The Future of Food

WHAT ARE THE ISSUES?

1. The Challenge of feeding the world
   - Food production, distribution, preservation
2. How to produce more?
3. What to produce?

The Challenge of Feeding The World

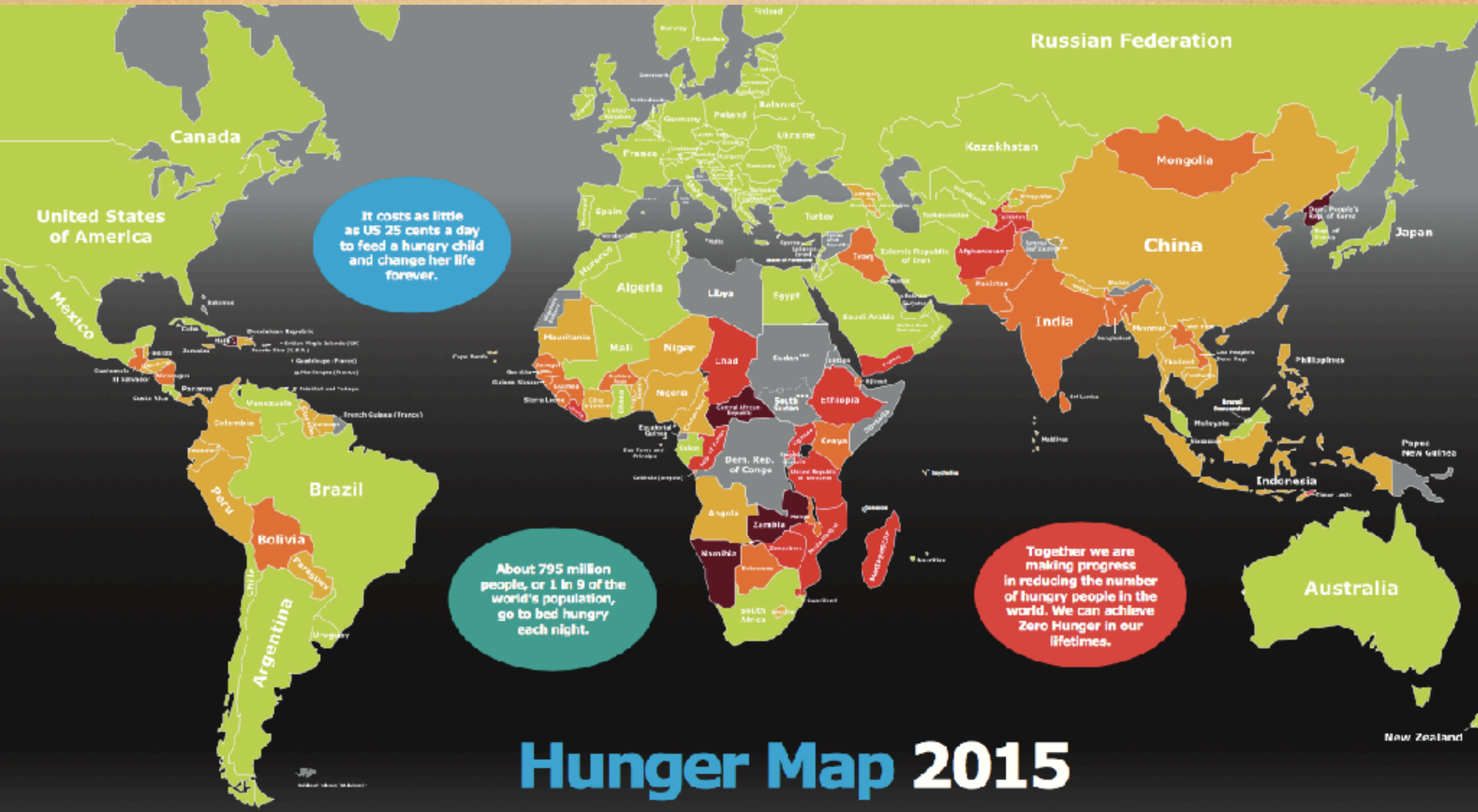
Hunger and malnutrition are already global problems.

- We have ~1 bn people going hungry or malnourished

- We will have 2 billion more *people to feed in 2050*

- We need a 60-100% increase in global food production to feed the planet

Visit: fao.org



Hunger Map 2015

WFP
World Food Programme
wfp.org

ZERO HUNGER CHALLENGE

Prevalence of undernourishment in the population (percent) in 2014-16

<5%	5-14.9%	15-24.9%	25-34.5%	35% and over	Missing or insufficient data
Very low	Moderately low	Moderately high	High	Very high	

The map shows the prevalence of undernourishment in the population of developing countries as of 2014-16. The indicator measures the probability that a randomly selected person in the population is consuming an amount of dietary energy which is insufficient to cover his/her requirements for an active and healthy life.

