Topic of Discussion

"Feeding 8 Billion People Well"

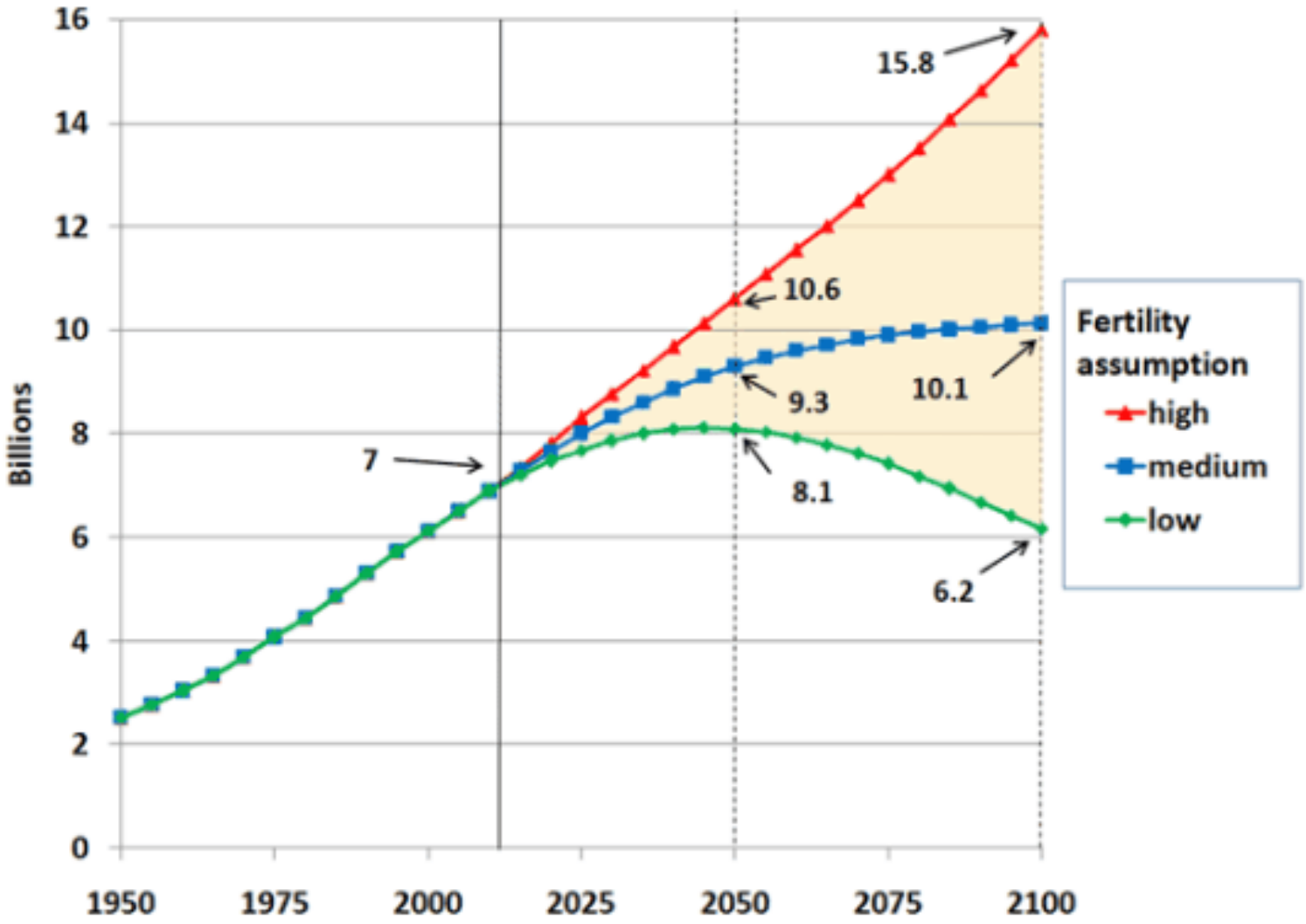
Presented by
Plan B Project Team

Plan B 4.0: Mobilizing to Save Civilization
by Lester R. Brown

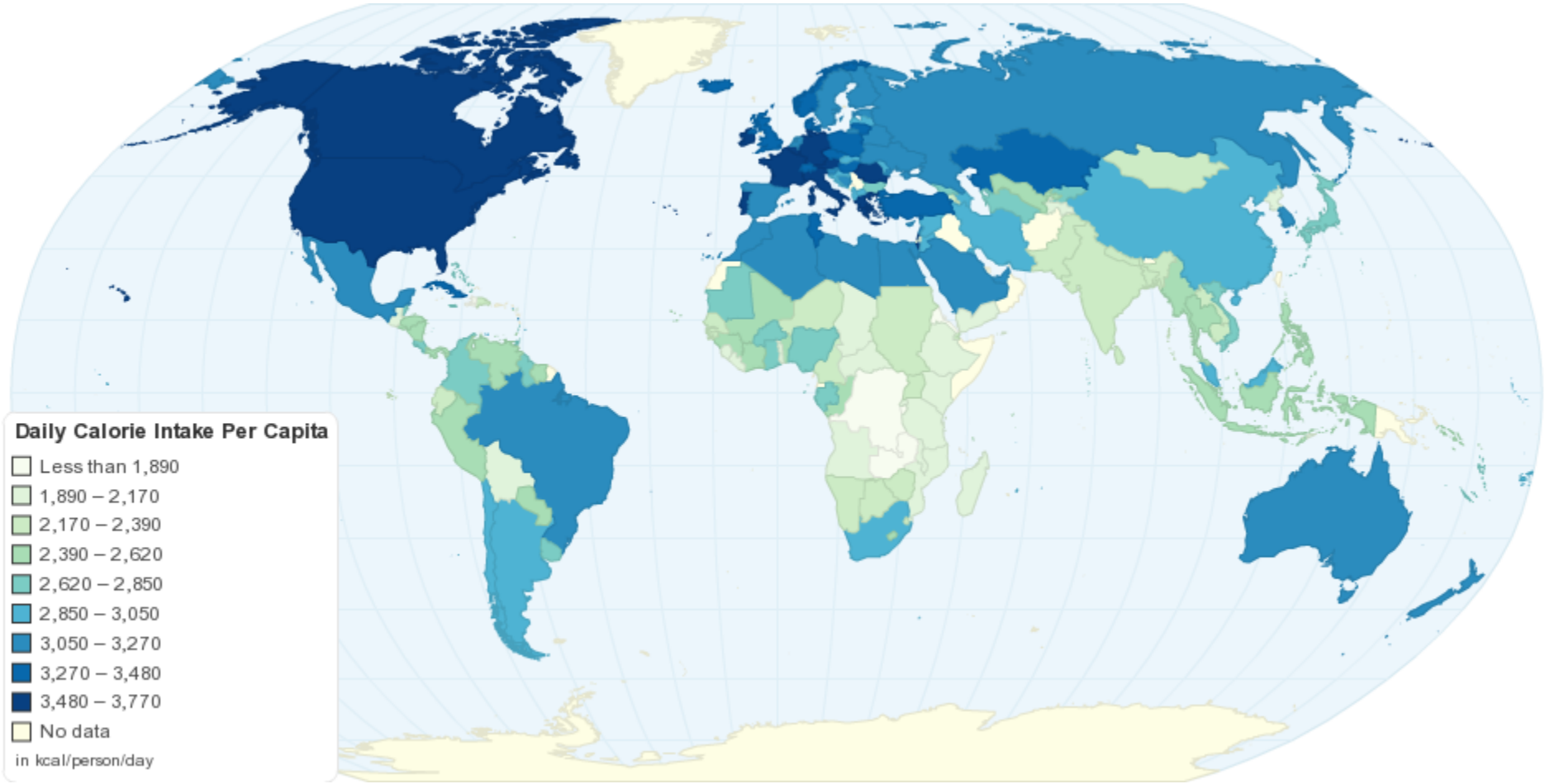
GENI Global Energy Network Institute

