

A wooden bowl is shown, containing a world map. The map is made of a darker wood, contrasting with the lighter wood of the bowl. Rice grains are scattered across the map, with a larger pile of grains in the bottom right corner, symbolizing food and global distribution.

Addressing the Global Food Challenge

How to feed
more people and
maintain the planet

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“You can’t wake a person
who’s pretending to sleep”

Oromo proverb

Food production

is the biggest threat to the planet



70% of
biodiversity loss



70% of freshwater use

25% of GHG
emissions



85% of marine
stocks fully exploited

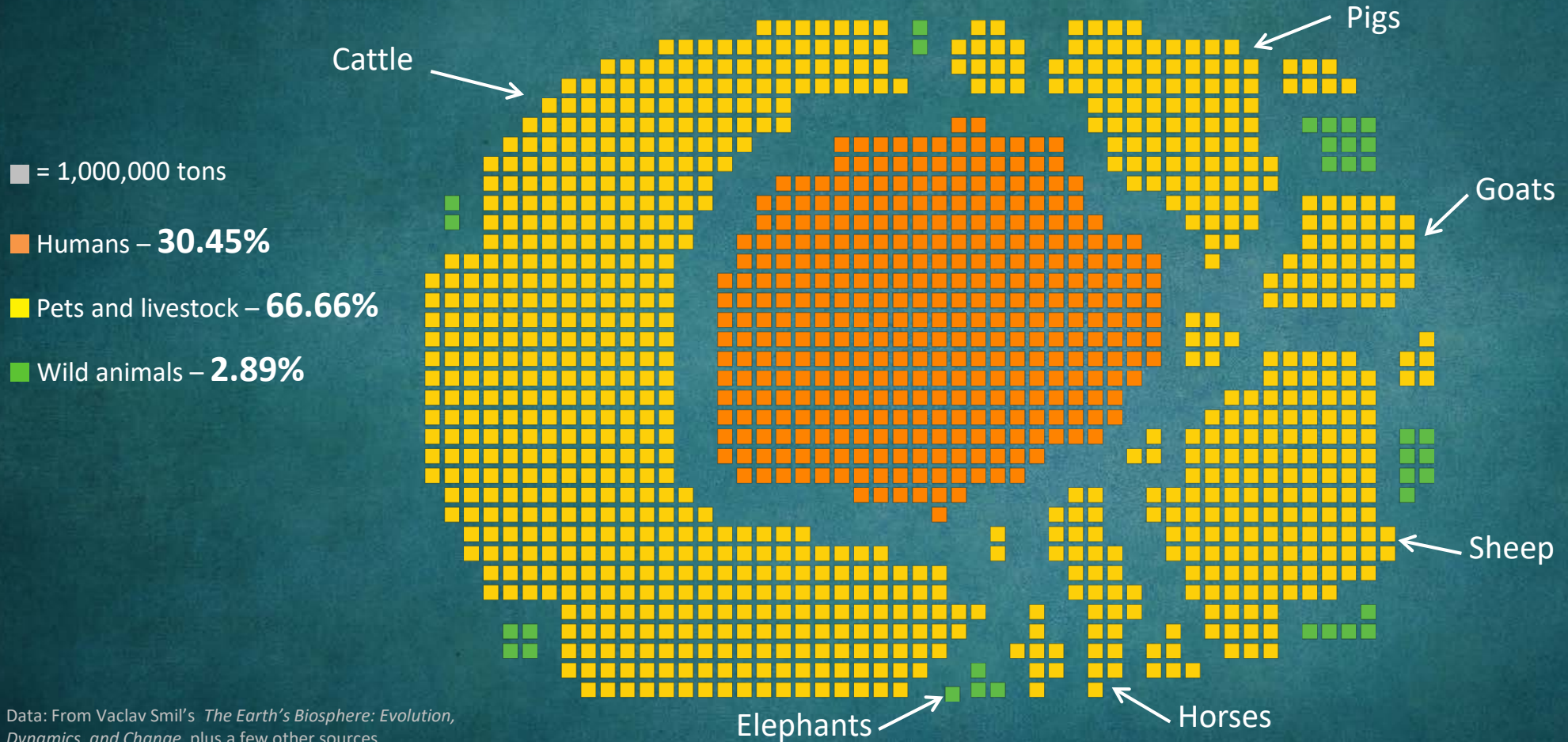


Most chemical use



50% of topsoil loss

Earth's land mammals by weight



Data: From Vaclav Smil's *The Earth's Biosphere: Evolution, Dynamics, and Change*, plus a few other sources



■ Countries where parks have been downgraded or taken off the books entirely (1990-2013)

A hand holding a small white onion against a dark, textured background. The hand is positioned on the right side of the frame, with the thumb and index finger gripping the onion. The background is a dark, mottled blue-grey color with a rough, stone-like texture. The text is overlaid on the left side of the image.

