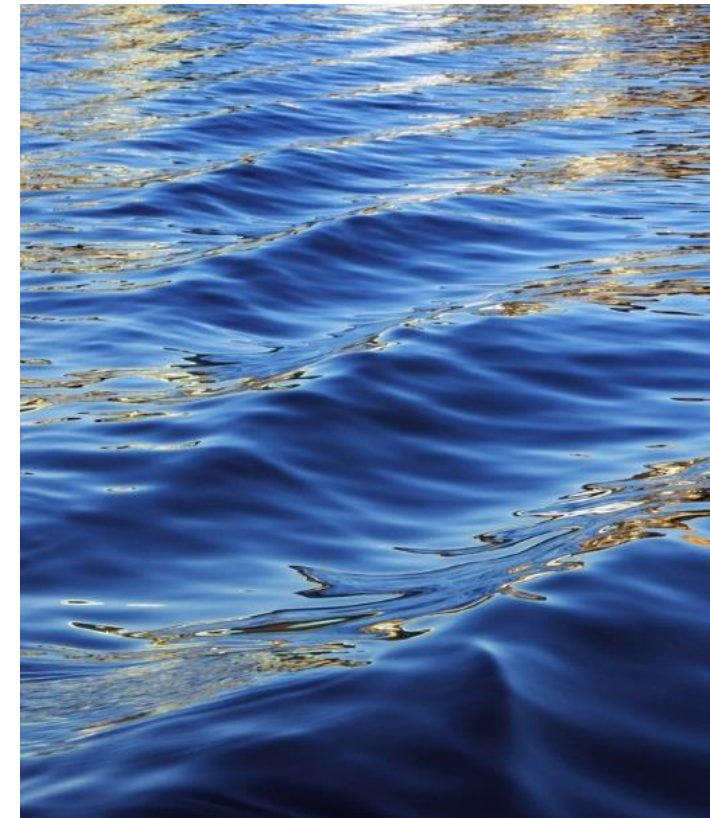




What is the role of biotechnology / GMOs in the future of food?

David Y. Smith
Orion Global Business Sustainability Consultants
May 2, 2018



Orion

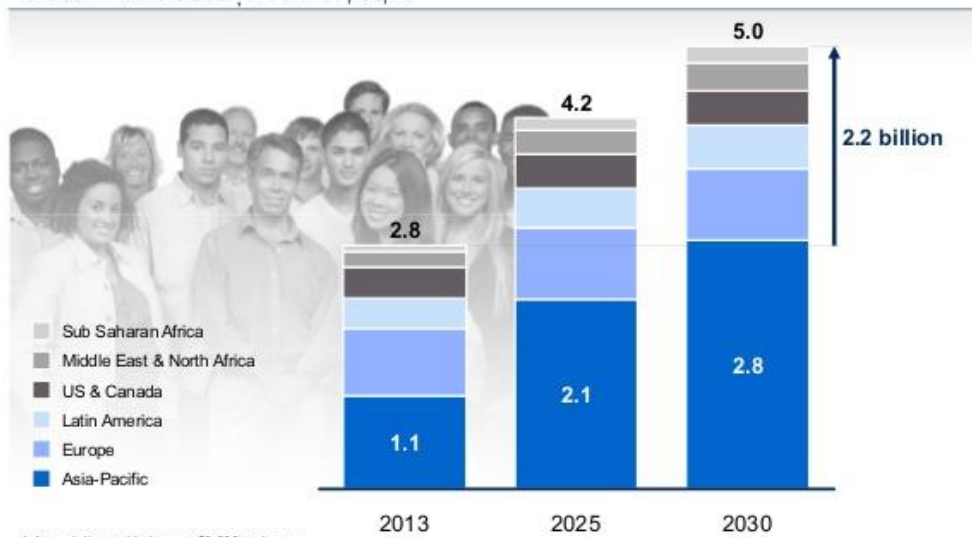
Global Business Sustainability Consultants

Food Security

80% Middle Class by 2030
 + 50% food production

There will be 2.2 billion new middle class consumers by 2030...1.7 billion of the additions will be in Asia-Pacific

Global middle class¹, Billions of people



¹ Annual disposable income \$3,600 and over

SOURCE: United Nations World Population Prospects; McKinsey Global Institute CityScope

