



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

uv.eb West, San Francisco

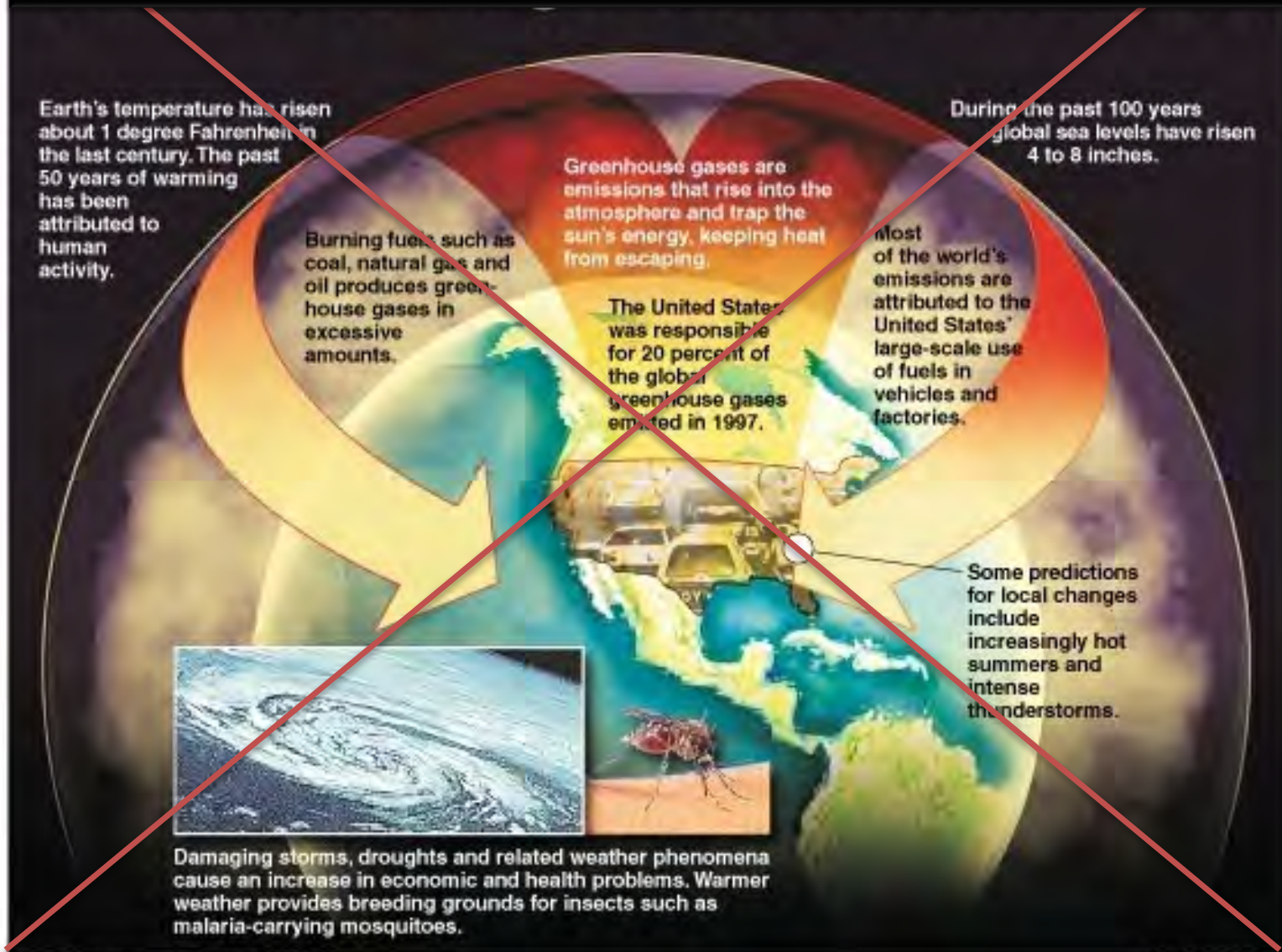
Presented by – Karl Swanson, V.P. Global Sales