Global food

40 years =
8,000 years



$$\times 1 = 7$$



$$\times 2 = 18$$



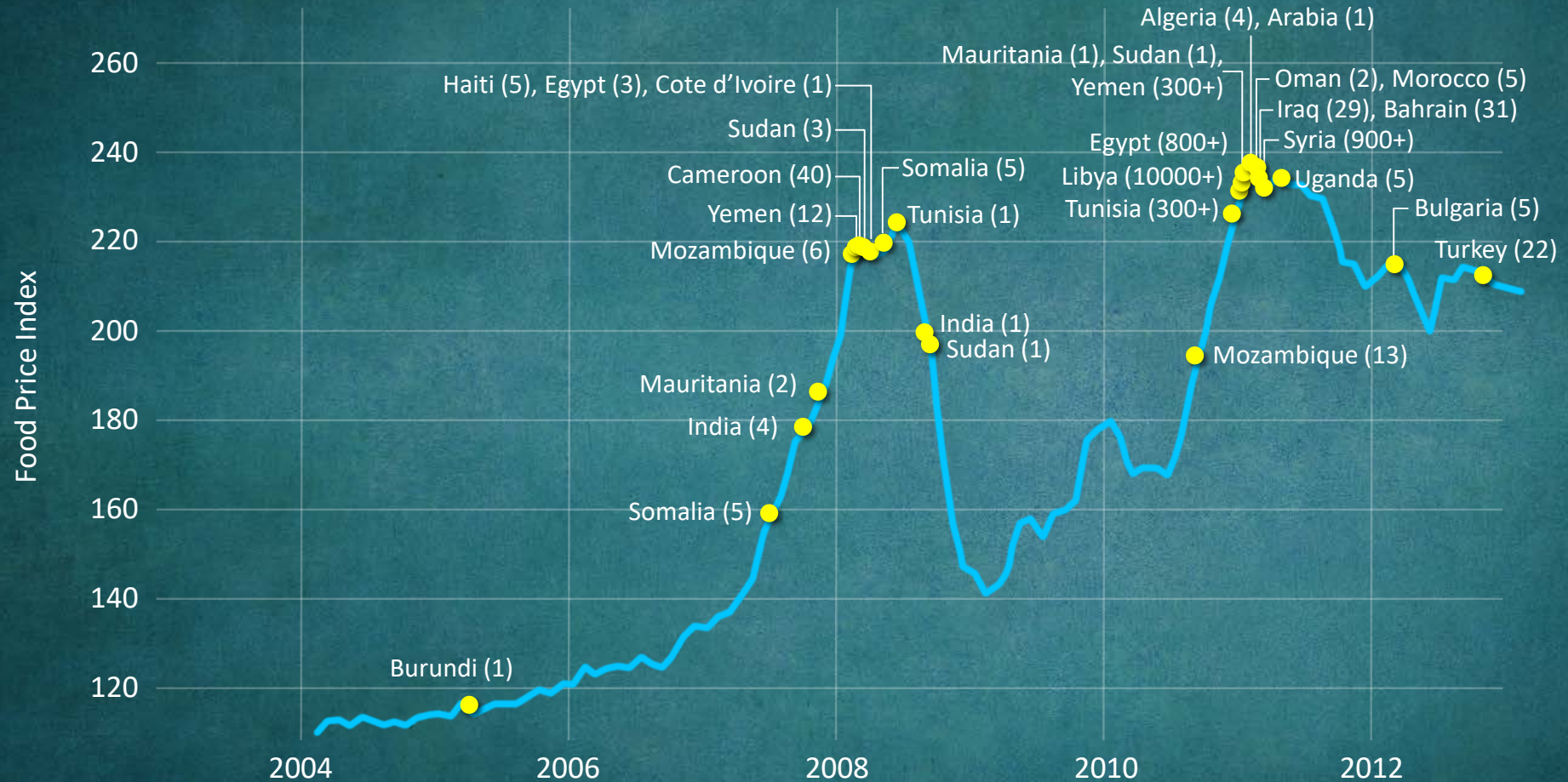
The China phenomenon

	Population at start of growth period	Years to double GDP per capita ¹
Britain (1700-1855)	9M	155
US (1820-1873)	10M	53
China (1983-1995)	1,023M	12
India (1989-2006)	822M	17

China doubling of GDP was **12x** the speed of Britain during the Industrial Revolution at **100x** the scale

400 million
lifted out of poverty

Food prices & food riots, 2004-13





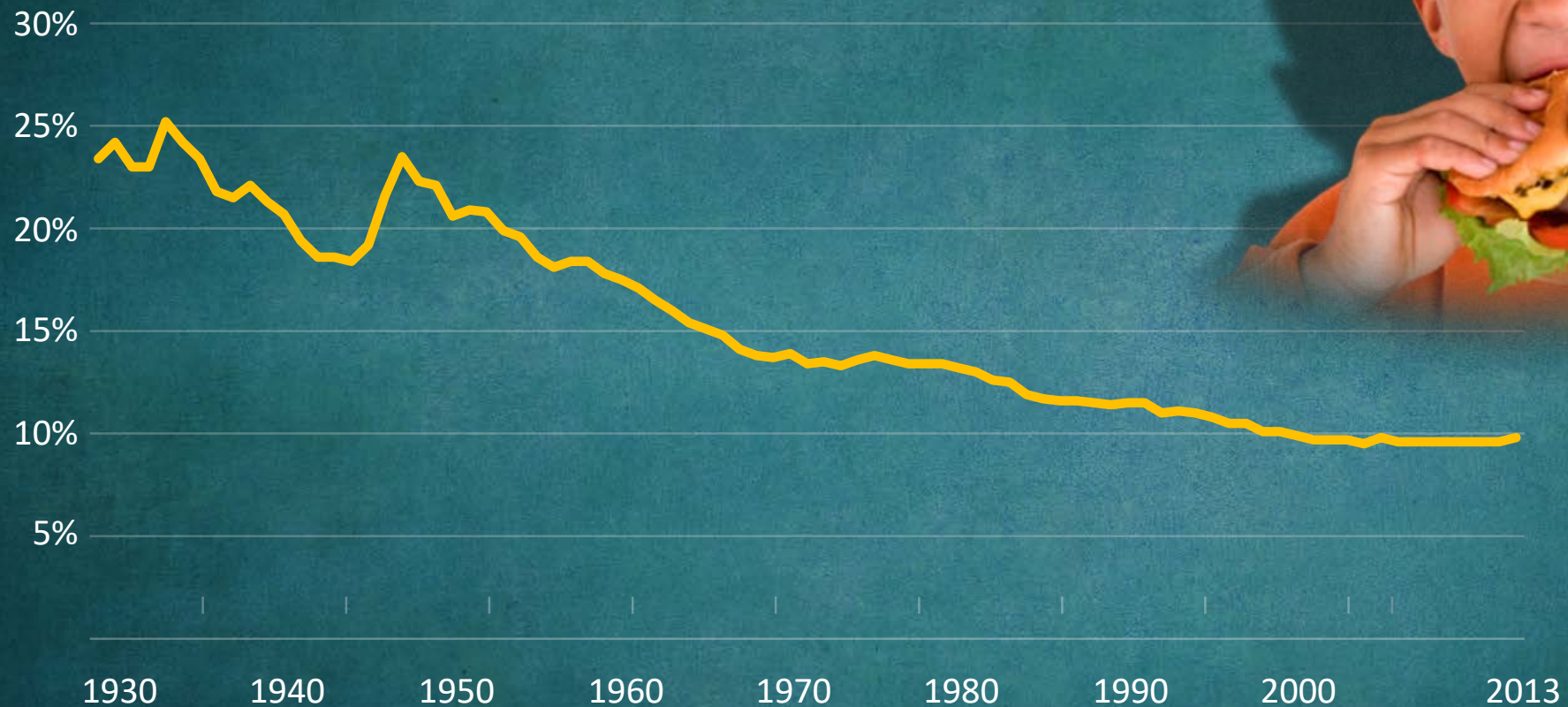
Current food realities

- 7.4 B food experts
- Social media trumps science
- Extremes dominate discussions
- Traceability *and* transparency
- Distrust – trade, globalization, experts



