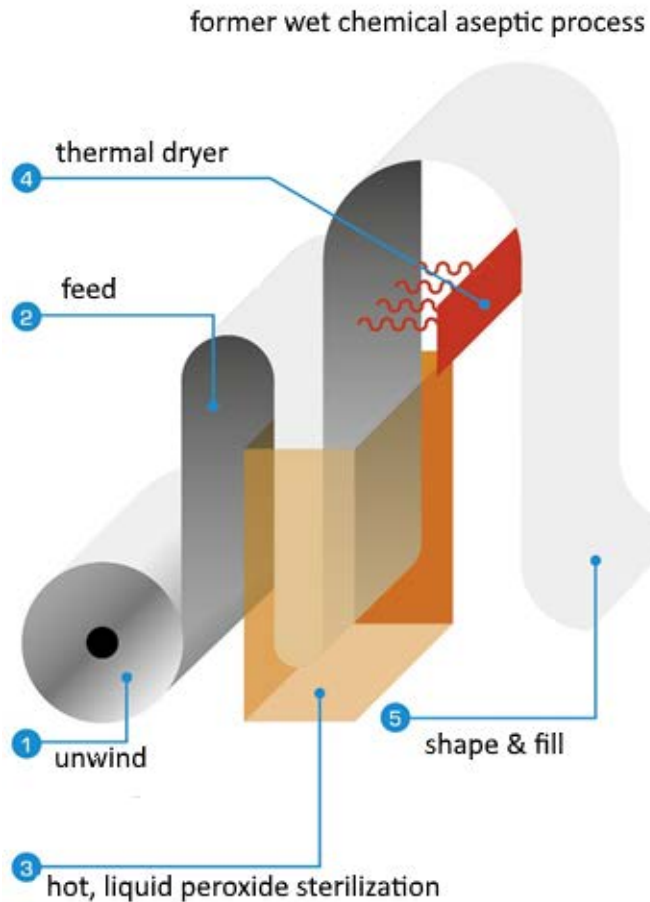
within the Food Production Chain

The Food Production Chain



ebeam for the masses

Tetra Pak – sustainable sterilization



ebeam

It`s Green Technology but this is NOT enough



-80%

-40%

-100%

ebeam

Blue is the new Green – Blue creates Market Pull



-80%



-40%



-100%



+165%