Prepared by - Dr. Gregor Hommes, Business Development Manager

ebeam



the human species



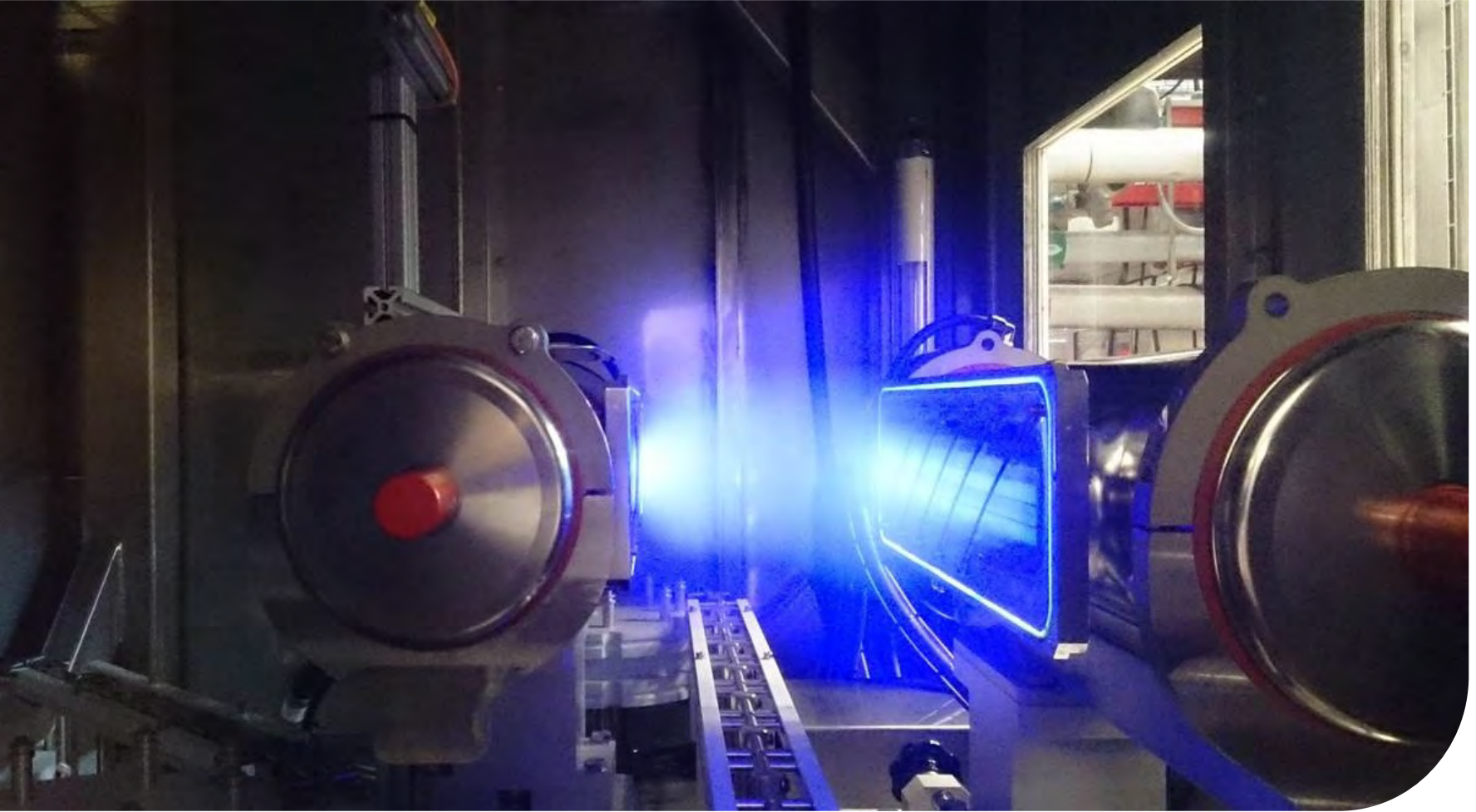
Source: Environmental Protection Agency

NATE OWEN/STAFF

How to meet these challenges?

Possible actions

- ~~Decrease the number of people~~
- Decrease the rate of resource consumption
- Protect the biosphere
- Increase the production rate of renewable resources



Sustainable Food Production

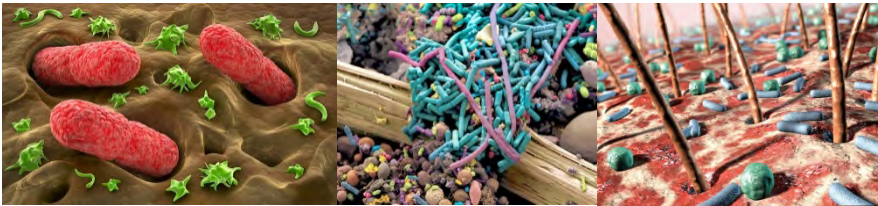
How ebeam contributes

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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

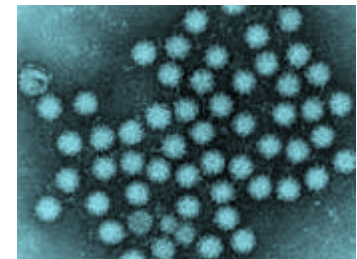


Sustainable killing step for:

- insects
- bacteria
- fungi
- viruses

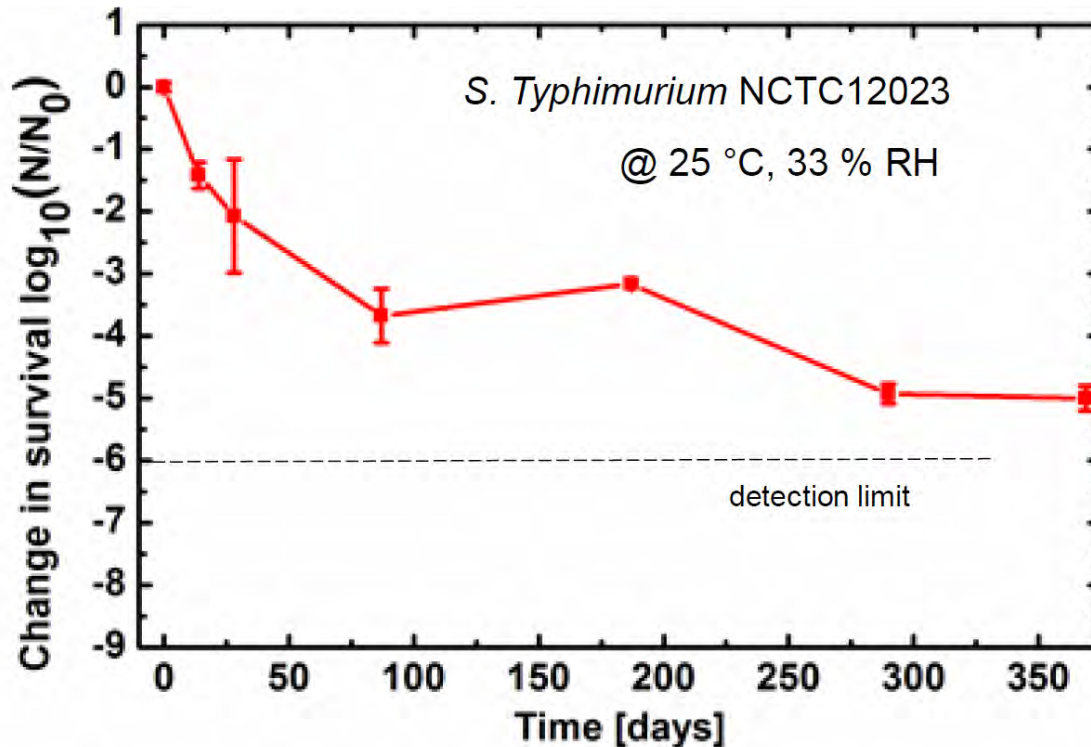
Protection of humans & animals

- 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?

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Global food safety/security

TOP 5 of foodborne 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	8,541,422	91

Huge economic impact

ebeam – Position within the food industry

Food Safety & Food Security

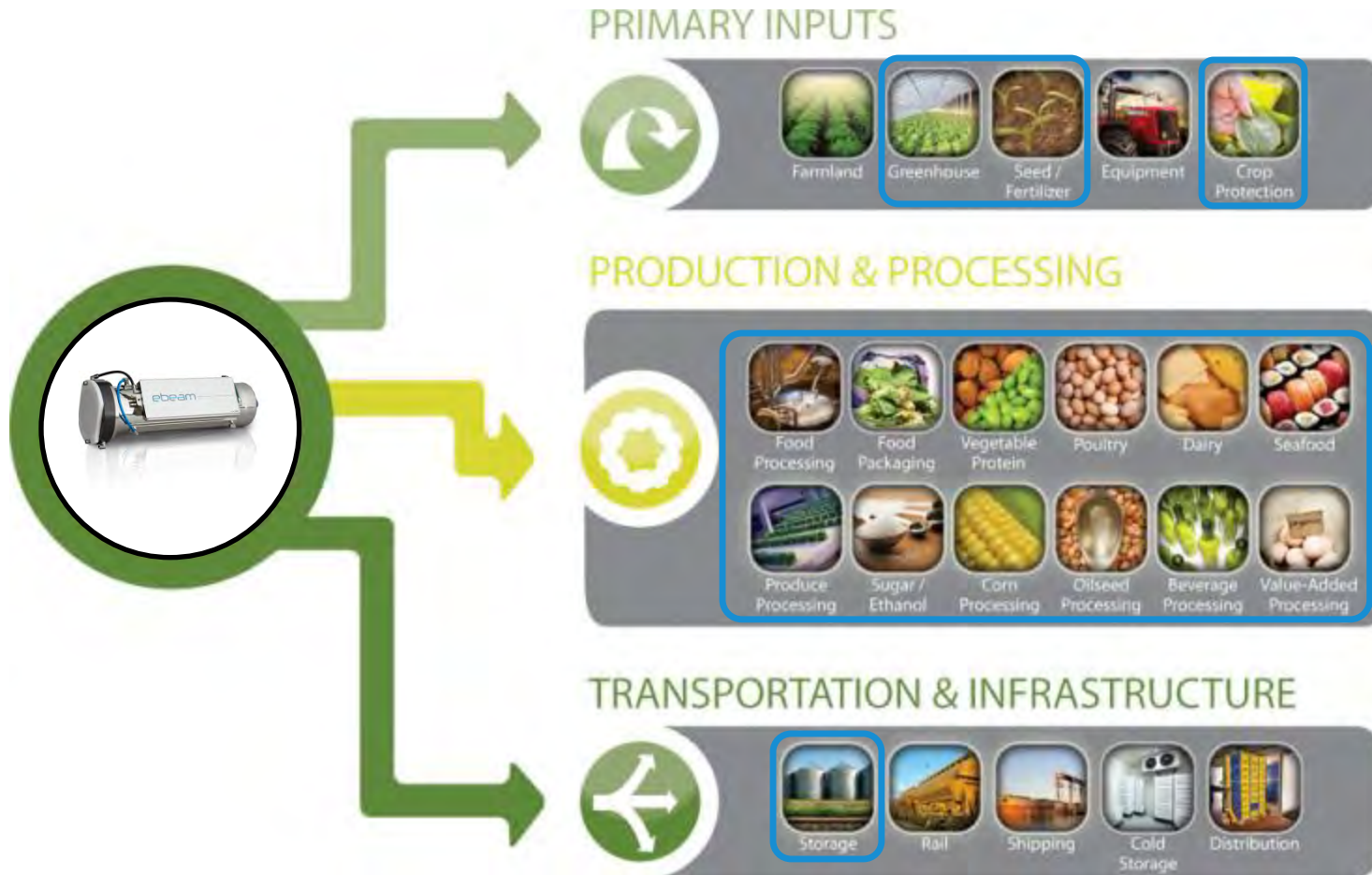
Food Safety & Food Security are interrelated concepts