trade is key
for food
security

Food as a % of U.S. disposable income



Food is cheap, but
800 million
can't afford it





Half of farm families
can't feed themselves

A large, dark, textured footprint graphic is positioned on the right side of the image, extending from the top right towards the bottom center. The background is a solid teal color with a subtle grain.

Freeze

the footprint of food

We must produce
more with less



Productivity & efficiency
and
waste & consumption

The issue isn't
what to think,
it's **how** to think

On a finite planet,
should consumers
have a **choice**
about sustainable
products?

Or should
all choices
be more sustainable?



waste

1 out of 3 calories





Stranded Assets & Urban Agriculture

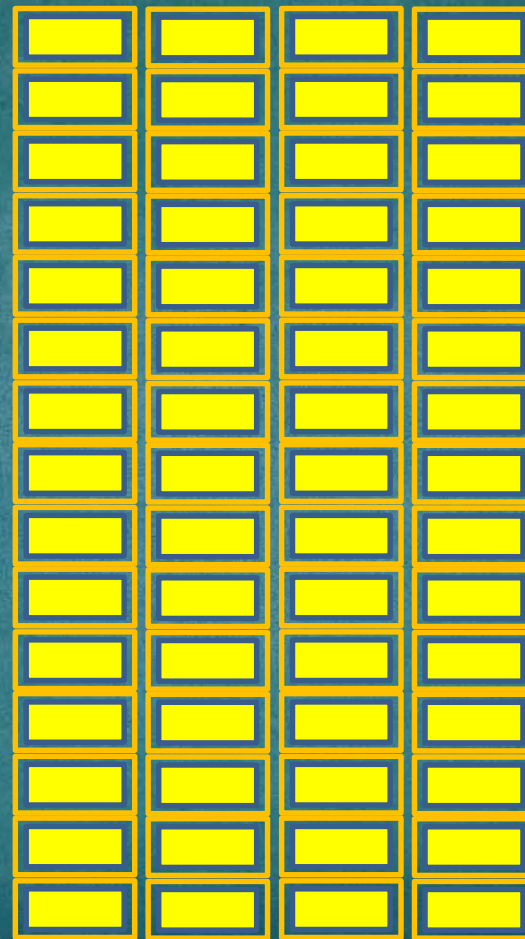
- In US & EU, most food waste is from fruits vegetables and seafood
- 30-40 years of life in many existing plants
- By-products—heat, CO₂, warm water, brownfields
- MIT grows fresh vegetables for Cambridge



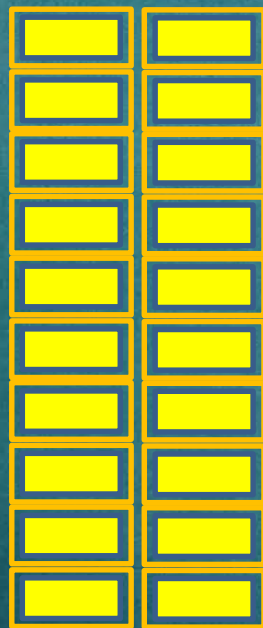
Genetics

“it’s not *if* genetics,
but *which* genetics”

