The Global Economic, Environmental and Human Health Benefits from GM Crops

College of Agricultural and Bioresources
Research Day

March 17, 2017

Stuart Smyth
Agricultural & Resource Economics
University of Saskatchewan

SAIFood
SUSTAINABLE AGRICULTURAL INNOVATIONS & FOOD
INDUSTRY FUNDED RESEARCH CHAIR IN AGRI-FOOD INNOVATION

Thank You To My Sponsors

syngenta®

SaskCanola

CropLife CANADA

BAYER Bayer CropScience

MONSANTO®

GIFS | GLOBAL INSTITUTE FOR FOOD SECURITY

POTASHCORP - A FOUNDING PARTNER

SAIFood

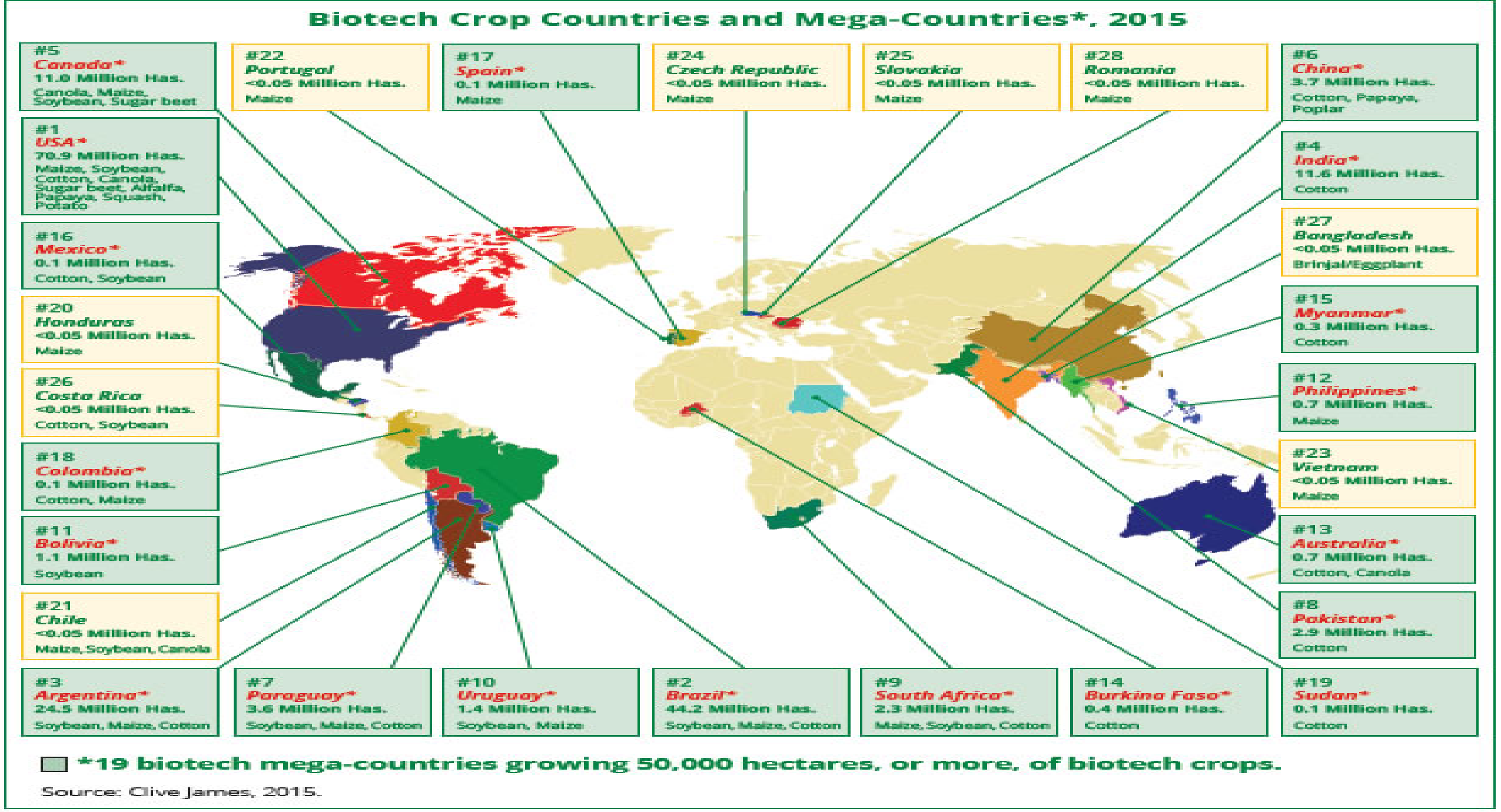

Figure 1. Global Map of Biotech Crop Countries and Mega-Countries in 2015

Distribution of benefits from GM crops

- Canola: Farmers 43%, Firms 48%, Consumers 5%
- Soybeans: Farmers 32%, Firms 34%, Consumers 25%
- Corn: Farmers 59%, Firms 30%, Consumers 11%
- Cotton: Farmers 75%, Firms 21%, Consumers 4%
- Alston et al. (2014) estimate the global benefits from GM soybeans to be $46 billion
- Brookes and Barfoot's (2016) report on GM crops in 2014 identify the cumulative economic benefit has reached **$150 billion**