WORLD RESOURCES SIMCENTER

Population Growth Projection

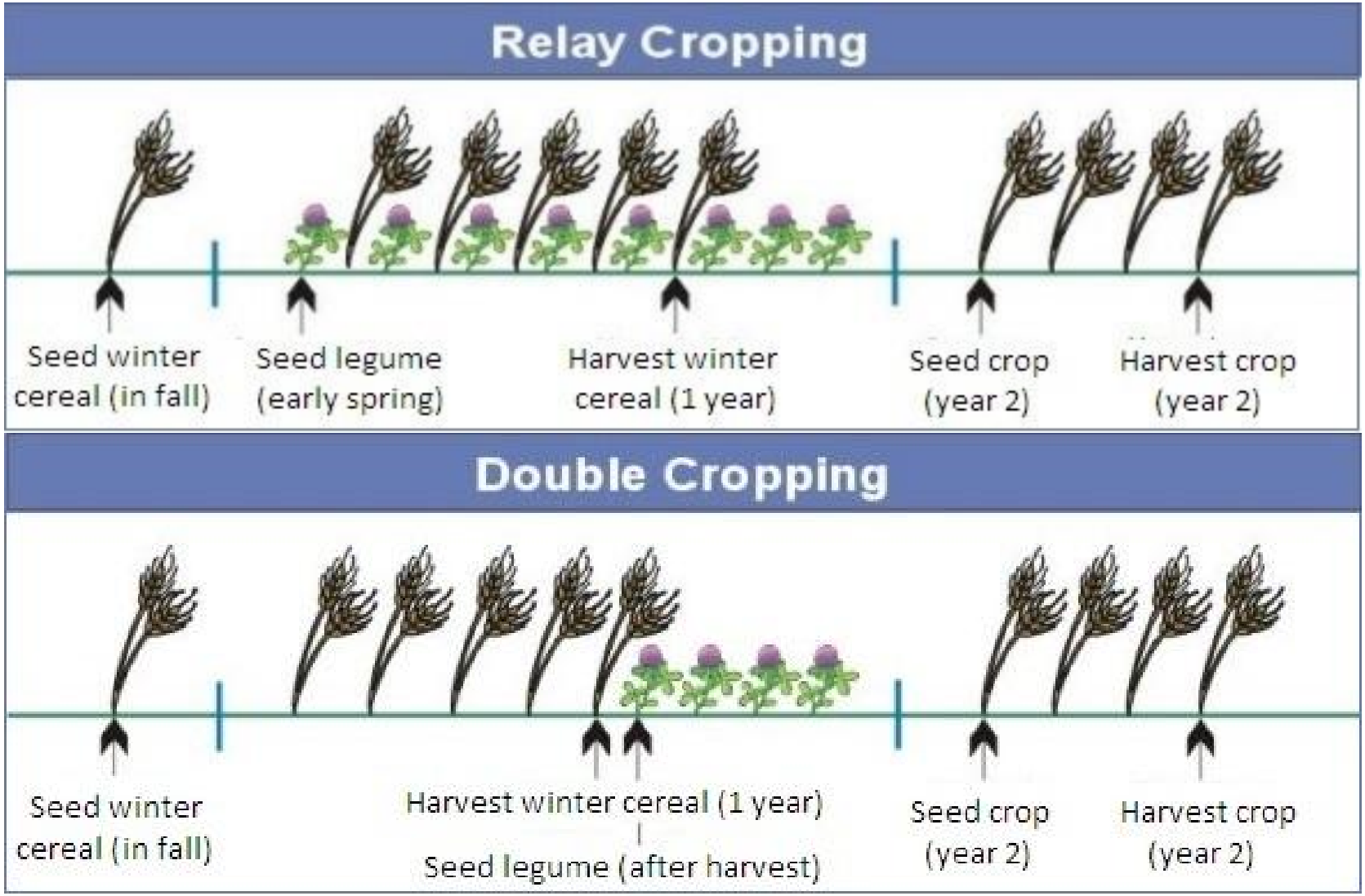


Do we have enough food?



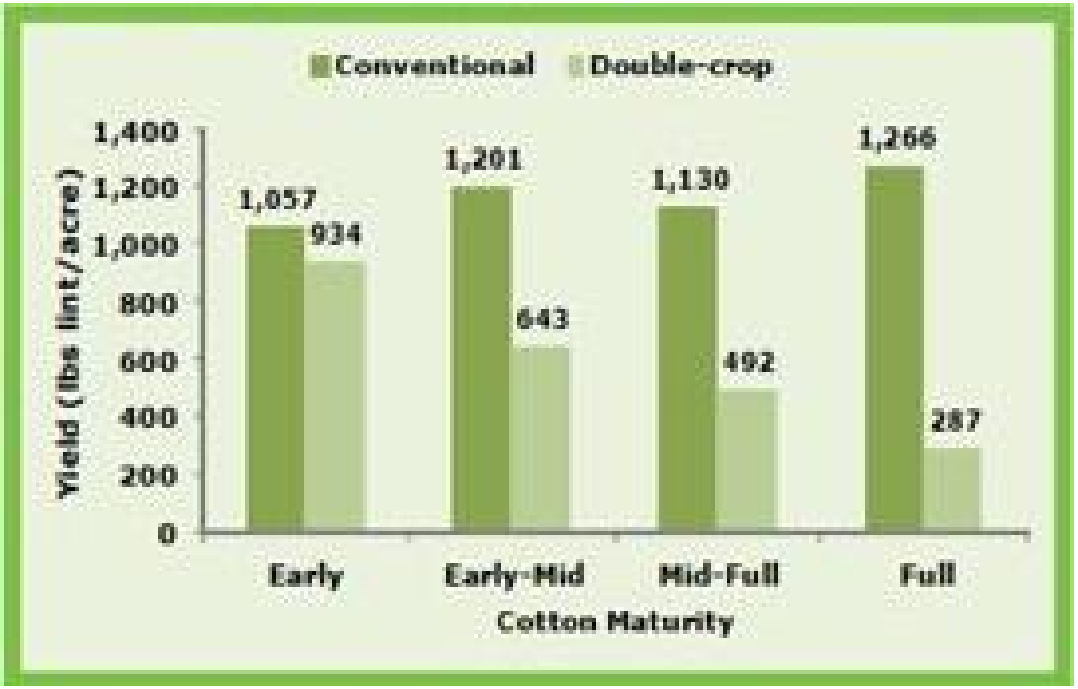
The world today produces enough grain alone to provide every human being on the planet with 3,500 calories a day.