Sugar



Bananas



Corn



Orphan crops



oil palm



millet



peanut



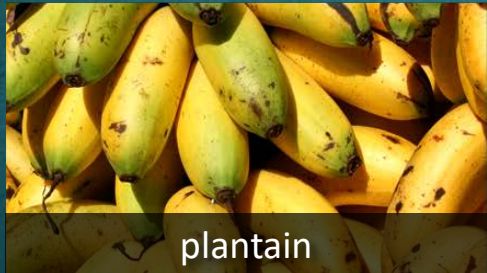
cowpeas



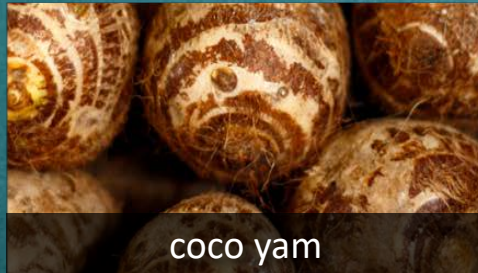
cassava



vine spinach




plantain



coco yam



sorghum

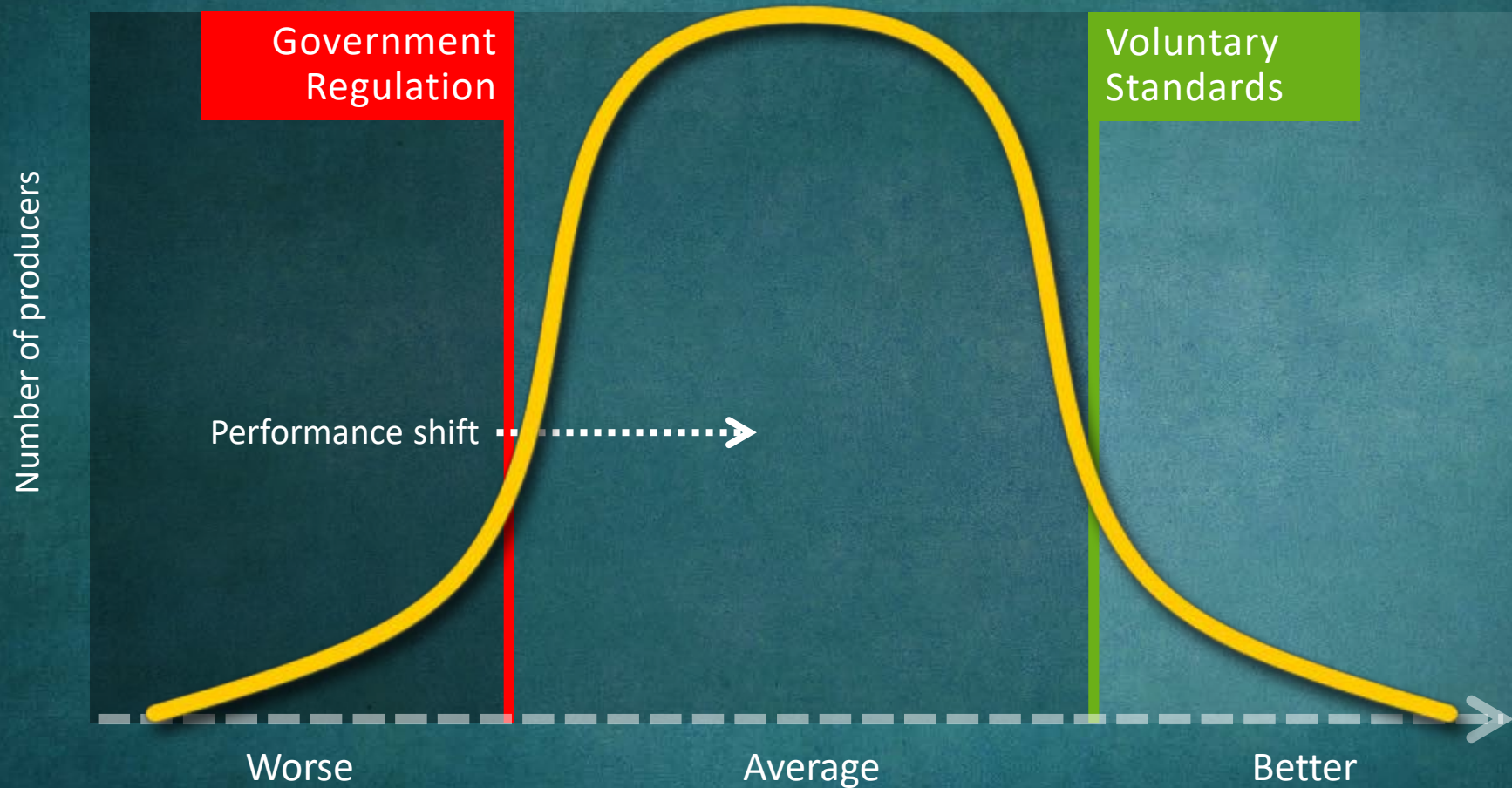


Rebuild soils

250 M hectares
by 2030

1 liter of water = 1 calorie

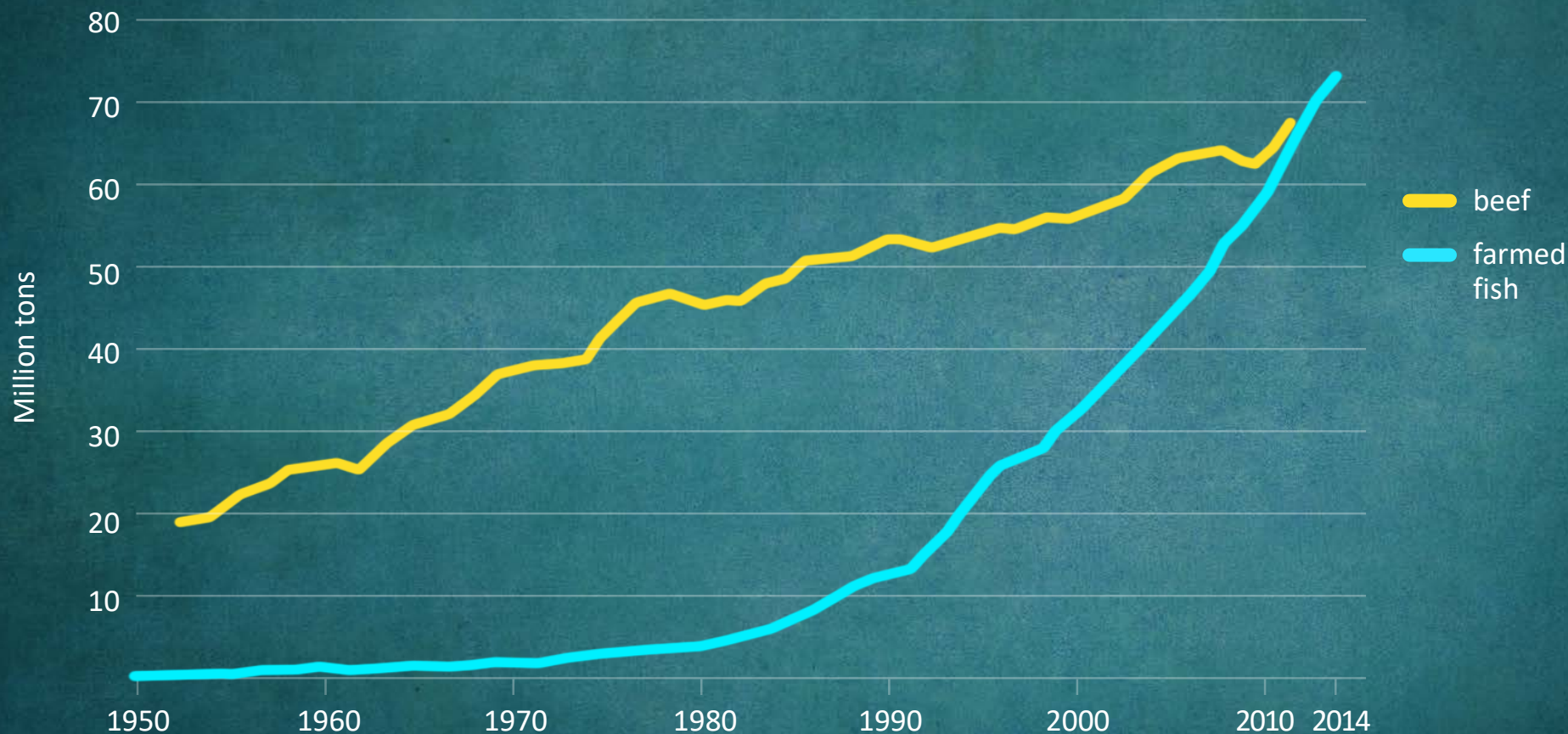
Reward the best or move the rest?