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 – Position within the food industry

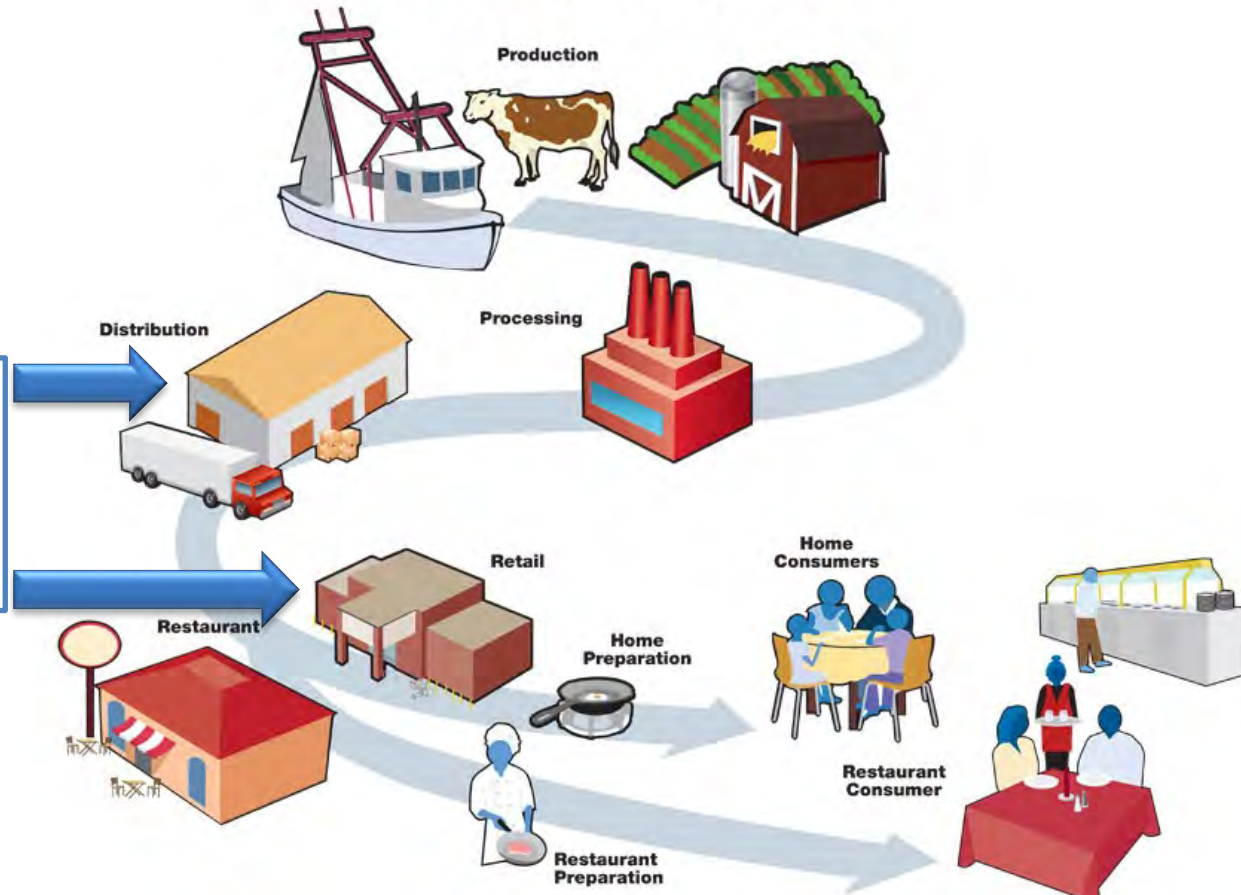
Sustainable Food & Feed Production



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Within the Food Production Chain