Using Land More Efficiently

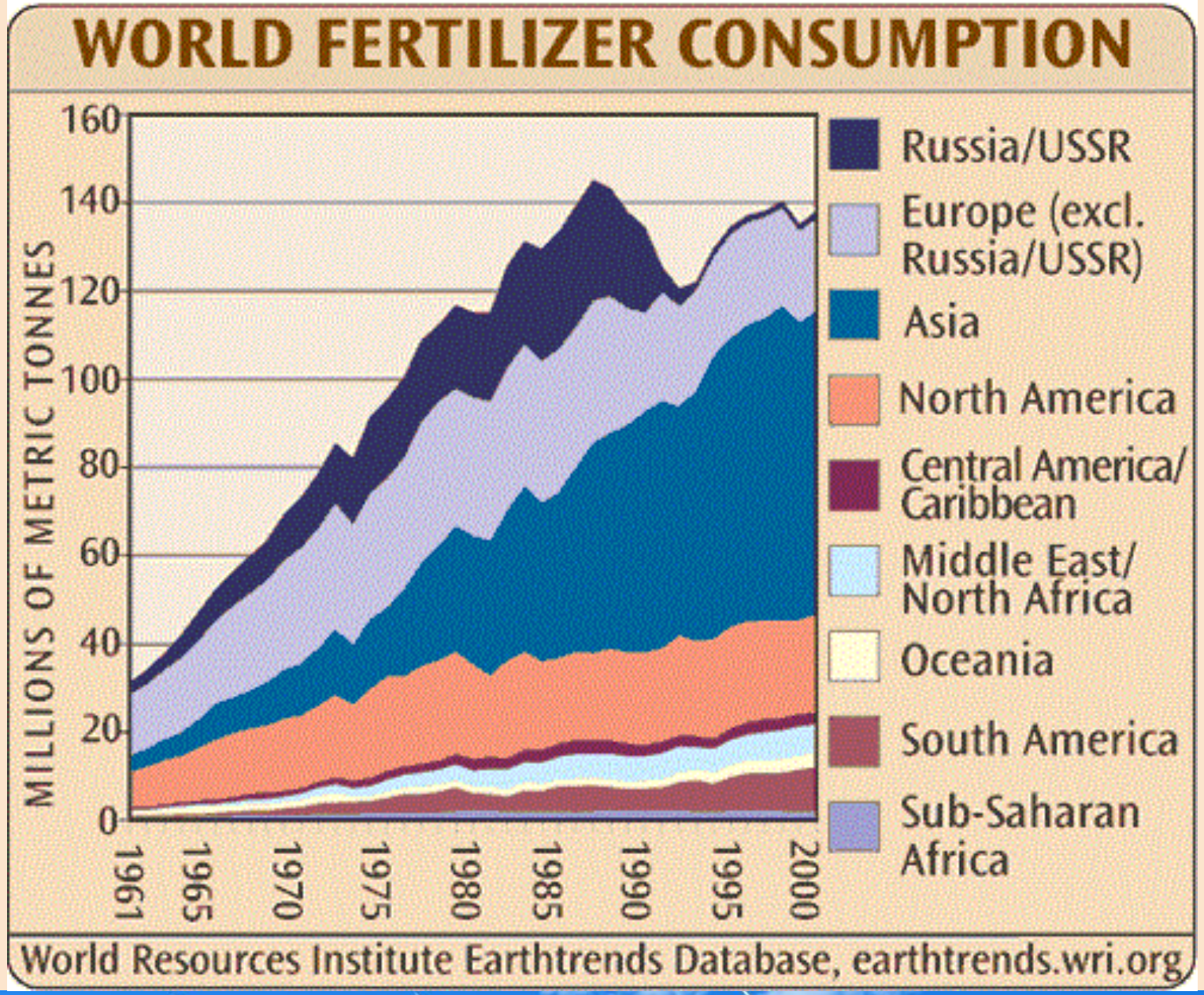


Source: umanitoba.ca

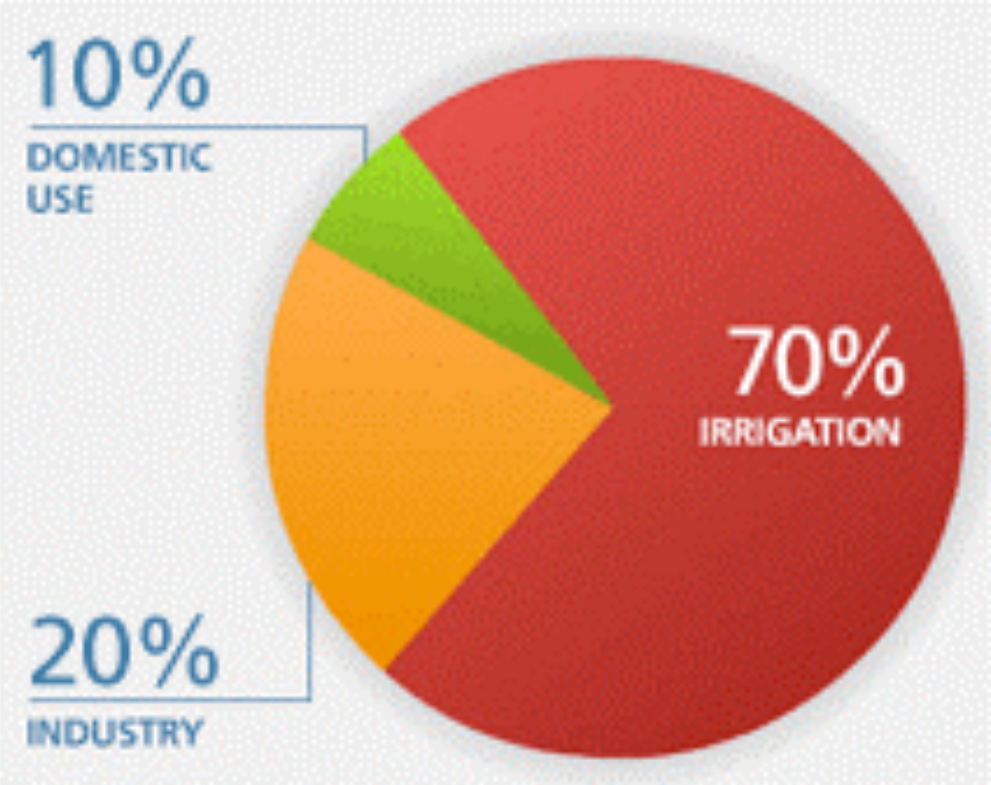
Multiple Cropping Advantages



- Reduction in risk of lose production by drought, pests and diseases
- Maintain soil fertility by fixing nitrogen in the soil.
- Different types of crops, providing a balanced diet
- Different seasonal crops can be planted.


WORLD FERTILIZER CONSUMPTION
MILLIONS OF METRIC TONNES
160
140
120
100
80
60
40
20
0
1961
1965
1970
1975
1980
1985
1990
1995
2000
Russia/USSR
Europe (excl. Russia/USSR)
Asia
North America
Central America/ Caribbean
Middle East/ North Africa
Oceania
South America
Sub-Saharan Africa
World Resources Institute Earthtrends Database, earthtrends.wri.org

Water Usage



It takes **1,000 tons** of water to produce **1 ton** of grain.

To raise water productivity overall, irrigation efficiency must be improved.

Source: UN Water

Irrigation Efficiency

University of Arizona. Credit: John C. Palumbo

Flood: Flooding the fields with water. The least efficient technique.

Efficiency: 65%

Furrow: Using pipes to extract water from a central channel.

Efficiency: 70%

Source: US Geological Survey, Biovision, US Department of Agriculture

Irrigation Efficiency

Sprinkler: Spraying water in the air, letting the water seep in where it needs to.

Efficiency: 75%

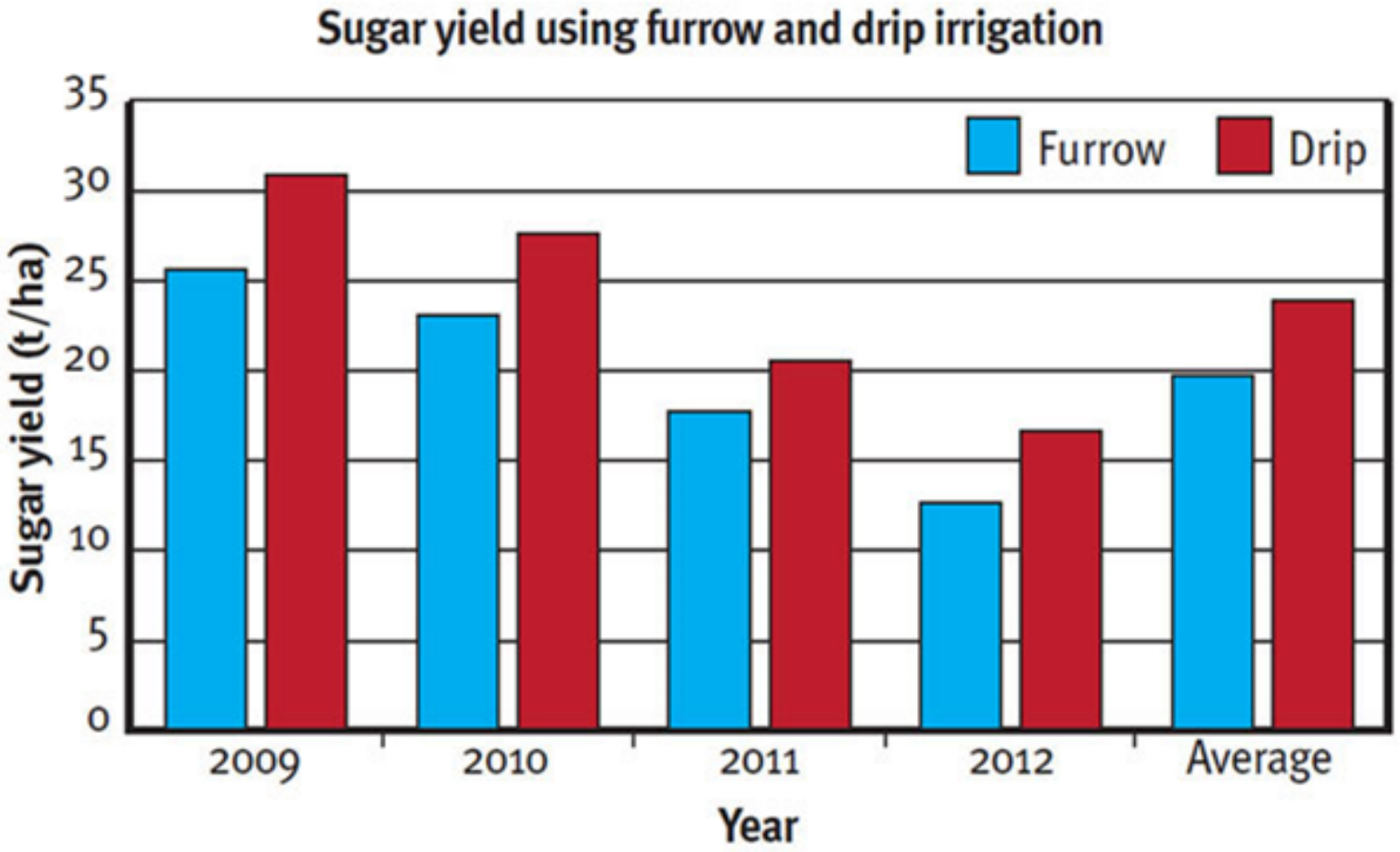
Drip (trickle) irrigation waters crops efficiently.
Credit: Nova Scotia Agriculture and Fisheries

Drip: distributing a specific amount of water over the plant. The most efficient technique.

