Biotechnology Products: A Global Report

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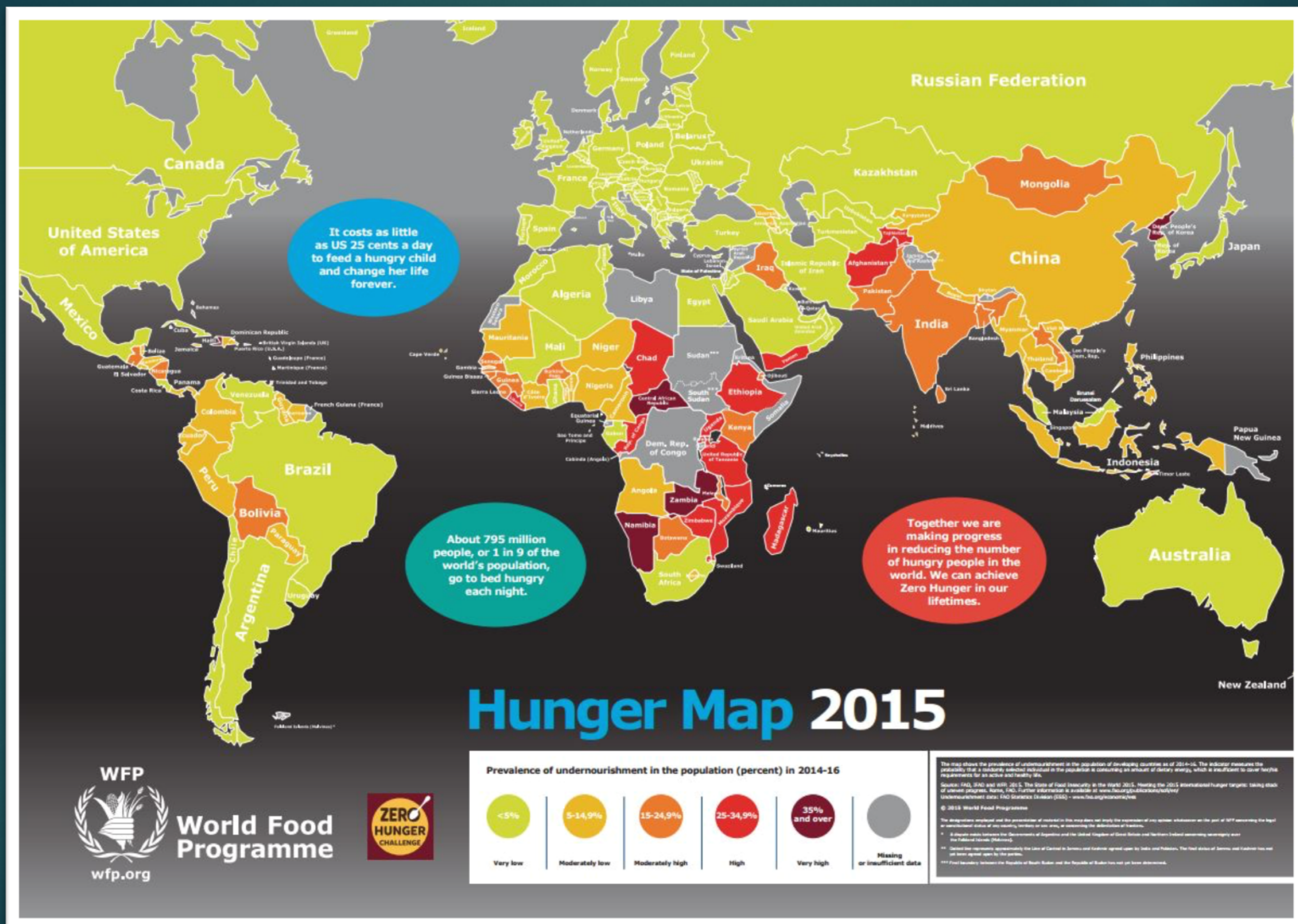
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