Source: FAO, IFAD and WFP. 2015. The State of Food Insecurity in the World 2015. Meeting the 2015 international hunger targets: taking stock of uneven progress. Rome, FAO. Further information is available at: www.fao.org/publications/sofi/en/
Administrative boundaries: GAUL Geospatial Database (2015) - www.fao.org/geonetwork/srv/en

* A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

** Control line representing approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

*** Final boundary between the Republic of the Sudan and the Republic of South Sudan has not yet been determined.

The Challenge of Feeding The World

Immediate solutions

- Improved distribution

- Preservation

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Immediate solutions

- Improved distribution

- Preservation

- Adding new, existing food sources

The Jackfruit*

- a 20-100 lbs fibrous, Indian tropical fruit

- in unripened state, it substitutes for meat**

- starchy, neutral taste

- sales of meat alternatives have doubled, from $69 M/yr (2011) to $109 M/yr (2015)

** family of figs, mulberry and breadfruit*

*** already available in USA in cans*

How to Produce More

Animal husbandry . . .

- consumes 1/3 of the Earth's fresh water

- occupies 45% of all arable land

- is responsible for 51% of all GHG

Doing more of the same is not a good solution!

IoT will help, but two things are better . . .

How to Produce More

Food of The Future 15:55 min

http://www.ted.com/talks/caleb_harper_this_computer_will_grow_your_food_in_the_future#t-943306

The Future of Meat 2:47 min

https://www.youtube.com/watch?v=u468xY1T8fw

What to Produce?

If not more of the same, then what?

- Seaweed

- Bugastronomy

SEAWEED

Healthy & Sustainable Food

Welcome to BUGastronomy!

Core Concept Idea for Healthy & Sustainable Food

One of the best solutions is to use insects – yes, BUGS!




It actually started a long time ago . . . "And John the Baptist was clothed with camel's hair, and with a girdle of a skin about his loins; and he did eat locusts and wild honey." (Mark I: 6)

Cool facts about insects!

- Nutritional value and fat content of crickets are very similar to chicken, pigs, and cows
- Many insects (e.g. mealworms) convert low-value organic waste into high-value protein
- Insect protein can be used directly in feed, food, drinks, and other products

  Examples: Red color from Cocheneal beetle (carmine)

  Used in Campari, Dannon strawberry yogurt, and Starbuck's Pink Frappuccino - and . . . lipsticks

Three strategies

1. **Insects as food** - i.e. eaten raw or cooked

Three strategies

1. **Insects as food** - i.e. eaten raw or cooked
2. **Insects as feed/feed ingredient** as supplements in pets and animal husbandry feed product**s** (granular or paste form)
3. **Insects as a source of protein/fat** in the food (and feed) industry

. . . but most importantly

	Feed required for 1 kg of weight	% consumable meat	Water requirement	Land usage (ha)	GHG (relative)
Cattle	10 kg	40%	Factor 22	Factor 10	100
Pigs	5 kg	60%	Factor 3.4	Factor 2-3.5	
Chicken	2.5 kg	55%	Factor 2.3	Factor 2	
Insects (avg)	1.7 kg	80%	1,000 l (Est.)	Factor 1	1

Bugs = bucks

- **Examples** (the prices below should not be used for extrapolation and should not be taken out of context):
- In Kenya, 1 kg of termites sells for €10
- 70 g of weaver ant pupae sell online for €7.50 in the United Kingdom
- In the Netherlands, 50 g of the yellow mealworm/lesser mealworm costs €4.85, and 35 migratory locusts cost around €9.99 online
- In Laos, the price of grasshoppers is €8–10 per kg.
- In Oaxaca, Mexico, chapulines sell for around €12 per kg.
- At markets in Cambodia, one can of fried crickets (150–200 g) sells for €0.40–0.70.

BUGastronomy!

If you can go from . . .

to . . .

BUGastronomy!

Why not from . . .

to . .

Yes, there are already cookbooks out there on insect food!

- *Creepy Crawly Cuisine: The Gourmet Guide to Edible Insects*, by Julieta Ramos Elorduy
- *Eat-a-Bug Cookbook: 33 Ways to Cook Grasshoppers, Ants, Water Bugs, Spiders, Centipedes and their Kin*, by David George Gordon
- *Man Eating Bugs: The Art and Science of Eating Insects*, by Peter Menzel and Faith D'Aluisio
- *Het Insectenkookboek* (*The Insect Cookbook*), by Arnold van Huis, Henk van Gurp and Marcel Dicke