Efficiency: 90%

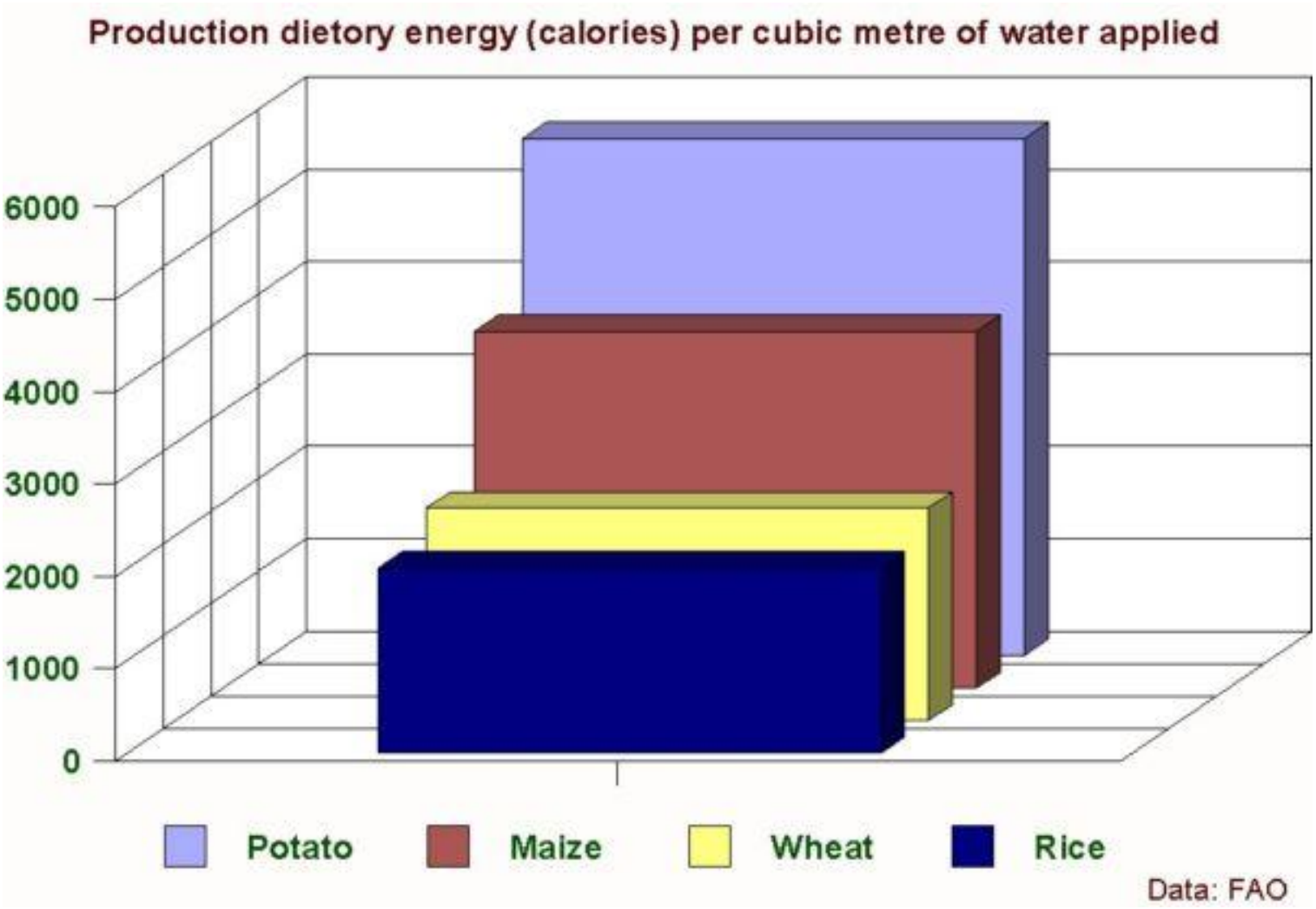
Source: US Geological Survey, Biovision, US Department of Agriculture

Irrigation Efficiency



Source: www.reefplan.qld.gov.au

Using more water efficient crops



Potato:
5,600 calories

Maize:
3,860 calories

Wheat:
2,300 calories

Rice:
2,000 calories

Source: http://www.aardappelpagina.nl/explorer/pagina/irrigationintr.htm

Cars and People Competing for Grain

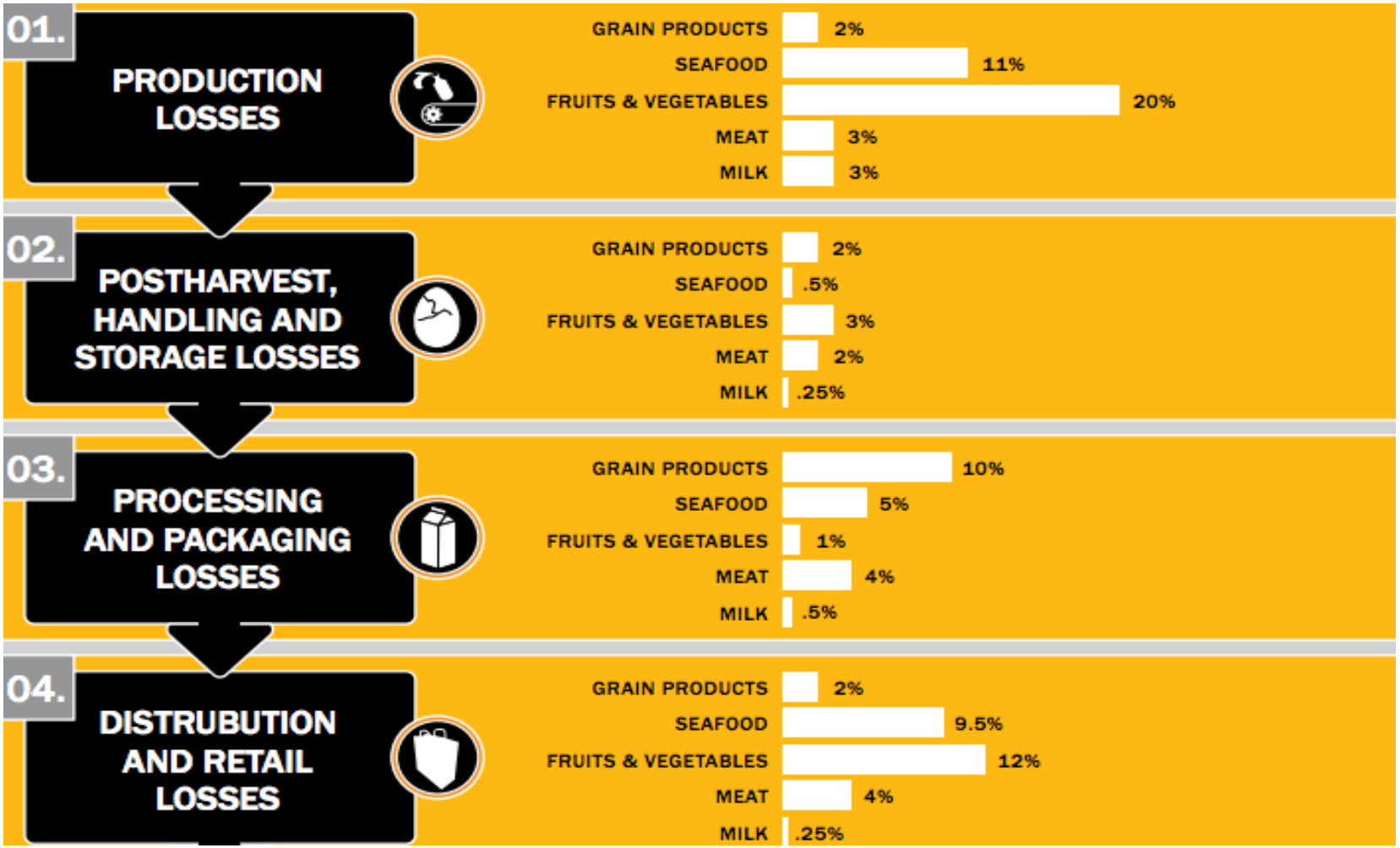
FOOD OR FUEL?

