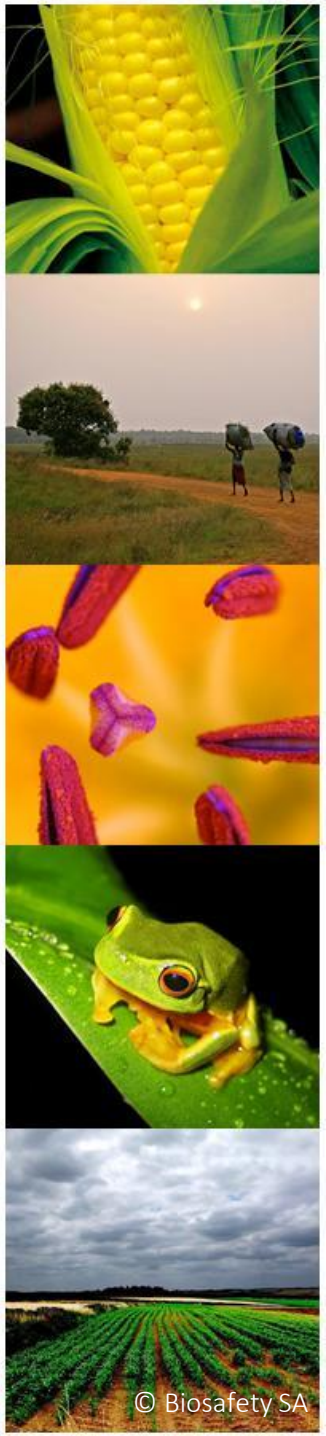


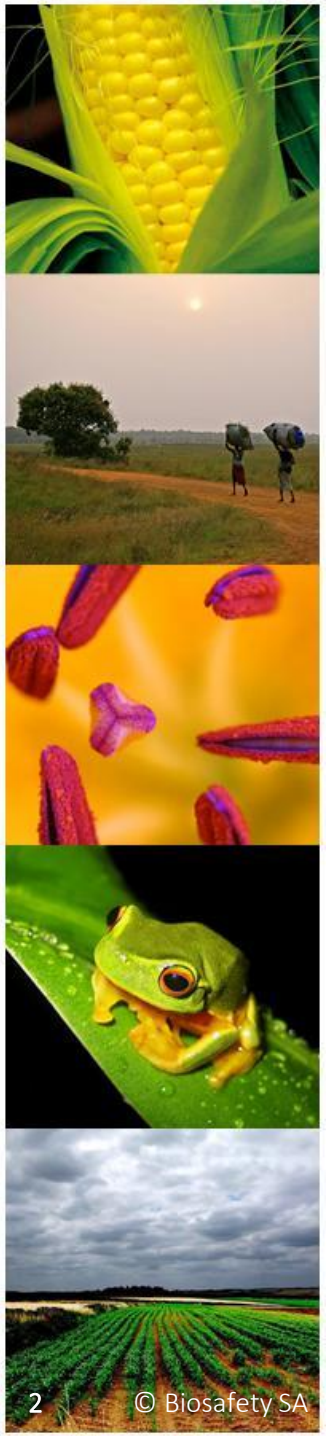
biosafety
SOUTH AFRICA

GMO RISK ANALYSIS SHORT COURSE

University of Pretoria, 4 September 2019

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

technology innovation
AGENCY



Communication & engagement

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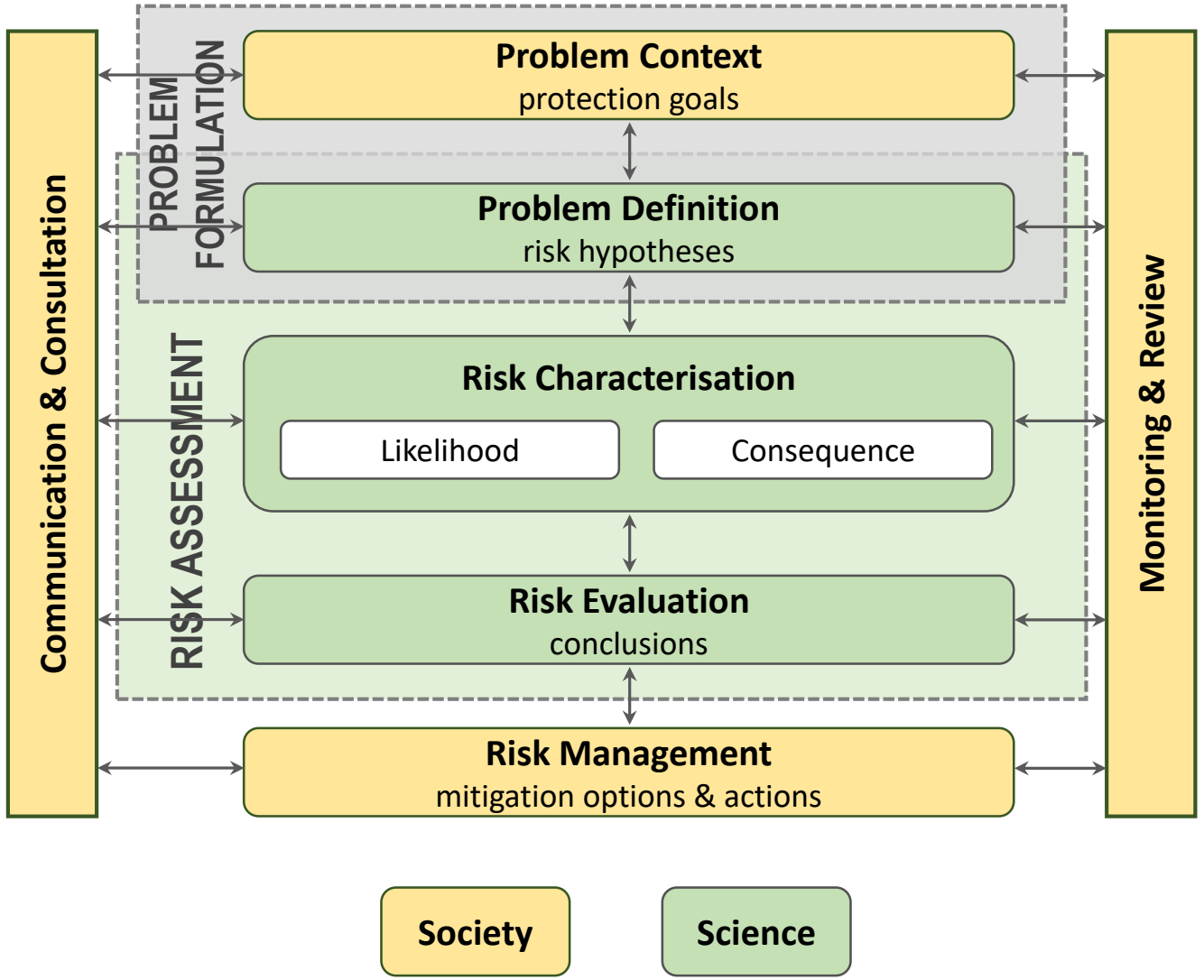
OVERVIEW