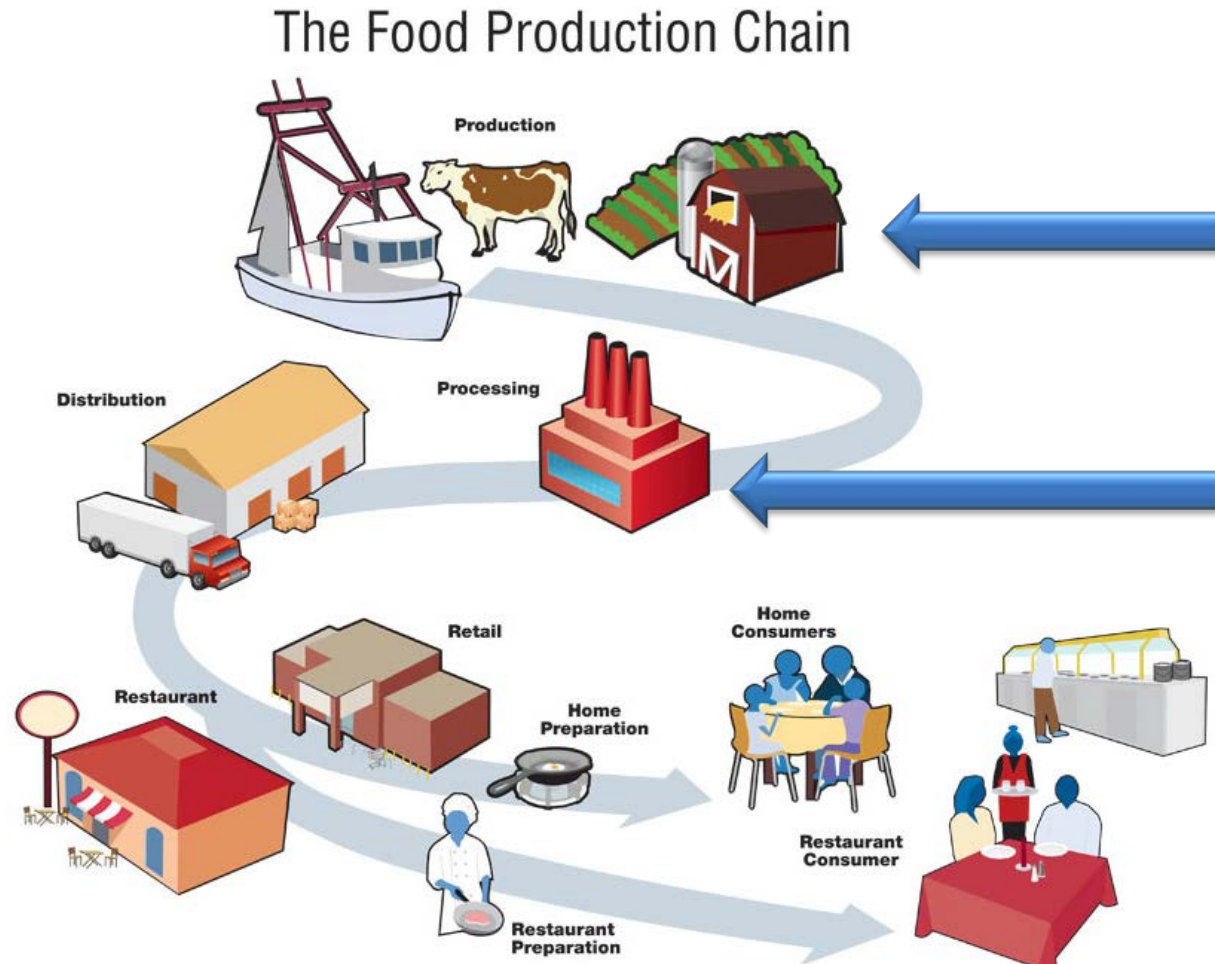
-30%

ebeam inkjet printing

on food packages



- safe inks
- 100% curing
- safe packaging material
- 0% migration of uncured compounds
- 0% migration of transformation products



DISINFECTION

- food safety
- shelf lifetime extension
- post harvesting losses
- resource efficiency