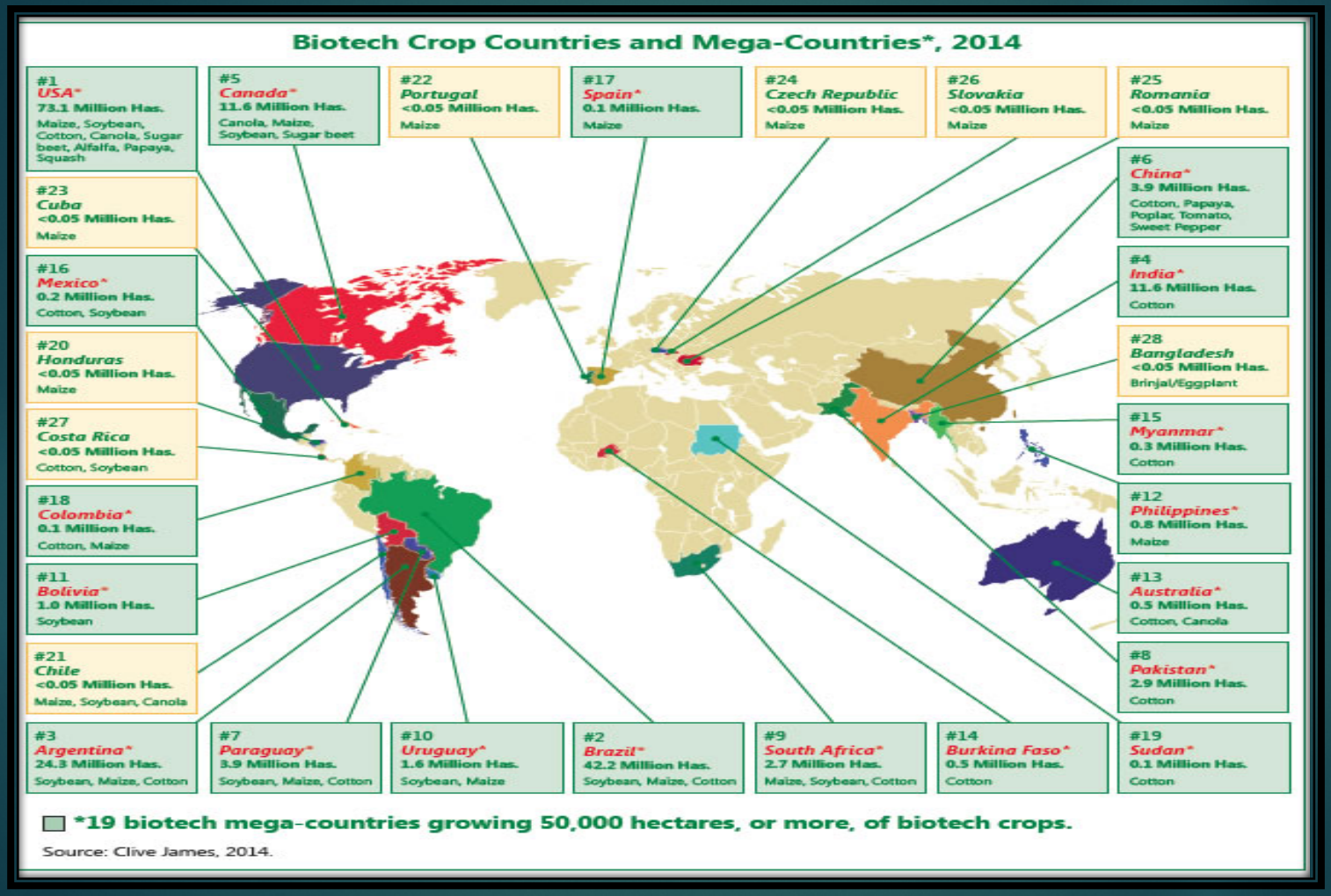
WORLD HUNGER

HUNGER FACTS

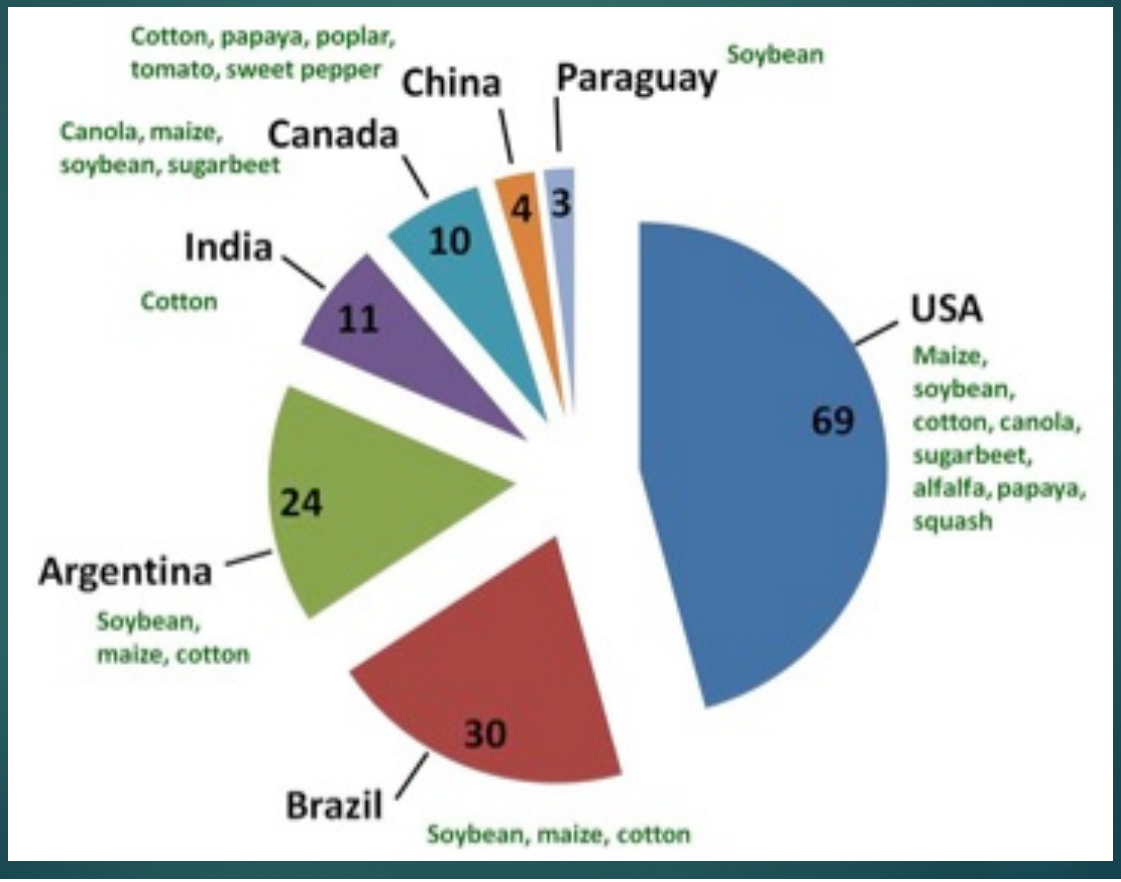
- There is enough food in the world to feed everyone
- More than 800 million people know what it is like to go to bed hungry; most of them are women and children
- Almost 200 million children under five years of age are underweight due to a lack of food
- Malnutrition in children causes mental retardation and physical stunting
- One child dies every seven seconds from hunger and related causes

WFP World Food Programme


Hunger Map 2015
Russian Federation
Canada
United States of America
Mexico
Brazil
Bolivia
Peru
Argentina
Colombia
Algeria
Libya
Egypt
Mali
Niger
Chad
Nigeria
Ethiopia
Kenya
Dem. Rep. of Congo
Angola
Zambia
Namibia
Botswana
South Africa
Madagascar
Kazakhstan
Mongolia
China
India
Pakistan
Afghanistan
Iraq
Saudi Arabia
Japan
Philippines
Indonesia
Papua New Guinea
Australia
New Zealand
It costs as little as US 25 cents a day to feed a hungry child and change her life forever.
About 795 million people, or 1 in 9 of the world's population, go to bed hungry each night.
Together we are making progress in reducing the number of hungry people in the world. We can achieve Zero Hunger in our lifetimes.
Prevalence of undernourishment in the population (percent) in 2014-16
<5%
Very low
5-14,9%
Moderately low
15-24,9%
Moderately high
25-34,9%
High
35% and over
Very high
Missing or insufficient data
WFP
World Food Programme
wfp.org
ZERO HUNGER CHALLENGE