The Food Production Chain



ebeam Inkjet Printing

For food packaging

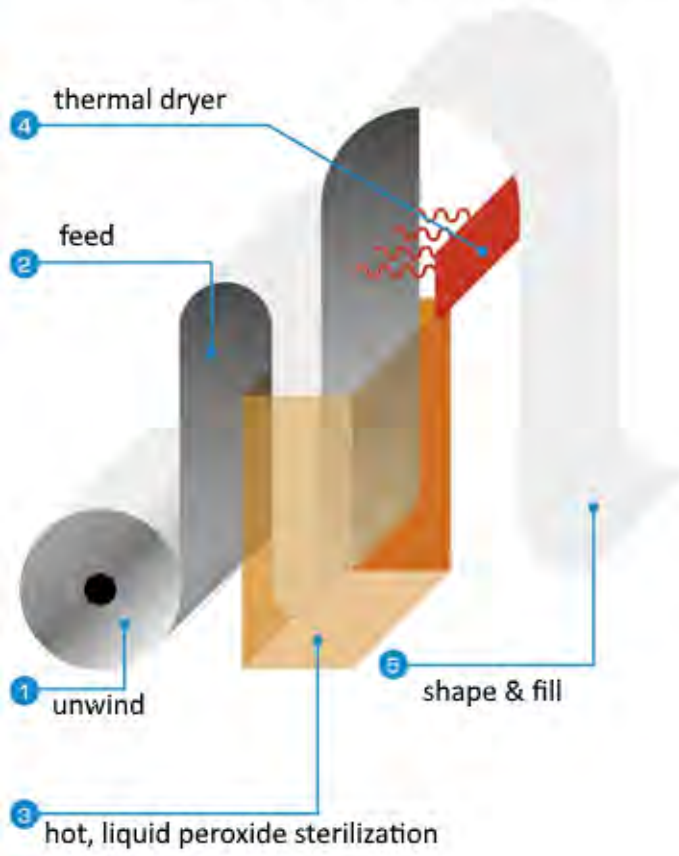


- Safe inks
- 100% curing
- Safe packaging material
- 0% migration of uncured compounds
- 0% migration of transformation products

ebeam for Food Packaging

Tetra Pak – Sustainable Sterilization

former wet chemical aseptic process



new ebeam aseptic process



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It`s "green" technology but this is NOT enough



-80%

-40%

-100%

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"Blue is the new green" – Blue creates market pull