Challenges for animal protein

World farmed fish & beef production, 1950-2014



Poultry – efficiency matters



Chicken – Global improvement evolution

	1925	1945	1965	1985	2005	2045*
Conversion – kg feed/kg live	4.7	4.0	2.4	2.0	1.7	1.6
Mortality %	18%	10%	6%	5%	4%	3%
Age (days)	112	84	63	49	42	40
Live commercial weight - kg	1.0	1.4	1.6	1.9	2.4	3.2

*projected

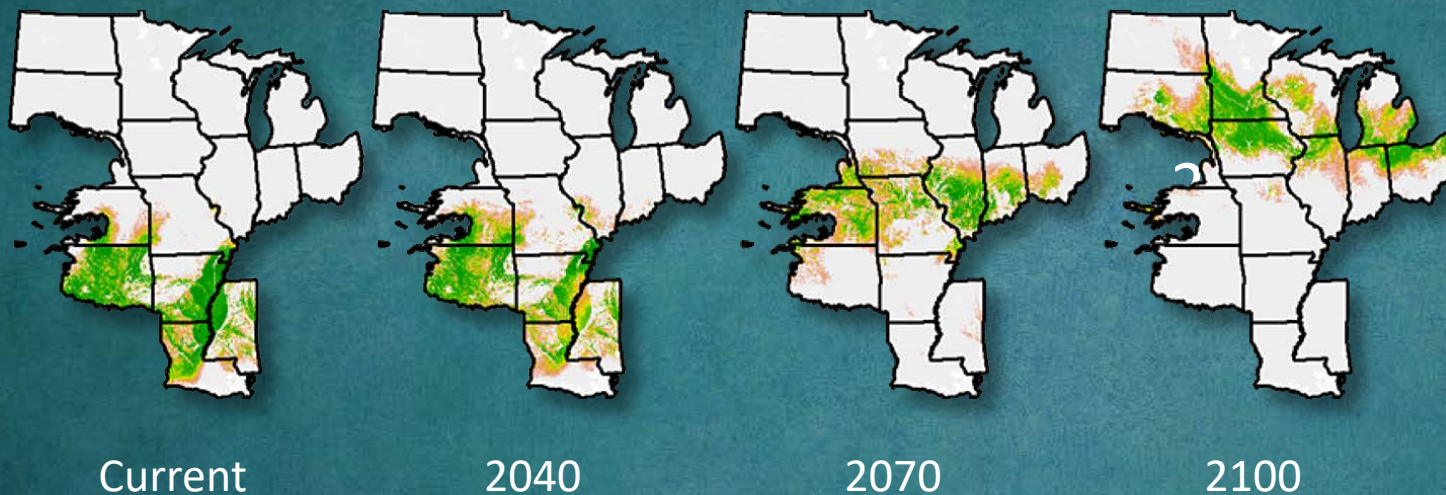
Shift from
maximizing one variable...