SAIFood

Impacts from GM crops

- Carpenter (2010) examined 168 studies on GM crop yields, finding 124 reported yield increases, 32 no change and only 13 reporting lower yields
- Finger et al. (2011) examined 203 peer reviewed studies, concluding that yield increases are due to reduced insect and weed populations
- Areal et al. (2013) examined 97 studies comparing yield increases between GM and non-GM, finding GM outperforms in both developed and developing countries

SAIFood

Global benefits from GM crops

Klümper & Qaim (2014) conducted a meta-analysis of 147 studies on the impacts of GM crops, finding:

- Chemical pesticide use decreased by 37%
- Crop yields increased by 22%
- Farmer profits increased by 68%

SAIFood

Economic benefits from GM crops

- Subramanian & Qaim (2010) Bt cotton adoption in India raised **vulnerable household incomes** (<$2/day) by 134%
- Hutchinson et al. (2010) found GM corn in the US created $6.8 billion in extra value, with 60% going to non-adopters
- Gusta et al. (2011), GM canola resulted in annual benefits of $350 - $400 million in Western Canada
- Yorobe & Smale (2012) found GM corn adoption in the Philippines increased household income from $400/yr. to $600/yr.
- Vitale et al. (2014) found Bt cotton adoption in Burkina Faso resulted in a profit of $150/ha vs $70/ha for conventional cotton

SAIFood

Environmental benefits from GM crops

- Subramanian & Qaim (2010) found Bt cotton reduced pesticide use in India by 41%
- Huang et al. (2010) found Bt cotton in China reduced insecticide use from 14kg/ha to 4kg/ha overall, with 40kg/ha to 10kg/ha in non-Bt fields
- Smyth et al. (2011) identified that GM canola reduced EIQ by 53% in Western Canada
- Brookes and Barfoot (2016) show CO_2 emission reductions equal to removing 10 million cars for one year

SAIFood

Environmental benefits from GM crops

- Australia decided to implement a moratorium against GM canola in 2004, delaying adoption by 6-8 years
- The costs of this delay are substantial
- Biden (2016) found the following impacts from delayed adoption:
  - the application of an additional 6.5 million kg of chemicals
  - 7 million additional field passes were made, requiring 8.7 million litres of diesel
  - 24 million kg of greenhouse gases were released
  - the environmental impact of the additional chemicals applied was 14% higher

SAIFood

Health benefits from GM crops

- Ostry et al (2010) examined 23 GM corn studies, finding lower mycotoxins on 19 of the studies.
- Gruere & Sengupta (2011) document a reduced suicide rate among Indian farmers following the release of Bt cotton
- Gouse (2013) found GM corn results in 3 fewer weeks of female hand weeding in South Africa
- Vitale et al. (2014) estimate Bt cotton in Burkina Faso results in 30,000 fewer cases of pesticide poisoning per year
- Kouser & Qaim (2014) found Bt cotton reduced pesticide poisoning in India by 2.4-9 million cases a year, saving $14-51 million

SAIFood

Health benefits from GM crops

- Zhang et al. (2016) found GM cotton in China contributed to reduced nerve damage in cotton farmers
- Wu (2014) found that reduced aflatoxins in GM corn contributed to a reduction of liver cancer rates in Qidong China by 45%
- Missmer et al. (2006) identify that fumonisin in corn is linked to neural tube defects
- Wu (2006) found the reduction in fumonisin and aflatoxins in GM corn resulted in $23 million of benefits in the USA

SAIFood

Impact of GM crops

- Every developing country that has adopted GM crops has experience at least one of, if not all of:
  - Increased yield
  - Reduced chemical use
  - Fewer cases of pesticide poisoning

SAIFood

Follow me on Twitter: @stuartsmyth66
Follow SAIFood: @SAIFood_blog

SAIFood
SUSTAINABLE AGRICULTURAL INNOVATIONS & FOOD
INDUSTRY FUNDED RESEARCH CHAIR IN AGRI-FOOD INNOVATION