Biotech Crop Countries and Mega-Countries*, 2014
#1 USA* 73.1 Million Has. Maize, Soybean, Cotton, Canola, Sugar beet, Alfalfa, Papaya, Squash
#5 Canada* 11.6 Million Has. Canola, Maize, Soybean, Sugar beet
#22 Portugal <0.05 Million Has. Maize
#17 Spain* 0.1 Million Has. Maize
#24 Czech Republic <0.05 Million Has. Maize
#26 Slovakia <0.05 Million Has. Maize
#25 Romania <0.05 Million Has. Maize
#23 Cuba <0.05 Million Has. Maize
#6 China* 3.9 Million Has. Cotton, Papaya, Poplar, Tomato, Sweet Pepper
#16 Mexico* 0.2 Million Has. Cotton, Soybean
#4 India* 11.6 Million Has. Cotton
#20 Honduras <0.05 Million Has. Maize
#28 Bangladesh <0.05 Million Has. Brinjal/Eggplant
#27 Costa Rica <0.05 Million Has. Cotton, Soybean
#15 Myanmar* 0.3 Million Has. Cotton
#18 Colombia* 0.1 Million Has. Cotton, Maize
#12 Philippines* 0.8 Million Has. Maize
#11 Bolivia* 1.0 Million Has. Soybean
#13 Australia* 0.5 Million Has. Cotton, Canola
#21 Chile <0.05 Million Has. Maize, Soybean, Canola
#8 Pakistan* 2.9 Million Has. Cotton
#3 Argentina* 24.3 Million Has. Soybean, Maize, Cotton
#7 Paraguay* 3.9 Million Has. Soybean, Maize, Cotton
#10 Uruguay* 1.6 Million Has. Soybean, Maize
#2 Brazil* 42.2 Million Has. Soybean, Maize, Cotton
#9 South Africa* 2.7 Million Has. Maize, Soybean, Cotton
#14 Burkina Faso* 0.5 Million Has. Cotton
#19 Sudan* 0.1 Million Has. Cotton
*19 biotech mega-countries growing 50,000 hectares, or more, of biotech crops.
Source: Clive James, 2014.