...to optimizing key ones

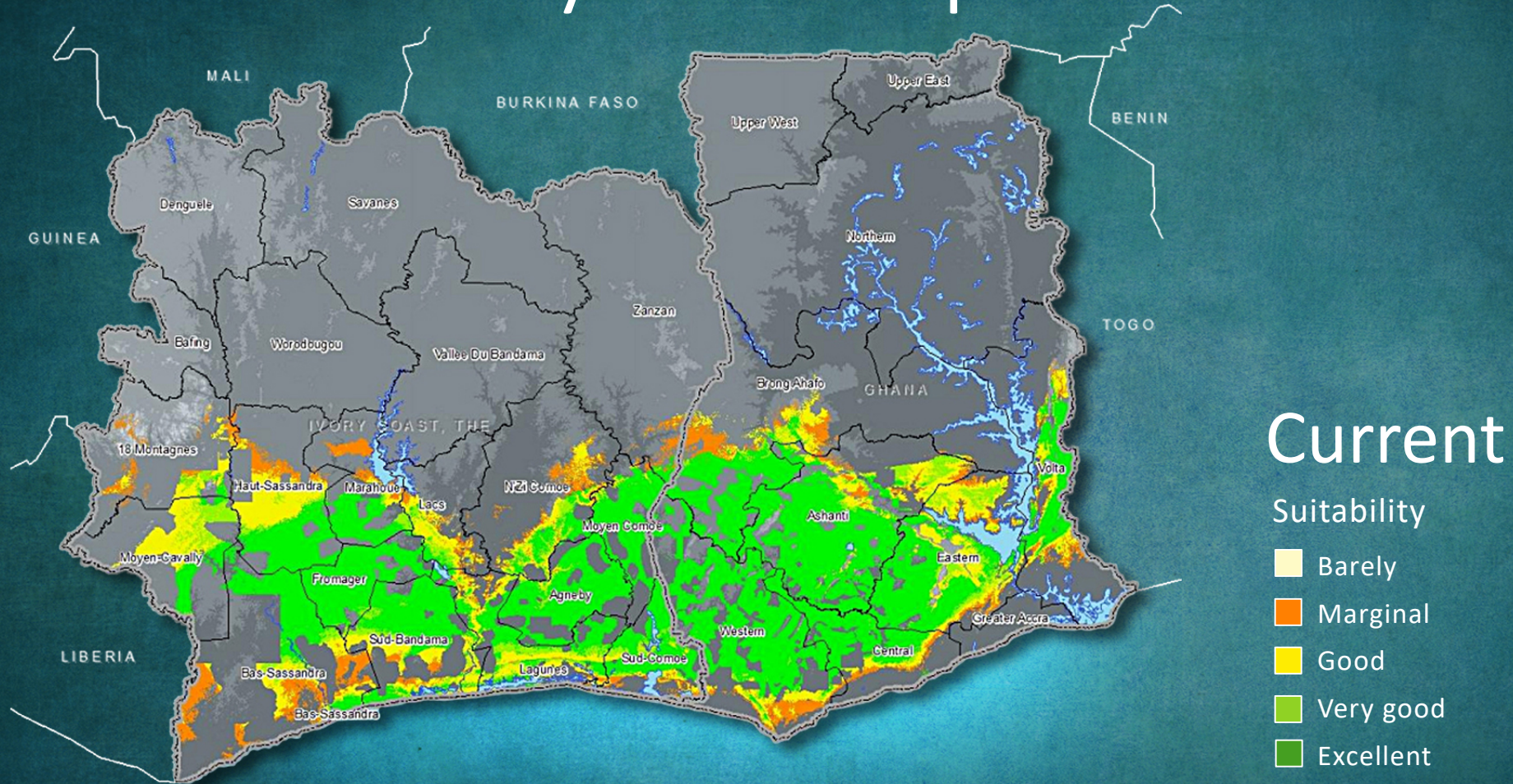


Climate change &
food production

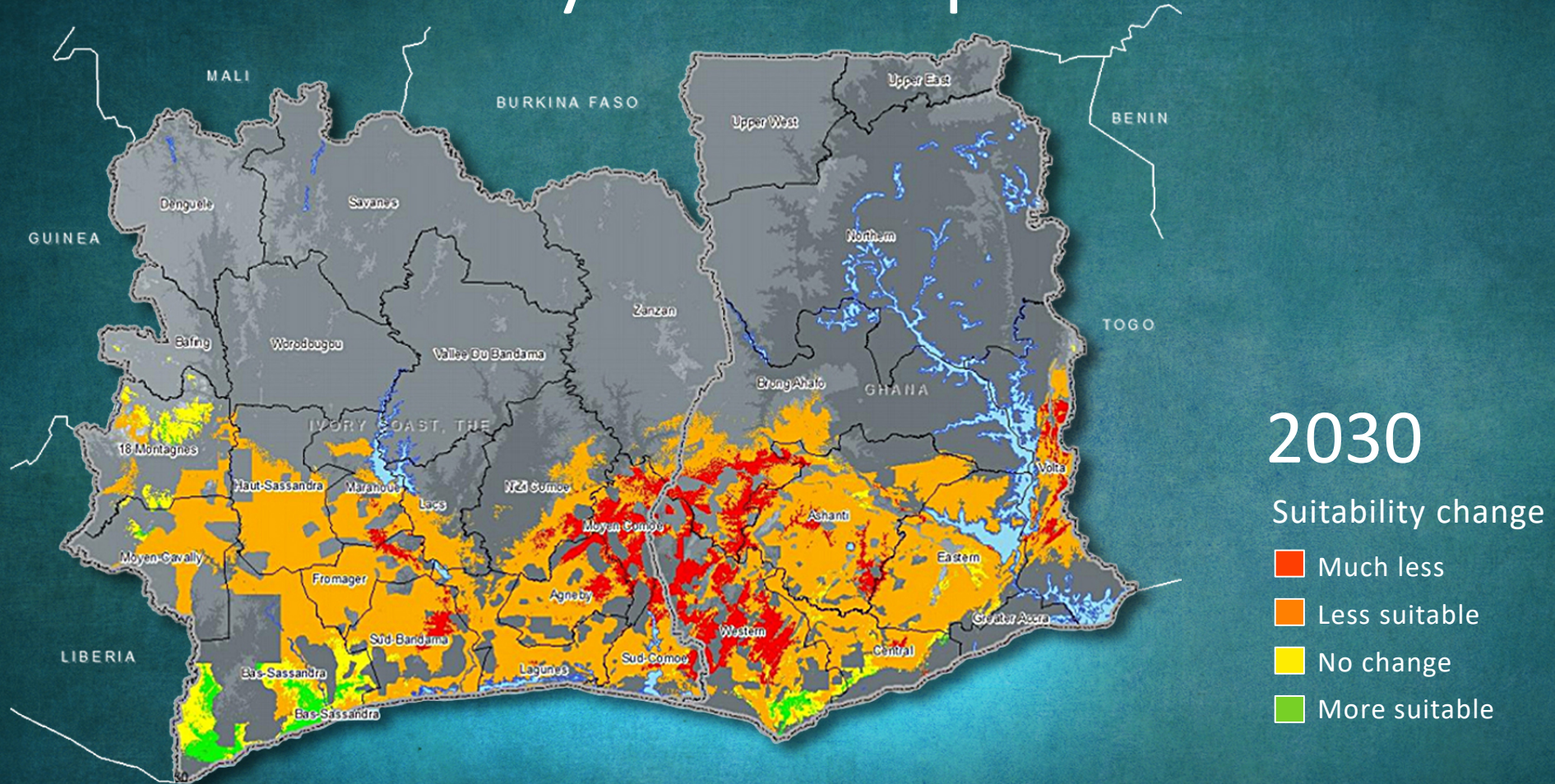
US Midwest land & climate suitability for cotton production, 2010-2100