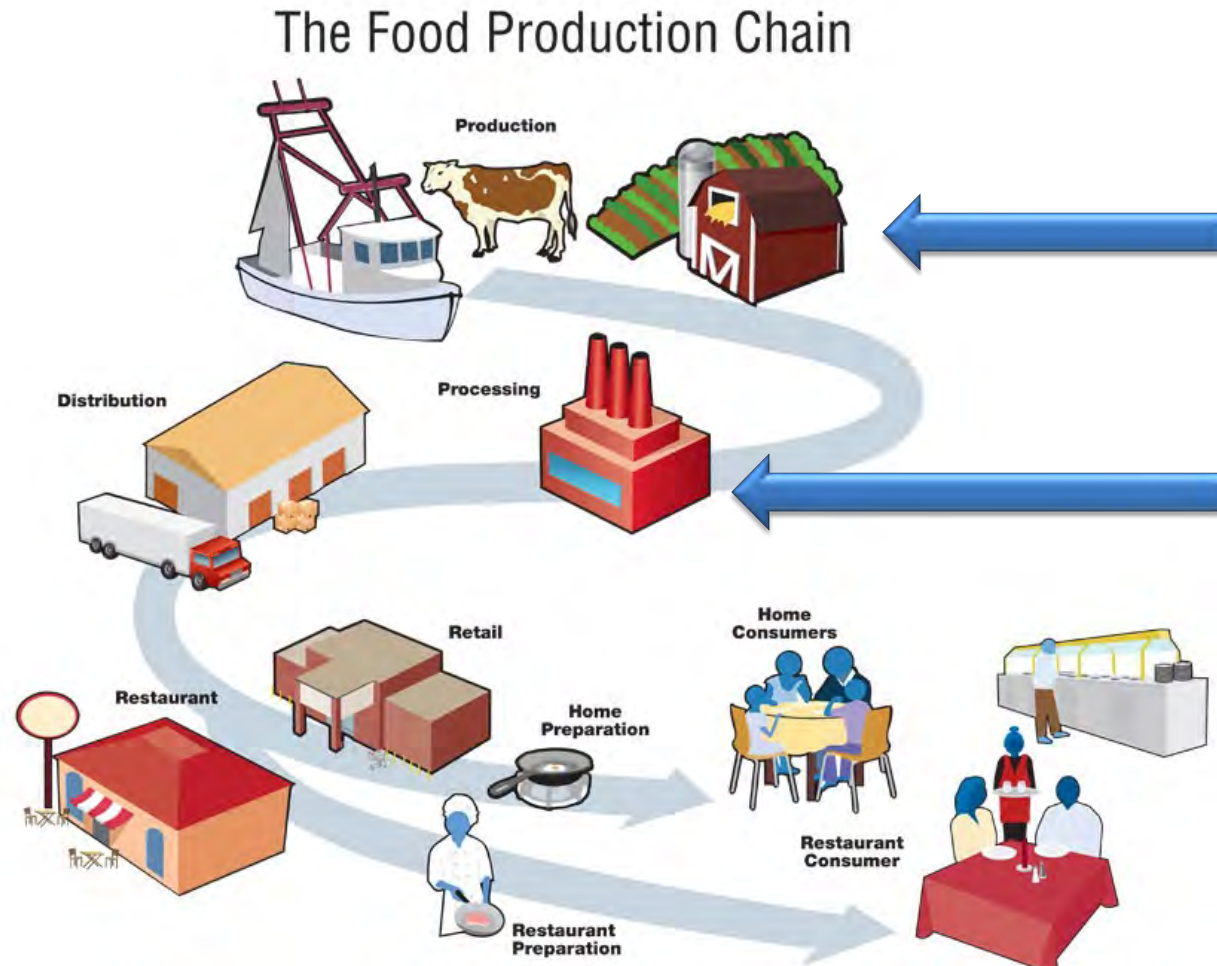
-80%

-40%

-100%

+165%

-30%



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



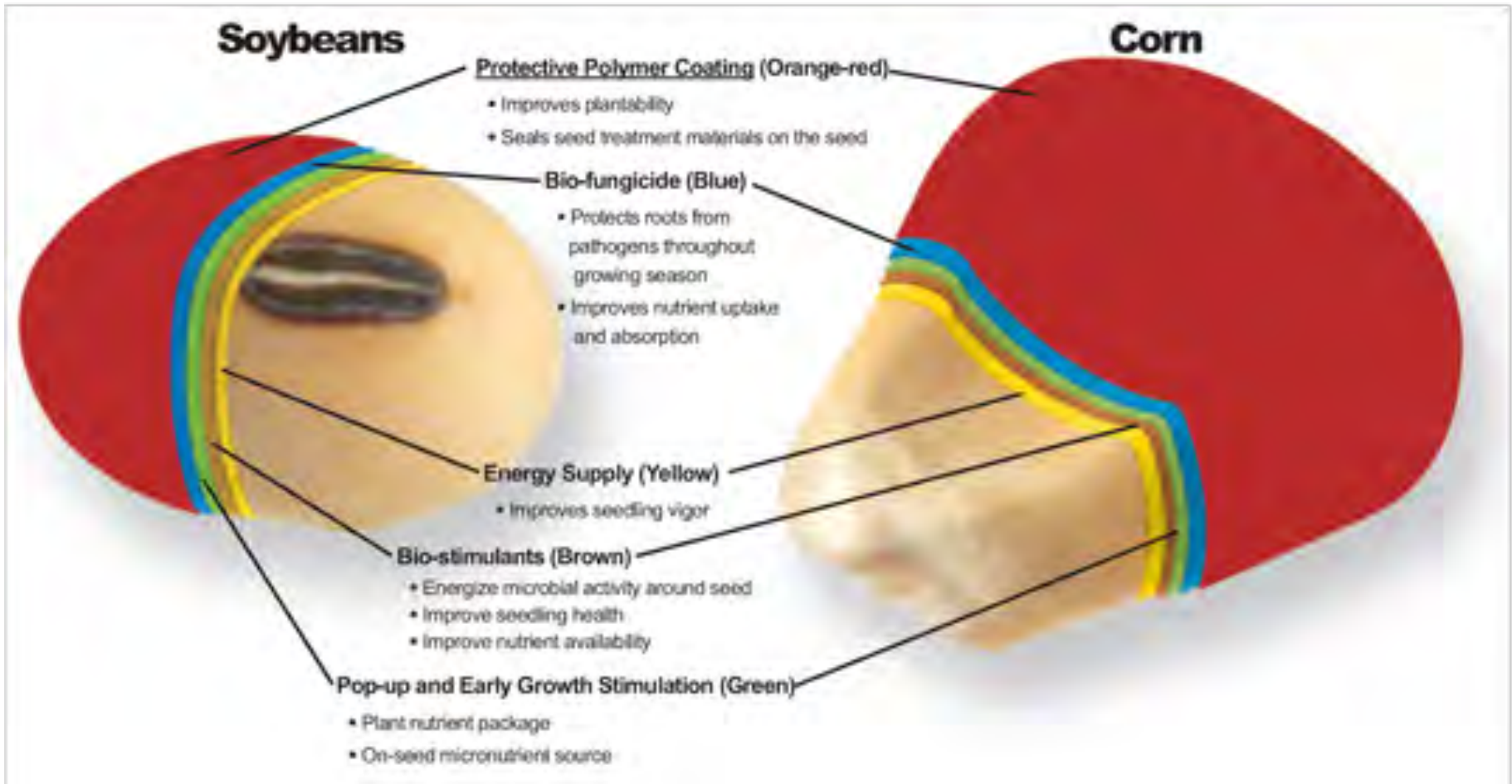
Biosafety

Printing, Coating, Curing...



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Advanced Seed Solutions



Inactivation of (μ)organisms on dry food stuff

Existing technologies \neq 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