McKinsey & Company | 4

“De-couple”

McKinsey “Resource Revolution”: Beyond capital and labour efficiency to resource efficiency

Footprint by national average per person income, 1961-2003

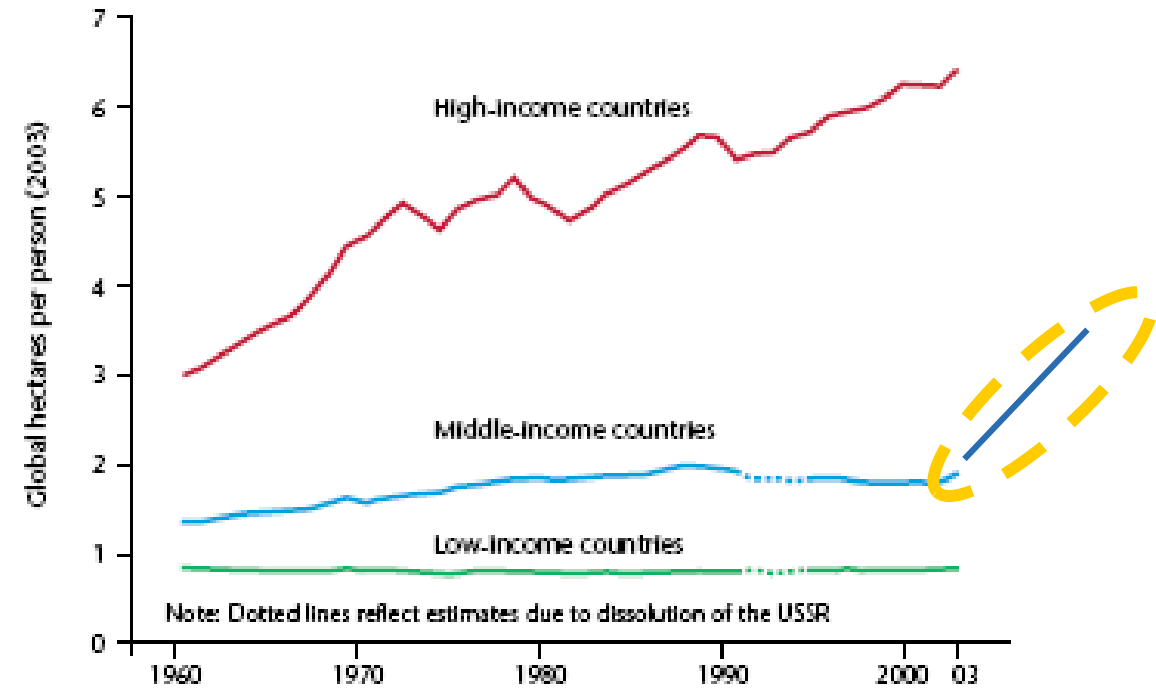


Figure 4: Consumers in wealthy countries account for the greatest per-capita environmental footprint.

Source: WWF, Living Planet Report, 2006.

The Case for Sustainability ?