Suitability of cocoa production



Suitability of cocoa production



In the short term
climate smart agriculture =
efficient production

In the medium term, producers
change genetics

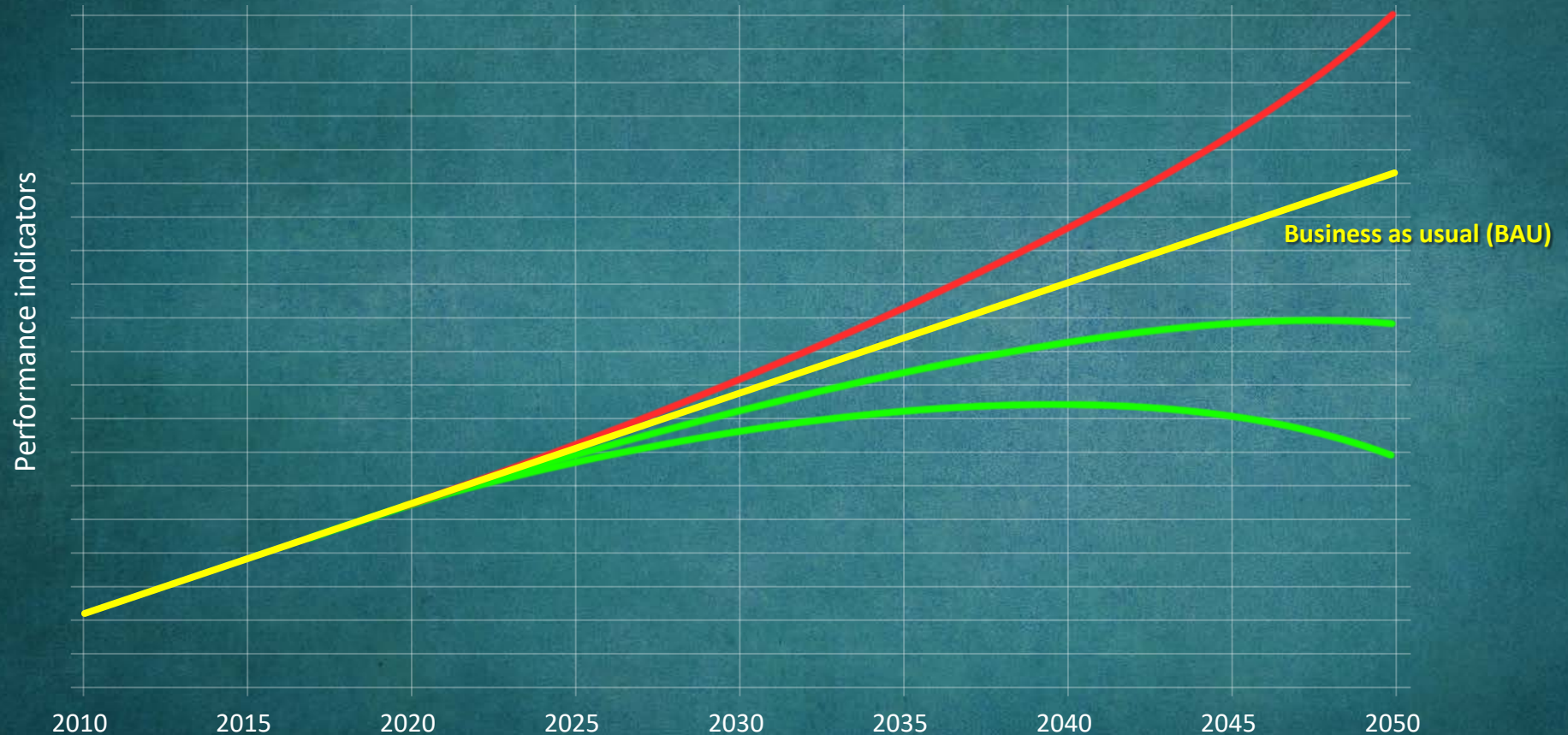
When is a crop “broken?”

Cocoa in Cote d'Ivoire – what are the trends?



	1945	1965	1985	2005	2015
Yield / hectare					Down
Illegal deforestation					Up
% pods on a tree that mature for harvest					Down
% producers above SDG poverty					Down
% trees infected with SSV					Up
% C in soil					Down
% farmers under 40					Down
Child labor					Up

Is Business as Usual (BAU) a stretch goal?



Sustainability of raw materials,
from niche to norm





2013: Global Salmon Initiative

70% of global production commits that all sales will be ASC certified by 2020



Working
with nature

Bord Bia

Irish Food Board

2012: Bord Bia and Ireland

Commit that all food exports will be certified by 2016

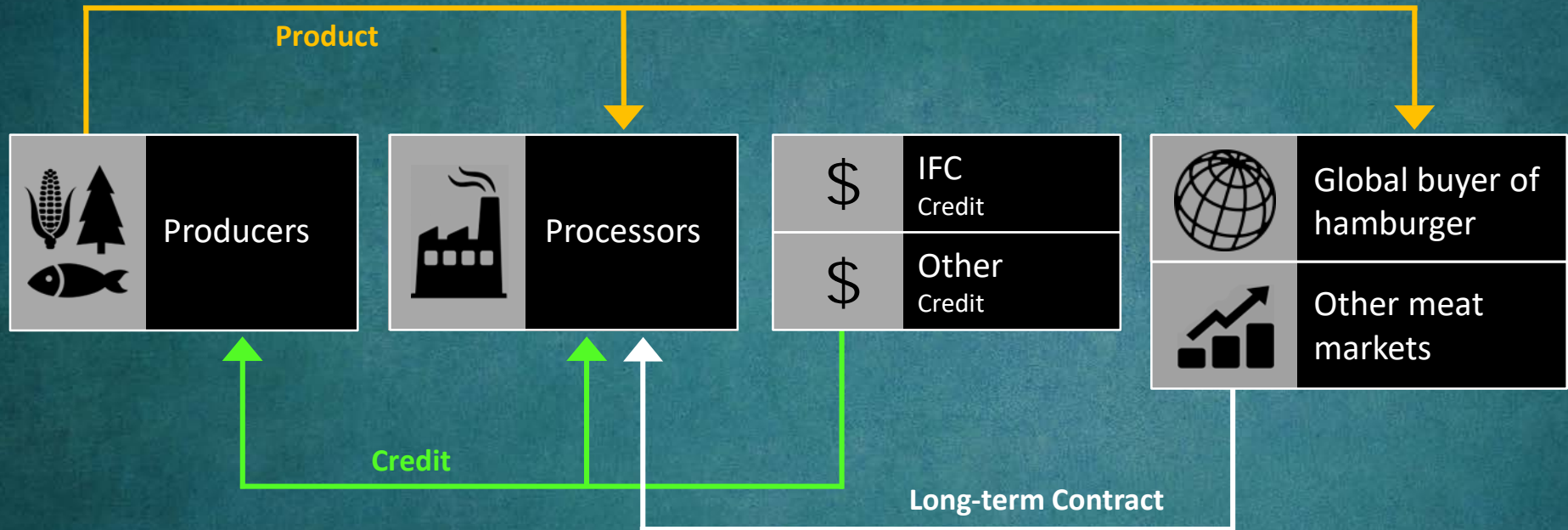


The Consumer Goods FORUM

The Global Network Serving Shopper & Consumer Needs



Long-term contracts



Inter-generational Land Transfers

- Global issue
- Every producer is concerned
- Governments care about food security
- Role of long-term contracts