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

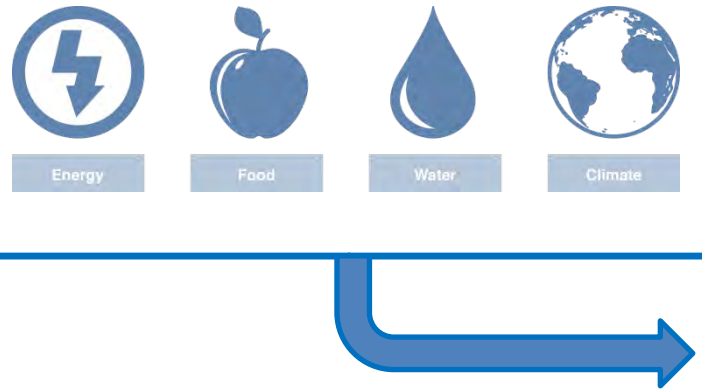
Irrational fears vs. realistic threats

“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**

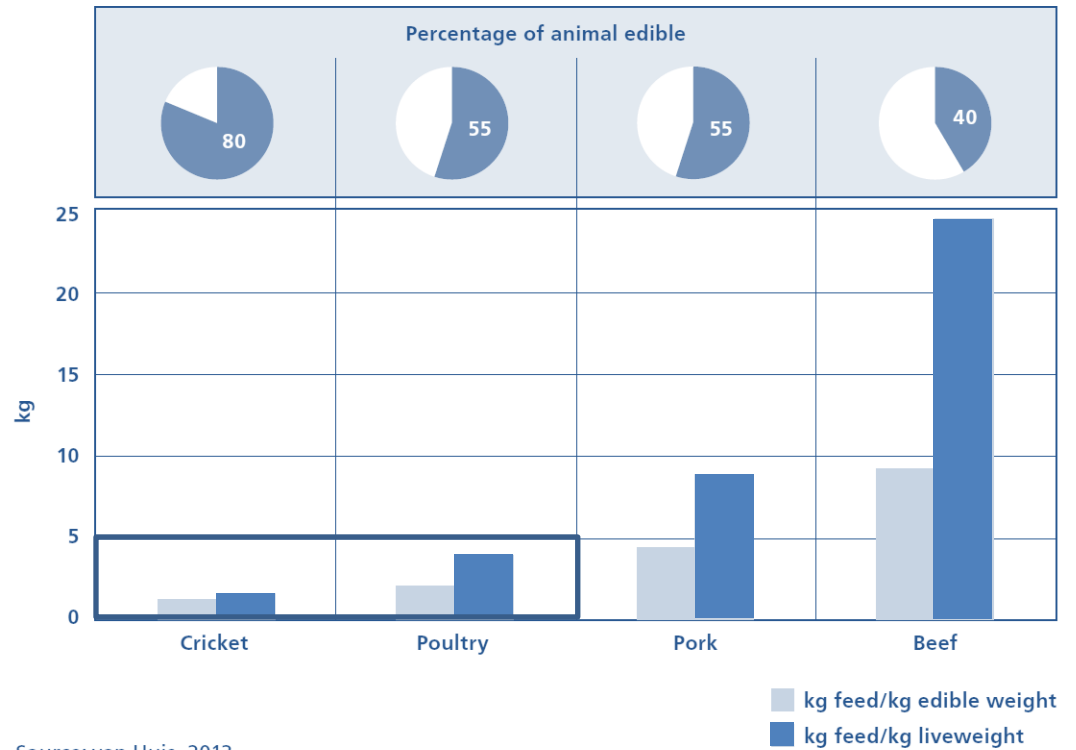


Megatrend:



Meat consumption will increase to 465 million tons by 2050

Efficiencies of production of conventional meat and crickets



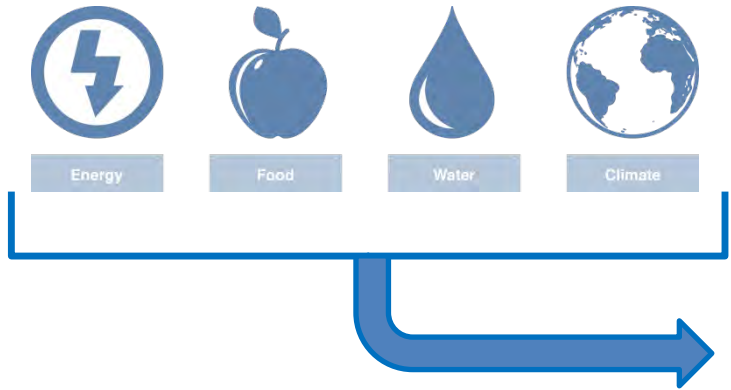
Source: van Huis, 2013.