Agriculture today

- Uses 70% of freshwater available
- Most arable land already used

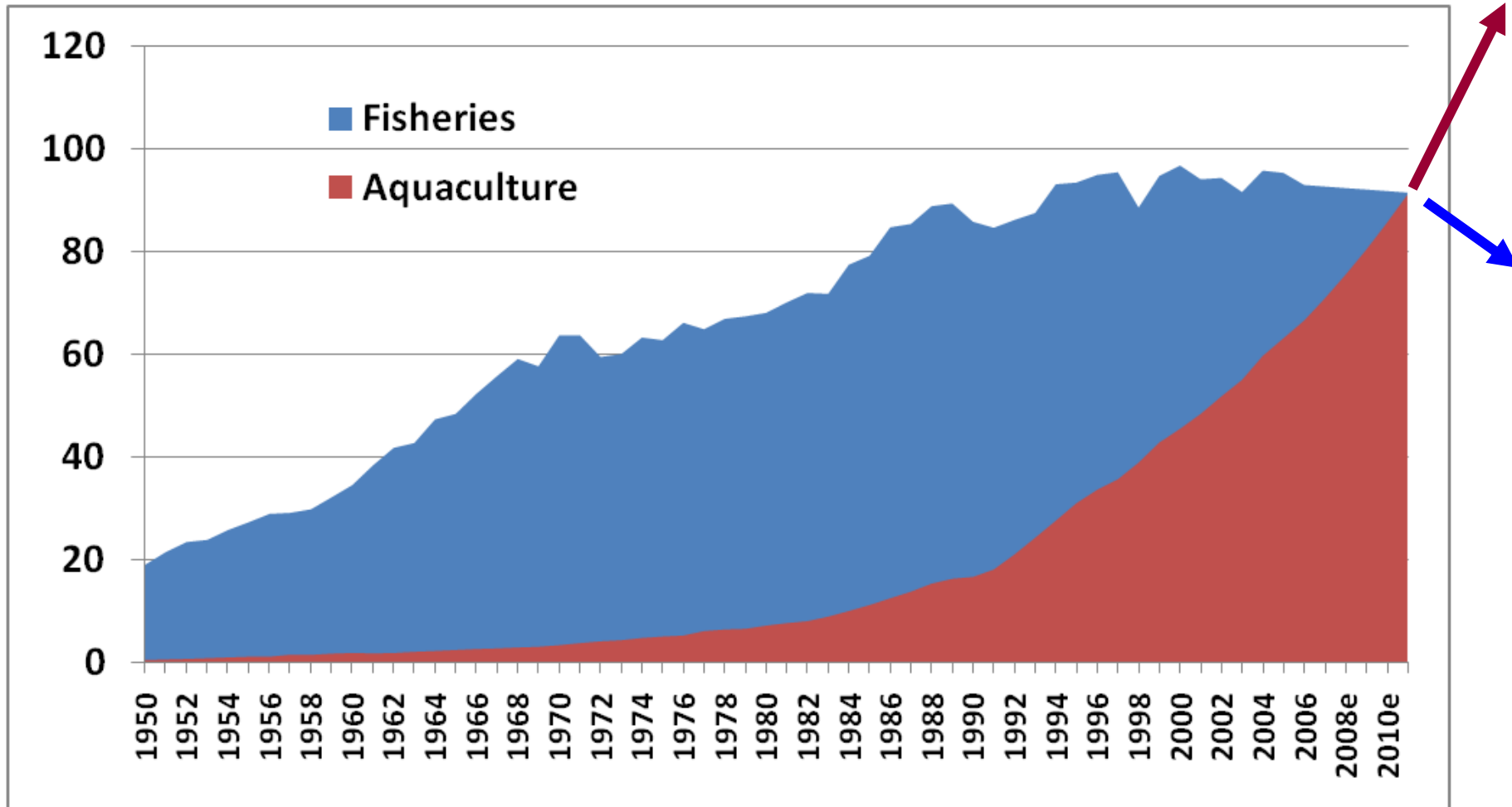


Food Production by 2030

- 50% increase required
- But 40% is wasted now

Seafood Sustainability – Why?

Wild Seafood – Global Tonnage Plateau Since Late 1980s; Farmed is the Future Growth



Definition: Genetically Modified Organisms

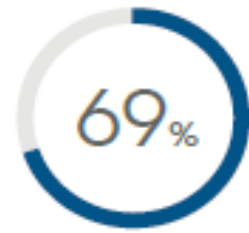
Genetic engineering, also called **genetic modification** or **genetic manipulation**, is the direct manipulation of an organism's [genes](#) using [biotechnology](#). It is a set of [technologies](#) used to change the genetic makeup of cells, including the transfer of genes within and across species boundaries to produce improved or novel [organisms](#). New [DNA](#) is obtained by either isolating and copying the genetic material of interest using [recombinant DNA](#) methods or by [artificially synthesising](#) the DNA.

An organism that is generated through genetic engineering is considered to be genetically modified (GM) and the resulting entity is a [genetically modified organism](#) (GMO). The first GMO was a [bacterium](#) generated by [Herbert Boyer](#) and [Stanley Cohen](#) in 1973. [Rudolf Jaenisch](#) created the first GM animal when he inserted foreign DNA into a [mouse](#) in 1974. The first company to focus on genetic engineering, Genentech, was founded in 1976 and started the production of human proteins. Genetically engineered human [insulin](#) was produced in 1978 and insulin-producing bacteria were commercialised in 1982. [Genetically modified food](#) has been sold since 1994, with the release of the [Flavr Savr](#) tomato. The Flavr Savr was engineered to have a longer shelf life, but most current GM crops are modified to increase resistance to insects and herbicides. In 2016 [salmon](#) modified with a growth hormone were sold.