KILLING STEP

—
ebeam
*inactivation of
(micro)organisms*
—

ebeam

killing
me
softly



ebeam – examples for applications

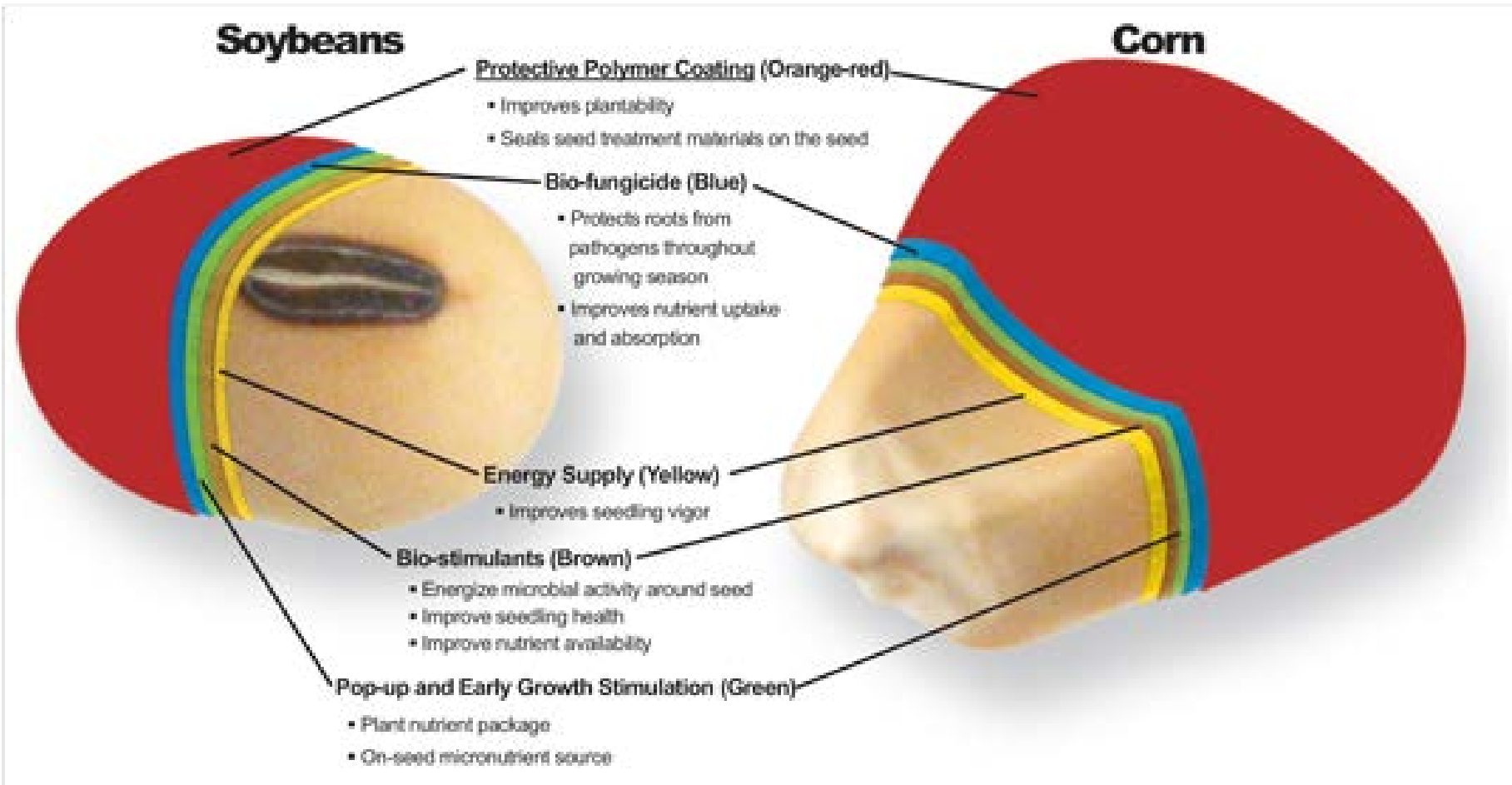
3D-surface disinfection



biosafety

printing, coating, curing...





Inactivation of (μ)organisms on dry food stuff

existing technologies ≠ available solutions

Existing technologies

- steam hot air (STD)
- radiofrequency
- microwave
- ohmic heating
- high pressure
- shockwaves
- ultrasound
- pulsed electric fields
- ebeam
- cold plasma
- ultraviolet
- pulsed light
- infrared
- Super critical CO₂
- chemicals & gases

ebeam and food

statement: European Food Safety Authority

The European Food Safety Authority reviewed all evidences and reasserted the opinion that food irradiation is safe (EFSA, 2011)!

It was concluded:

- (i) that there are **no microbiological risks** for the consumer linked to the use of food irradiation and its consequences on the food microflora, and

How applicable is ebeam on food & feed *considering the current legislation*

- no differentiation between high & low energy
- dose uniformity ratio
- maximum dose limits vs. max. surface dose limits

food = emotion

- How to deal with consumer emotions?
- How can we «sell/communicate» low energy ebeam?
- Is there a why to separate low energy electron beam from high energy electron beam?
- Do we have a clear definition of what low energy electron beam is?

legislation & consumer issues

irrational fears vs. realistic threats

"The National Center for Policy Analysis (2004) carries estimates (advanced by CDC based on Osterholm *et al*, 2004) that if half the food at greatest risk consumed in the USA were to be irradiated, **food-borne illnesses would decline by 900,000 cases annually and by 352 deaths.**"