Nearly a billion people will go hungry tonight, yet this year the U.S. will turn nearly 5 billion bushels of corn into ethanol. That's enough food to feed 412 million people for an entire year.

8 BUSHELS OF CORN = 21.6 GALLONS OF ETHANOL FUEL OR ENOUGH FOOD TO FEED A PERSON FOR A WHOLE YEAR

Source: Foodorfuel.com, USDA

Efficiency Losses in Food Distribution



Source:Food and Agriculture Organization 2011

Changing the food supply system

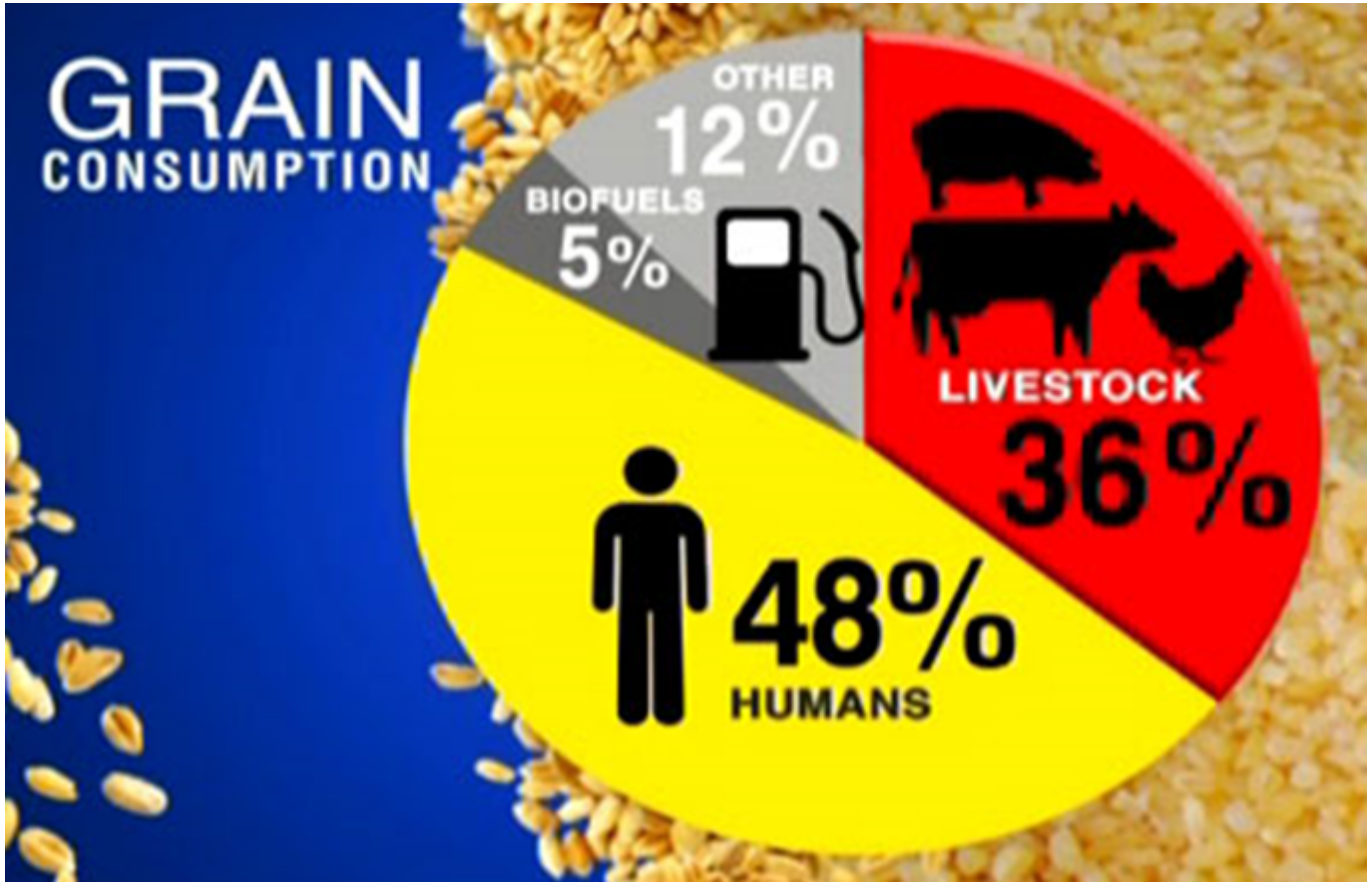
Localize Agriculture

Source: National Cooperative Grocers Association

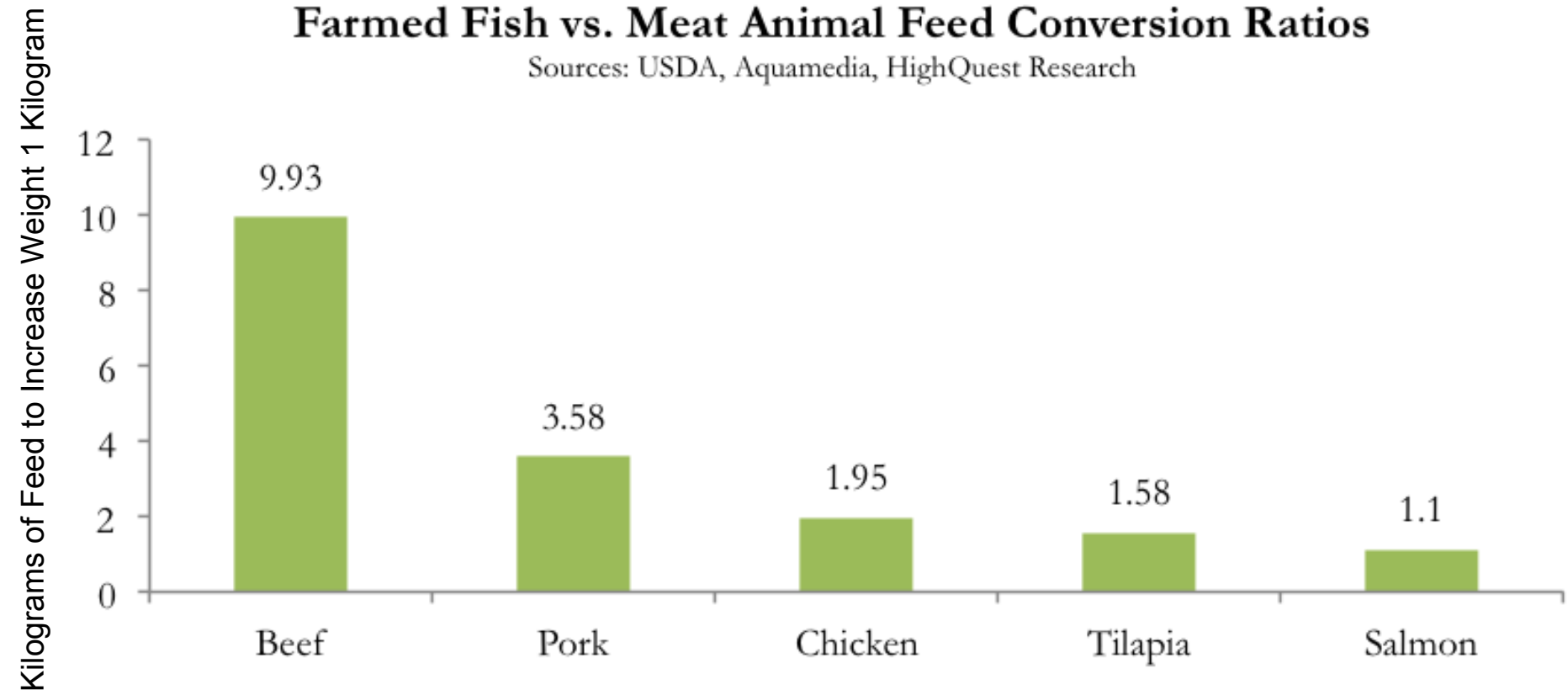
Vertical Farm in Singapore

http://www.bbc.co.uk/news/business-23675278

Efficient Protein Production



Source: Food and Agriculture Organization of the United Nations



Source: USDA, Aquamedia, HighQuest Research