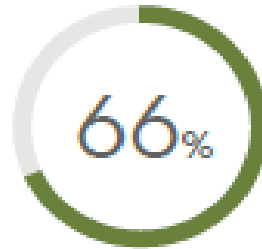
Genetic engineering has been applied in numerous fields including research, medicine, industrial biotechnology and agriculture. In research GMOs are used to study gene function and expression through loss of function, gain of function, tracking and expression experiments. As well as producing hormones, vaccines and other drugs genetic engineering has the potential to cure genetic diseases through [gene therapy](#). The same techniques that are used to produce drugs can also have industrial applications such as producing enzymes for laundry detergent, cheeses and other products.

Source: Wikipedia

What are Canadians very concerned about?



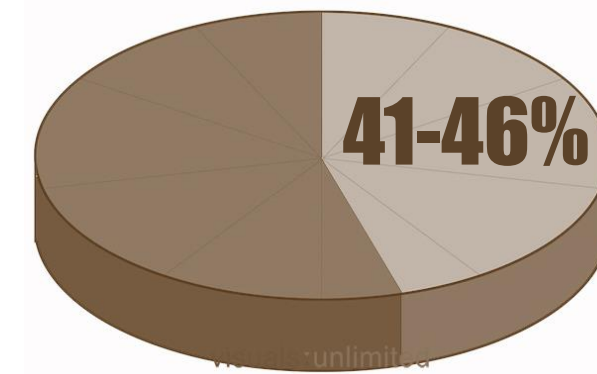
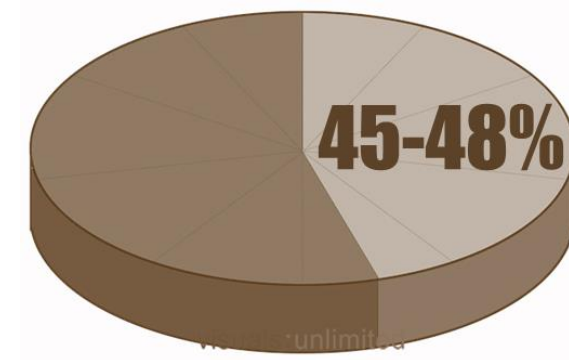
Rising Cost of Food



Keeping Healthy Food Affordable

“I am personally concerned about”

- Drug resistance due to farm animals given antibiotics
 - Use of hormones in farm animals
 - Drug residues in meat, milk, eggs
 - Use of pesticides in crop production
-
- Eating meat (incl. poultry) that comes from GE farm animals
 - Eating food from GE crops
 - I am more concerned about GE foods than I was 5 years ago



Question: Please tell us how concerned you are about the following issues? % = Very Concerned (Top Box (8-10) on 0 to 10 scale)

Please rate the degree to which you agree or disagree with the following statements. % = Strongly Agree (Top Box (8-10) on 0 to 10 scale)

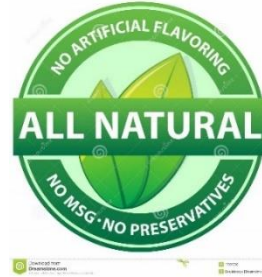


THE CANADIAN CENTRE FOR
FOOD INTEGRITY™

Common Consumer Perceptions



“Food miles”
Transport = small % of env. impact
Not inherently better practices



No legal definition
Not inherently better nutrition
Ingredients sustainably produced?



THE CANADIAN CENTRE FOR
FOOD INTEGRITY

93% of Canadians acknowledge they know little or nothing about farming.
Low Trust in Big Business and in Government oversight.

Not really about science: It's about trust.

Low Trust = No Nuance. No Balance.

“Precautionary Principle”: more nuanced approach than dismissing entire set of technologies.

THANK YOU

David Y. Smith

www.OrionGBSC.com

David@OrionGBSC.com

647-771-5522



Orion

Global Business Sustainability Consultants