Largest GMO Crop Producers



Impacts of GM crop adoption by modified trait.

Outcome variable	All GM crops	Insect resistance	Herbicide tolerance
Yield	21.57*** (15.65; 27.48)	24.85*** (18.49; 31.22)	9.29** (1.78; 16.80)
n/m	451/100	353/83	94/25
Pesticide quantity	−36.93*** (−48.01; −25.86)	−41.67*** (−51.99; −31.36)	2.43 (−20.26; 25.12)
n/m	121/37	108/31	13/7
Pesticide cost	−39.15*** (−46.96; −31.33)	−43.43*** (−51.64; −35.22)	−25.29*** (−33.84; −16.74)
n/m	193/57	145/45	48/15
Total production cost	3.25 (−1.76; 8.25)	5.24** (0.25; 10.73)	−6.83 (−16.43; 2.77)
n/m	115/46	96/38	19/10
Farmer profit	68.21*** (46.31; 90.12)	68.78*** (46.45; 91.11)	64.29 (−24.73; 153.31)
n/m	136/42	119/36	17/9

Average percentage differences between GM and non-GM crops are shown with 95% confidence intervals in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. *n* is the number of observations, *m* the number of different primary datasets from which these observations are derived.
doi:10.1371/journal.pone.0111629.t002

Klümper W, Qaim M (2014) A Meta-Analysis of the Impacts of Genetically Modified Crops. PLoS ONE 9(11): e111629. doi:10.1371/journal.pone.0111629

EMBRAPA is developing :
-Soybean and Sugarcane drought-resistant,
-Folate-fortified Lettuce,
-Soybean as a biofactory of HIV antibody
-Virus-resistant Bean expected to be commercially launched in 2016.

A new herbicide-tolerant Soybean was approved for release in country and to be exported to 17 markets including China and the EU

Status of Genetically Modified (GM) Crops in Africa
(Modified from absafrica.org)

Application stage	No. of Countries	Country Names
Commercial production	3	Burkina Faso; Egypt; South Africa
Confined field testing	7	Burkina Faso; Egypt; Kenya; South Africa; Uganda; Nigeria; Malawi
Contained research	At least 14	Burkina Faso; Cameroon; Egypt; Ghana; Kenya; Mali; Mauritius; Namibia; Nigeria; South Africa; Tanzania; Tunisia; Uganda; Zimbabwe; Malawi
Developing capacity for research and development	At least 27	South Africa; Burkina Faso; Egypt; Kenya; Morocco; Senegal; Tanzania; Uganda; Zambia; Zimbabwe; Benin; Cameroon; Ghana; Malawi; Mali; Mauritius; Namibia; Niger; Nigeria; Tunisia; Algeria; Botswana; Ethiopia; Madagascar; Rwanda, Burundi, Sudan

Barriers to Development and Adoption of Biotech Crops

1-Governance and Political Instability

2-Lack of approval and implementation of functional biosafety frameworks

3-Delayed investments in agricultural production and technology development

4-Increased food production instability (climate change)

5- Sub-standard seed systems and germplasm delivery mechanisms

6- EU

7-Explosion in population growth

The Silver Lining

Field trials of a variety of crops (rice, maize, bananas, sorghum, cassava, sweet potato, sorghum) exhibiting insect resistance, herbicide tolerance, virus and drought and salt resistance have been conducted in Cameroon, Egypt, Ghana, Kenya, Malawi, Nigeria, and Uganda and await final commercialization approval.

Water Efficient Maize for Africa/ will be release in South Africa as early as 2017, followed by Kenya and Uganda, and then by Mozambique and Tanzania, subject to regulatory approval.

Bt Corn 26% of total production

Bt eggplant/MAHYCO

Golden Rice/IRRI

Bt cotton
Chinese gen in Indian varieties

INDIA, Bt Cotton

95% adoption

230% increased in cultivated area (50000ha to 11.6 mil ha)

112.5 Billion farmer income increase in 13 years

CHINA

3.9 million hectares of biotech cotton at an adoption rate of 93%

8,500 hectares of virus resistant papaya were doubling the previous year planting

Bt poplar was planted in about 600 ha

Bt cotton occupied 3.5 mil Ha

What is new?

- RNAi – based Biotech crops:
  - Innate potato
  - Reduced lignin Alfalfa
  - spray-able dsRNA to control cassava viruses
  - Low lignin sugar cane for biofuel uses
- CRISPR
- Plant Membrane transporter