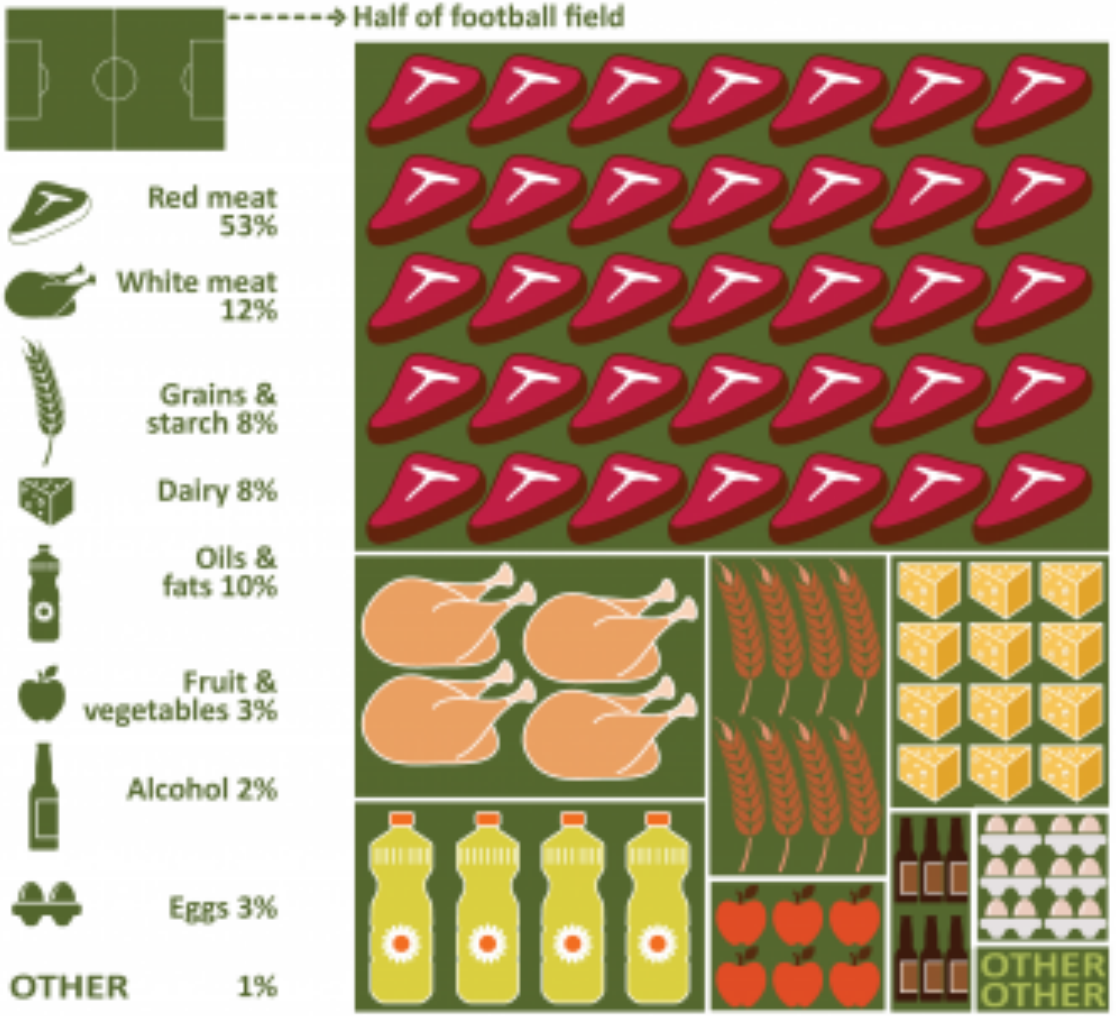
Table 2. | Water Required To Produce Selected Foods

Crops	Water Needed (liters per kilogram)
Potato	500–1,500
Wheat	900–2,000
Alfafa	900–2,000
Corn/Maize	1,000–1,800
Sorghum	1,100–1,800
Soybeans	1,100–2,000
Rice	1,900–5,000
Animal Products	(liters per kilogram of meat)
Eggs	3,300
Chicken	3,500–5,700
Goat	4,000
Sheep	6,100
Beef	15,000–70,000

Source: Pacific Institute (2009)

THE FOODPRINT FOR ONE UK PERSON

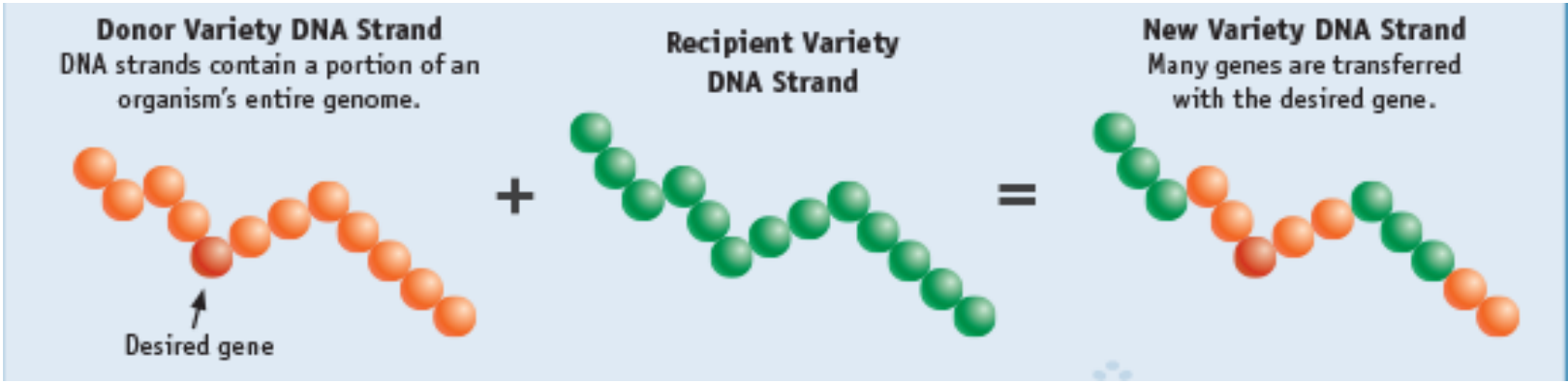
Every individual has a foodprint – the amount of land it takes to produce the food they eat. The typical foodprint for a person from the UK is around half the size of a football field. This diagram shows how much land is needed to produce the different food groups eaten by a typical UK individual.