What will be our future protein source?

Novel Foods

Sustainable diets as strategy against resource scarcity

Megatrend:



Future Protein Source?

- synthetic meat
- algae based food
- insect based food

WHY WE SHOULD EAT MORE BUGS
TAKE UP LITTLE SPACE TO BREED

CRATES OF EDIBLE INSECTS SUCH AS CRICKETS CAN BE STACKED ON TOP OF EACH OTHER LIKE BUG APARTMENTS

80% OF THE WORLD POPULATION ALREADY EATS EDIBLE INSECTS

BY EATING INSECTS ONE DAY PER WEEK, YOU SAVE OVER **100,000L** WATER PER YEAR

THEY TASTE DELICIOUS & VERSATILE

100G COW = 2000L WATER + 1000G FEED + 2850g CO₂

VS

100G INSECT = 200L WATER + 90G FEED + 0.20g CO₂

INSECTS ARE A SUSTAINABLE SOURCE OF PROTEIN

PROTEIN, IRON, AMINO ACIDS, CALCIUM, LOW ON SATURATED FATS

EDIBLE BUG SHOP
EDIBLEBUGSHOP.COM.AU

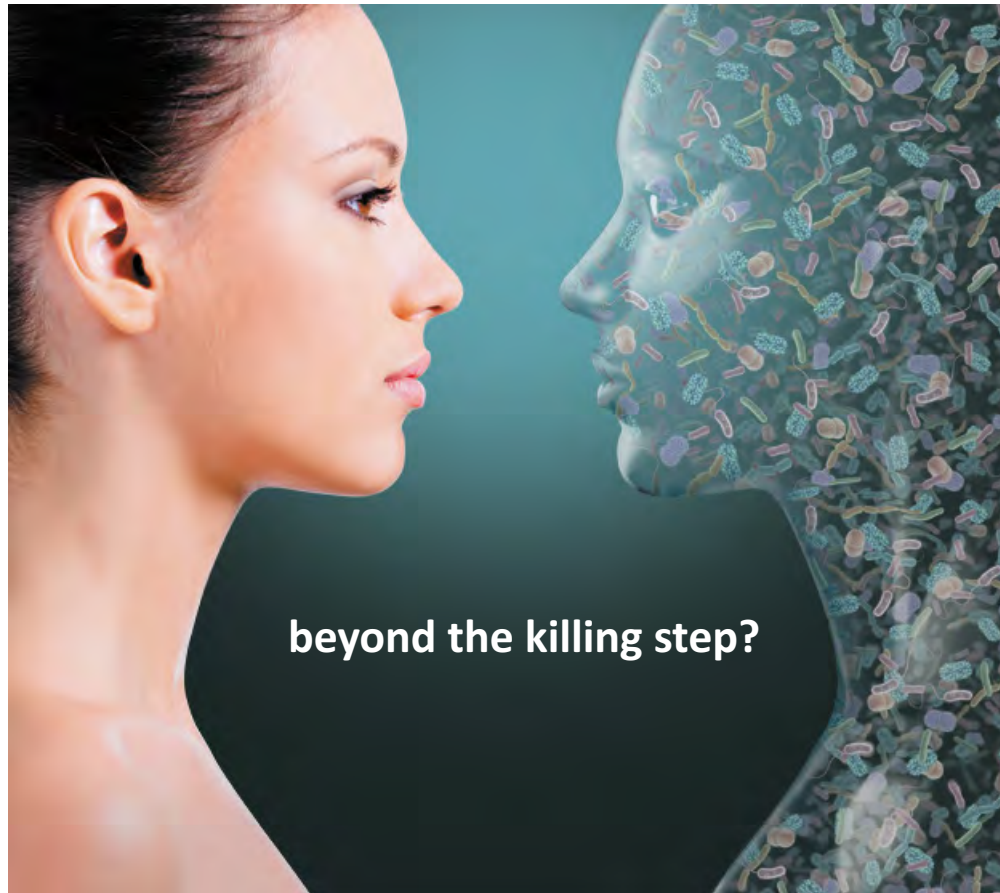


Industrialization of insect rearing

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

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From food security to microbiome design



beyond the killing step?

Why?





Thank you for your attention!