amazon

WHOLE
FOODS
MARKET



Amazon and Whole Foods

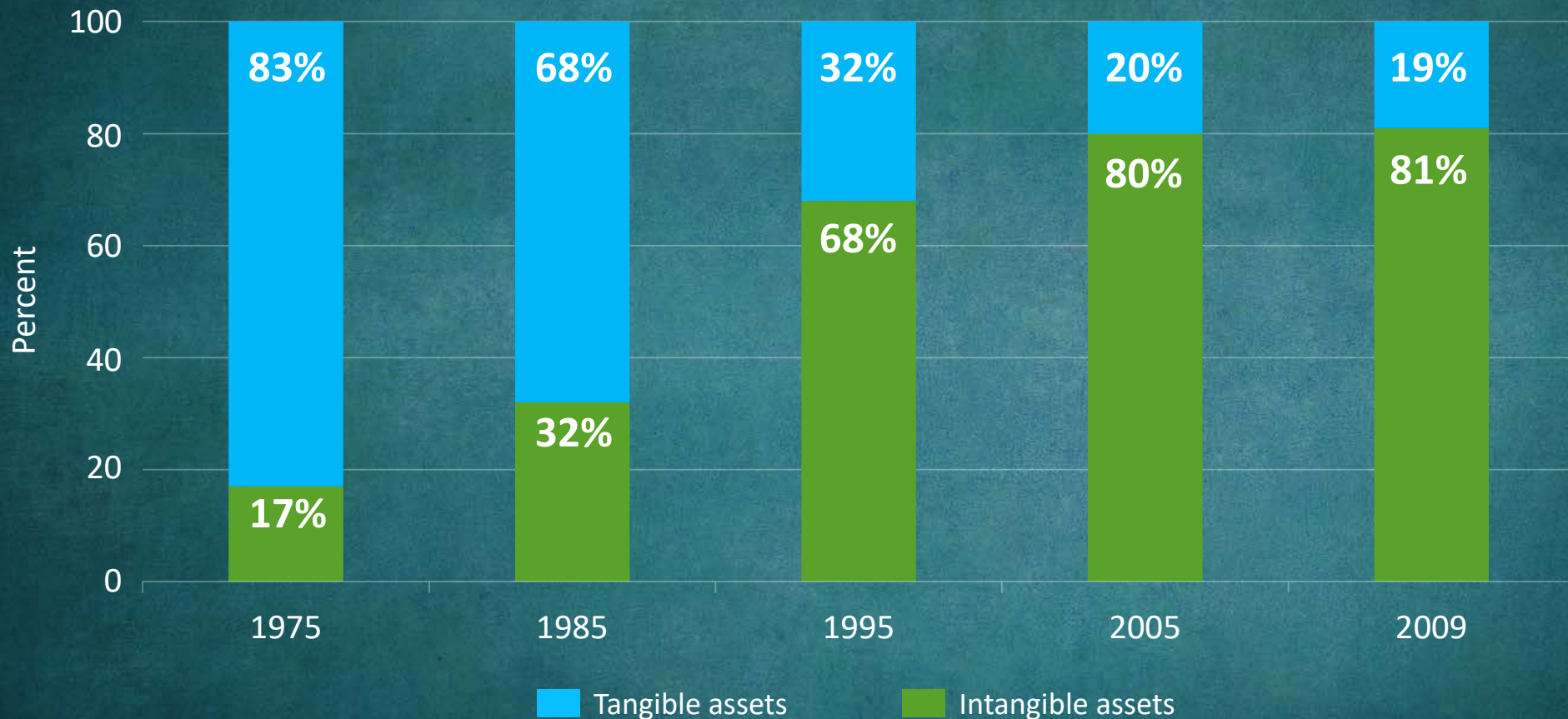
- Impact on organic supply/demand
- Whole Foods organic to date
- “Waste” from sight unseen, returns policy
- Impacts on retail (e.g. scale, lifestyle, GHG)

The issue is

risk

both availability and reputation

Components of S&P 500 market value



Illegally in food

FISHERIES



AQUACULTURE



LIVESTOCK



FOOD CROPS



NON-FOOD CROPS





Illegality – key issues

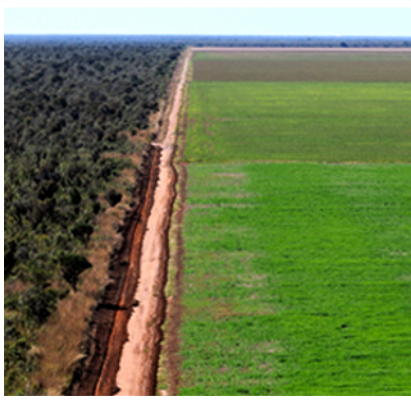
- Resource rights, access, concessions
- Labor and social issues
- Other laws and regulations
- Fraud
- Corruption





Research – Is illegality important for you?

- 8 companies' supply chains
- 9 commodities, 8 countries
- All data in the public domain
- White paper drafted in September
- Goal: make illegality pre-competitive



What the research suggests

- 4 to 44% of target globally traded commodities are produced illegally
- Even greater % of domestic consumption produced illegally
- Using only one source of illegality, one country and data in the public domain

If a product is produced
illegally,
can it be legal?

If a raw material is produced
illegally,
can a product made with it be
legal?

If a feed ingredient is produced
illegally,
can animal protein made from it
be legal?

Traceability
vs.
Transparency

It isn't just **where** a
product is produced,
it's **how** it's produced

Traded commodities – then and now

19th & 20th Century Physical values

weights and measures

broken & quality

color

foreign matter

health & safety, ppm, etc.



21st Century Transparency values

organic

non-GMO

no child labor

zero deforestation

water used

income & SDG goals



Key sustainability issues

- Productivity
 - Soil health; soil carbon
 - Genetics (drought & disease)
- Efficiency
 - Water, fertilizer and pesticides
- Food loss and waste
 - 2030 Goal – Reduce by 50%
- Consumption
 - Awareness of tradeoffs – fresh, off season, animal protein, etc.



Think about it.

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Technology & VC

Are they the solution?



R&D and VC—will our model solve our problems?

- Are the key problems technological?
- Can we agree on the biggest issues?
- Can we focus—X-Prize, other prizes
- Is pre-competitive VC possible at scale?