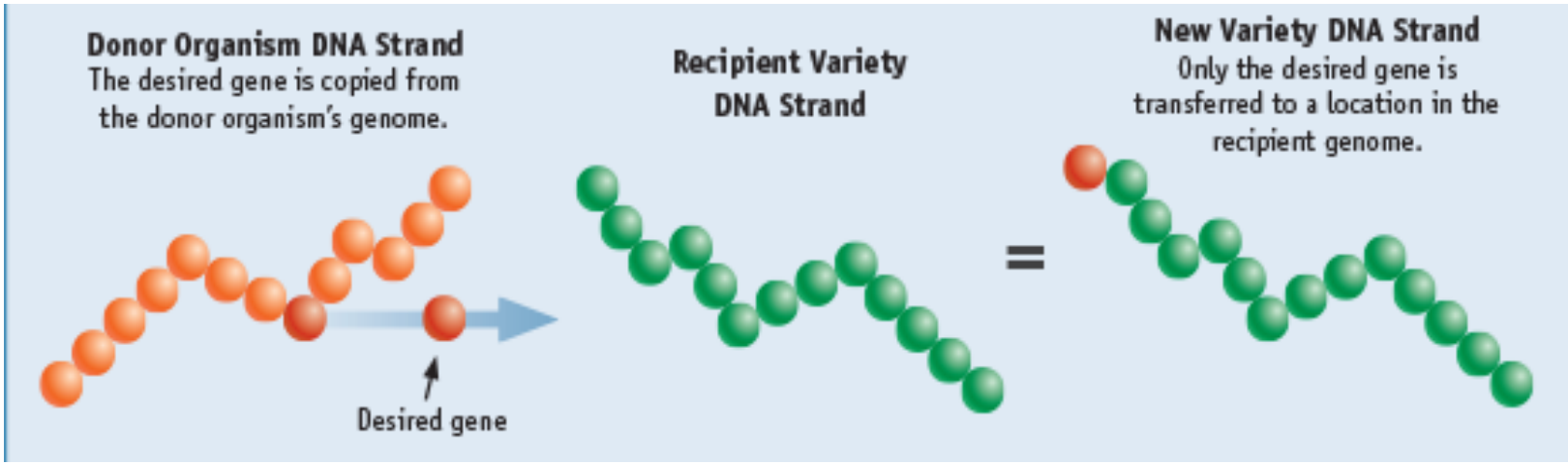
Source: Best foot forward

Methods of Plant Breeding

Traditional



Genetic Engineering



Source: fda.gov

GMO?

Genetically Modified Organism

A GMO IS:

the direct human manipulation of an organism's DNA in a laboratory environment.

A GMO IS NOT:

Plants and animals that are traditionally bred to achieve specific characteristics such as breeding dogs or cross-pollination of plants

SCIENCE OF GMOS

Genetic modification may include the ADDITION OF DNA from species that would NOT BREED in nature.

Genetic modification may also involve REMOVING SPECIFIC STRANDS OF DNA.

Cross-species—or transgenic—genetic manipulation has gone so far as to **COMBINE FISH DNA WITH STRAWBERRIES** and tomatoes.

GMO foods have only existed in groceries since the *late 1990's.*

GMO life can be **patented**

GMO varieties of corn and potatoes are engineered to **PRODUCE THEIR OWN PESTICIDES.**

PERCENT OF GMOS IN TOTAL CROP PRODUCTION

2011 (USA)

PUBLIC OPINION OF GMOS

Polls consistently show that a significant majority of North Americans would **LIKE TO BE ABLE TO TELL** if the food they're purchasing contains GMOs.

OUT OF A CBS NEWS POLL:

87% want GMOs labelled

53% would not buy genetically modified food

NATIONAL OPINIONS OF GMOS:

The USA is the **largest** producer of GMO crops and **does not mandate** labels for GMO food.

In 30 other countries there are bans or restrictions on the production of GMOs, because they are **not considered proven safe.**

DESIGN BY MCKENZIE LONG AT CARDINAL INNOVATIVE

Source: occupynewmexico.org

the good

Reduction in
insecticide use

As adoption of insect-resistant crops has increased, insecticide usage has decreased.

Can produce
higher yields

To varying degrees, GMO crops have produced higher yields, largely due to improved pest control.

Benefits for
farmers

Many GMO farmers have experienced increased profitability, decreased exposure to pesticides and improved crop management.

Can provide defence against
aggressive disease

In the 90s, Hawaii's papaya industry faced a crisis as the due to the Papaya ringspot virus (PRSV). A GMO variety of papaya with resistance to PRSV saved the industry.

May help fix big
world problems

"Agricultural biotechnologies provide opportunities to address the significant challenges of ensuring food security without destroying the environmental resource base."
– Food and Agriculture Organization of the UN

the bad

Concerns about health

Use of an allergenic protein in a GMO crop could result in allergic reactions. The WHO raises concerns about potential gene transfer of antibiotic resistance.

Concerns with IP ownership

GMO opponents are concerned that corporations will charge unreasonable rates for GMOs and subsequently hurt economies and the viability of small farms.

Superbugs and superweeds

Herbicide-resistant weeds and insecticide-resistant bugs can arise from the use of the HT and Bt GMOs, potentially negating many future GM benefits.

Lack of transparency

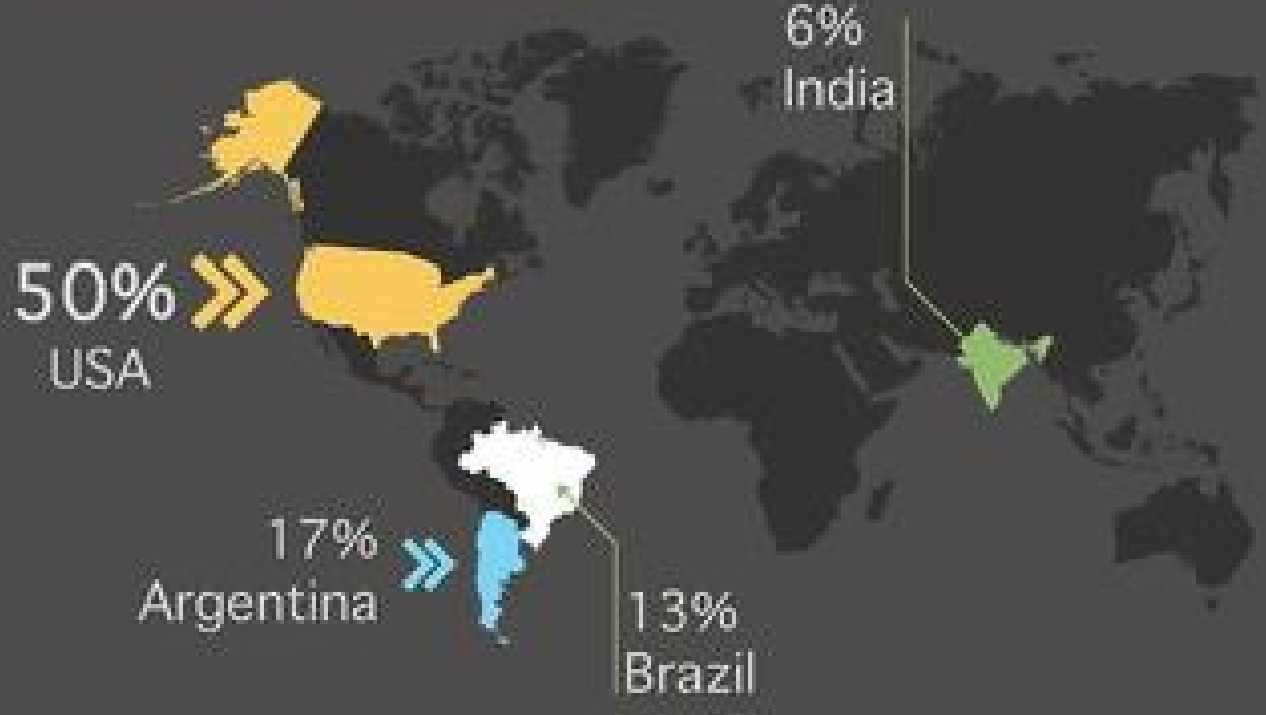
In the US, there is no mandatory labeling of GMOs. While an estimated 70% of foods sold in the US contain GMOs, the lack of labeling prevents consumers from making an informed decision.

May cause big world problems

Gene transfer from GMO crops could contaminate non-GMO crops and wildlife. Genetic modifications could create super-invasive species. Opponents are concerned about these and other unknowns.

Who grows it?

% World GMO Crop Area by country



9 of every 10 farmers planting GMOs are resource-poor and living in developing countries.

Drought-resistant Crops

Farmers have had to wait between 150 and 180 days before harvesting their traditional maize crop, but the centre says the new seed takes only 136 days to mature

The Scientific and Industrial Research and Development Centre (SIRDC), in partnership with the University of Zimbabwe and Biotechnology Research Institute (BRI) has developed a drought-resistant variety of maize seed called Sirdamaize 113.