Institute of
Food Science
+ Technology **ifst**



ebeam

ebeam

sustainable Food & Feed production

Megatrend:



Energy



Food



Water

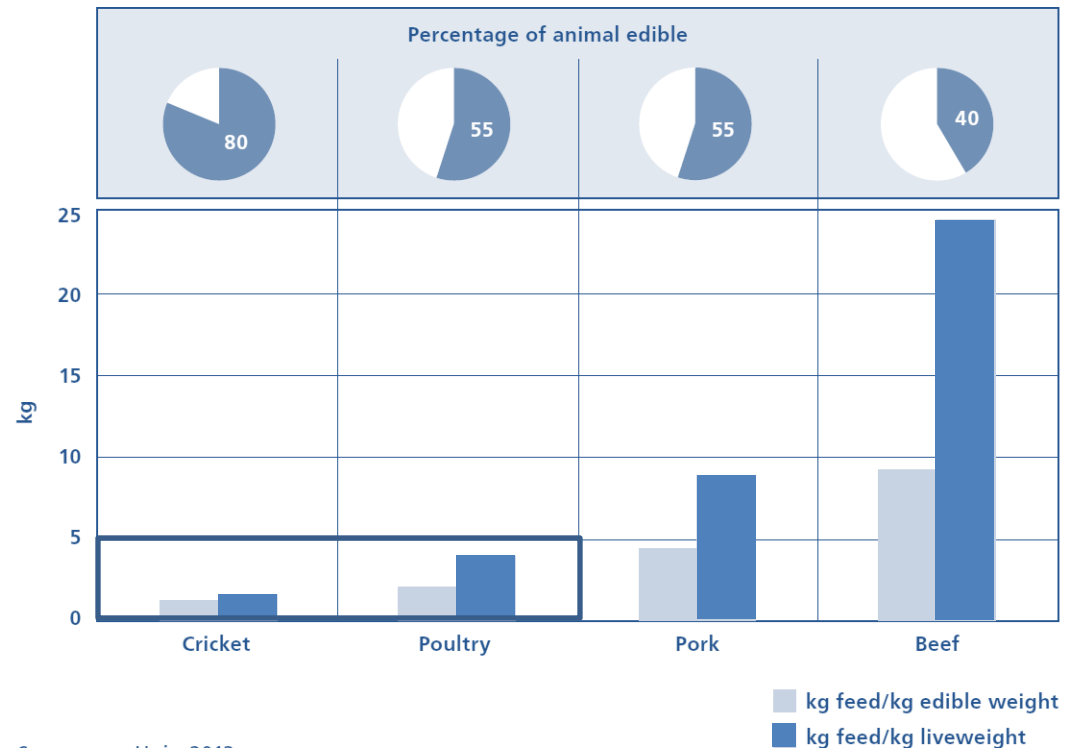


Climate



Meat consumption
will increase to 465
million tons by 2050

Efficiencies of production of conventional meat and crickets



Source: van Huis, 2013.

What will be our future protein source?

ebeam

Novel Foods

sustainable diets as strategy against resource scarcity

Megatrend:



Energy



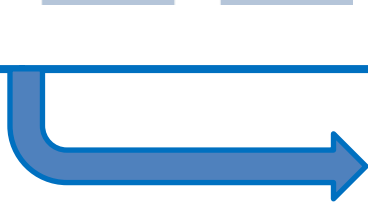
Food



Water

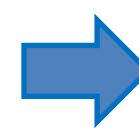
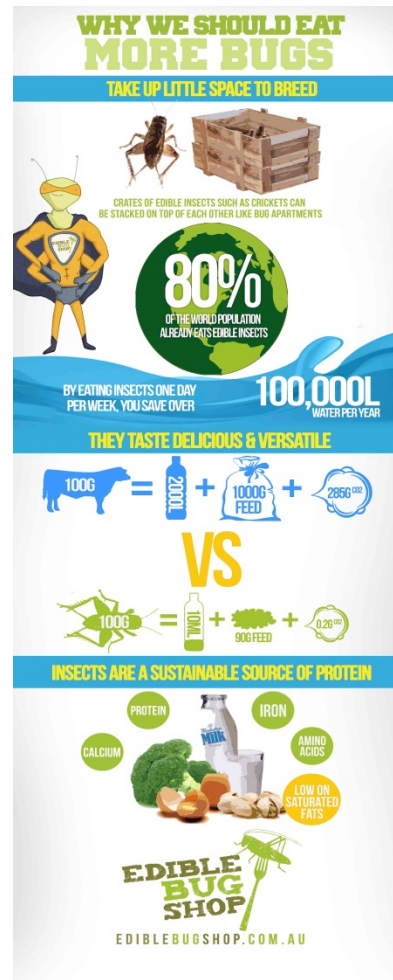


Climate



Future Protein Source?

- synthetic meat
- algae based food
- insect based food

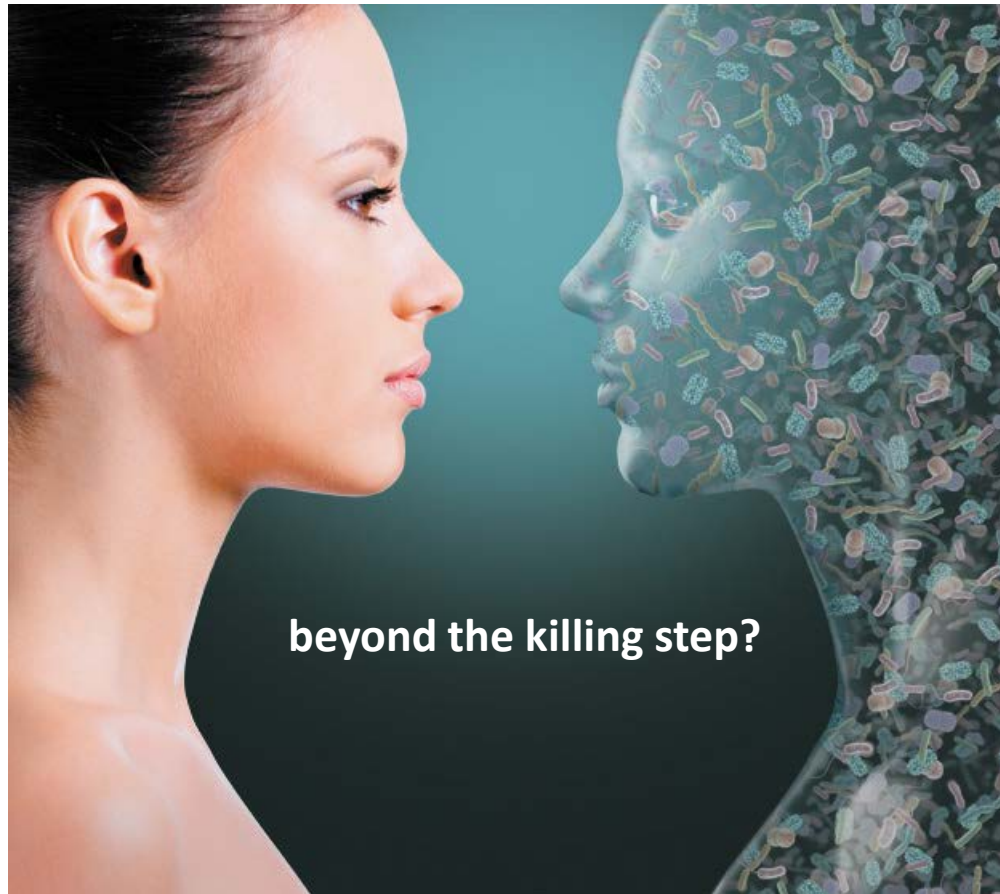


Industrialization of insect rearing

- scale
 - quality
 - industrial standards
- food safety
- pest control

ebeam

from food security to microbiome design



why?





Thank you for your attention!