Source: Park Orchards Garden supply

New science - Creating the $300,000 “Burger”

Source: WSJ

Consumption of Grain Per Person Per Year for Food and Feed

U.S.	800 kg
Italy	400 kg
India	200 kg

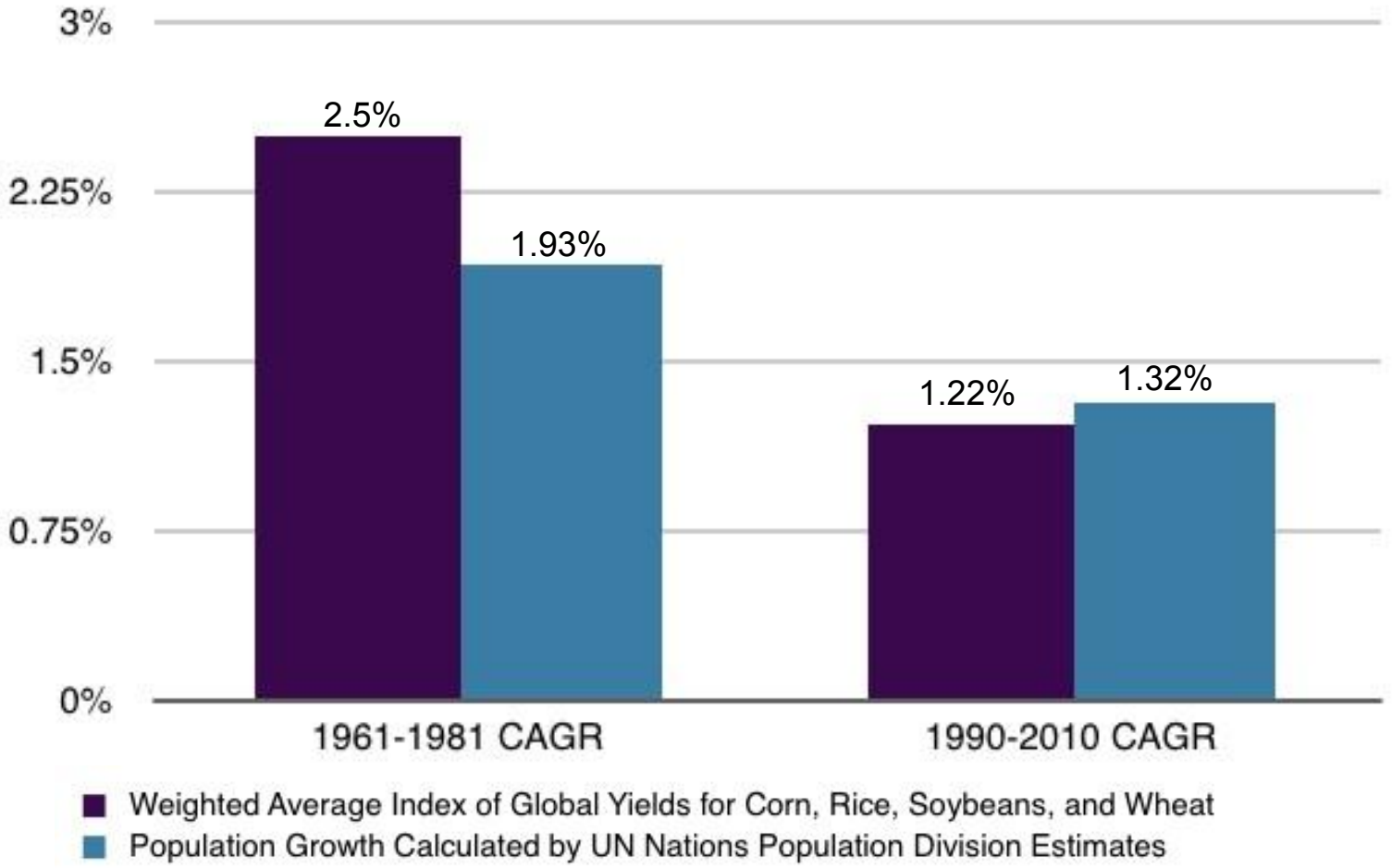
Mediterranean Diet

- includes meat, cheese and seafood (all in moderation)
- studies show that people consuming this type of diet are healthier and live longer

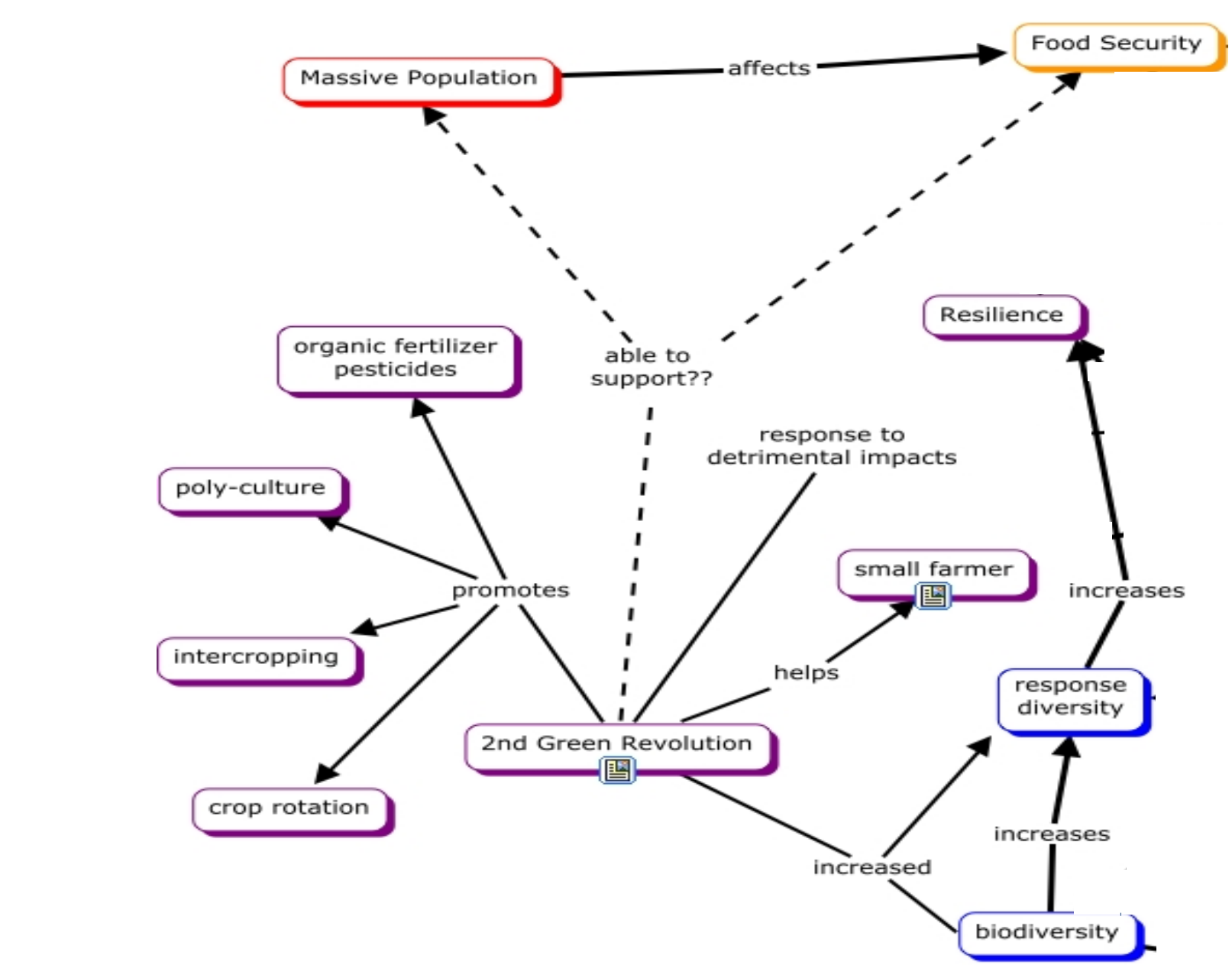
Source: Plan B 4.0

GREEN REVOLUTION

The Green Revolution vs. The Gene Revolution



Source:globalaginvesting.com



Source:enviro.lclark.edu

A little *more* persistence, a little *more* effort, and *what seemed* hopeless failure may *turn to* glorious *success*.

Elbert Hubbard

Schedule of presentations: 5:30 pm - 7:30 pm

Date:Thursday	Topics
June 20	Selling our Future
June 27	Population Pressure: Land & Water
July 11	Climate Change & the Energy Transition
July 18	Stabilizing Climate:An Energy Efficiency Revolution
July 25	Stabilizing Climate:Shifting to Renewable Energy
August 1	Designing Cities for People
August 8	Eradicating Poverty & Stabilizing Population
August 15	Restoring the Earth
August 22	Feeding Eight billion People Well
August 29	Can We Mobilize Fast Enough
September 5	Summary & Priorities

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