- C&E context
- Biosafety SA's C&E strategy
- GM product labelling

C&E context

Sustainable bioeconomy products

RISK ANALYSIS & SOUND DECISION MAKING



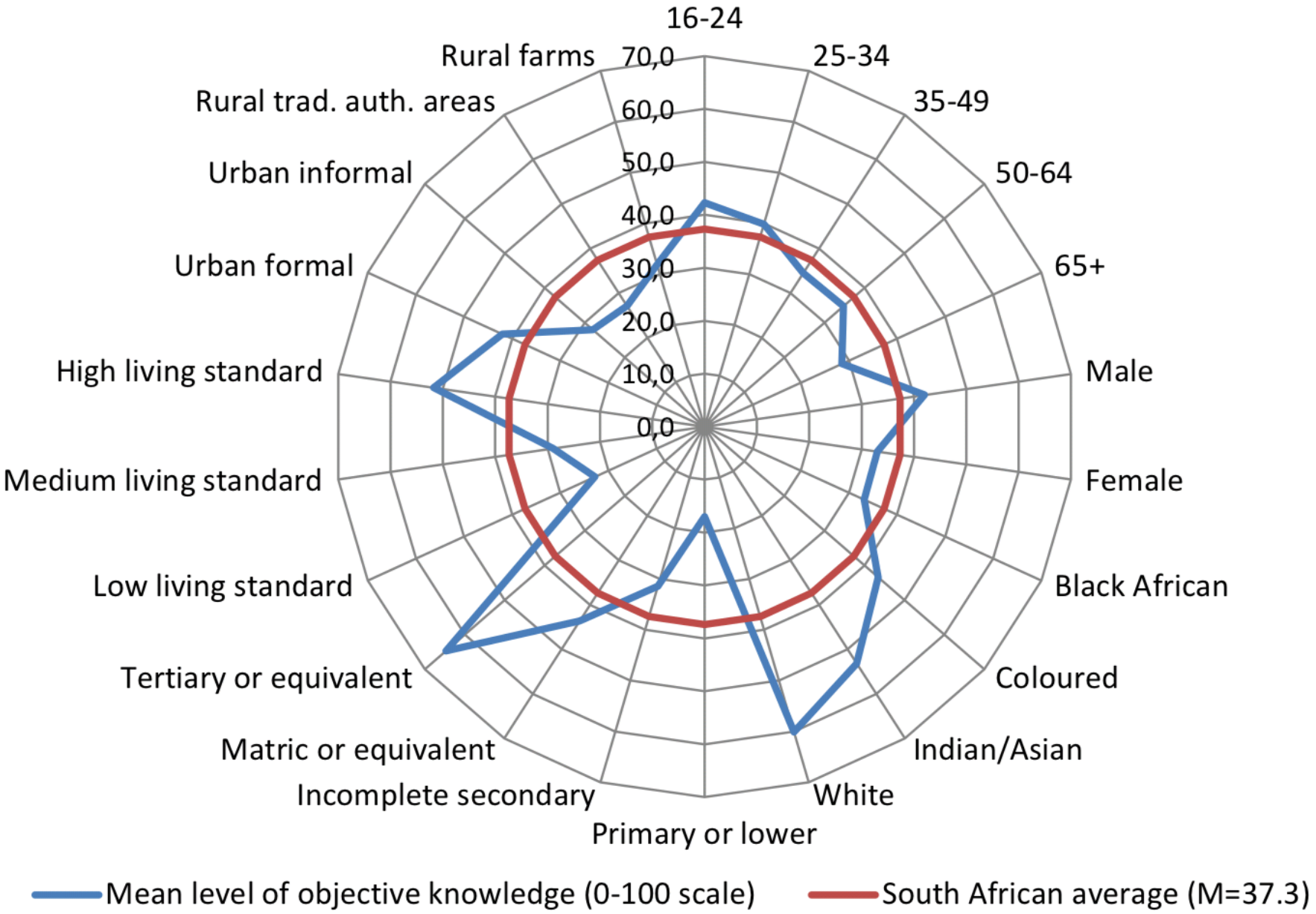
Adapted from Wolt *et al*. 2010. Transgenic Research 19: 425-436 &
Johnson et al. 2007. Trends in Plant Science 12(1): 1-5.

Do you know what the term “biotechnology” means?

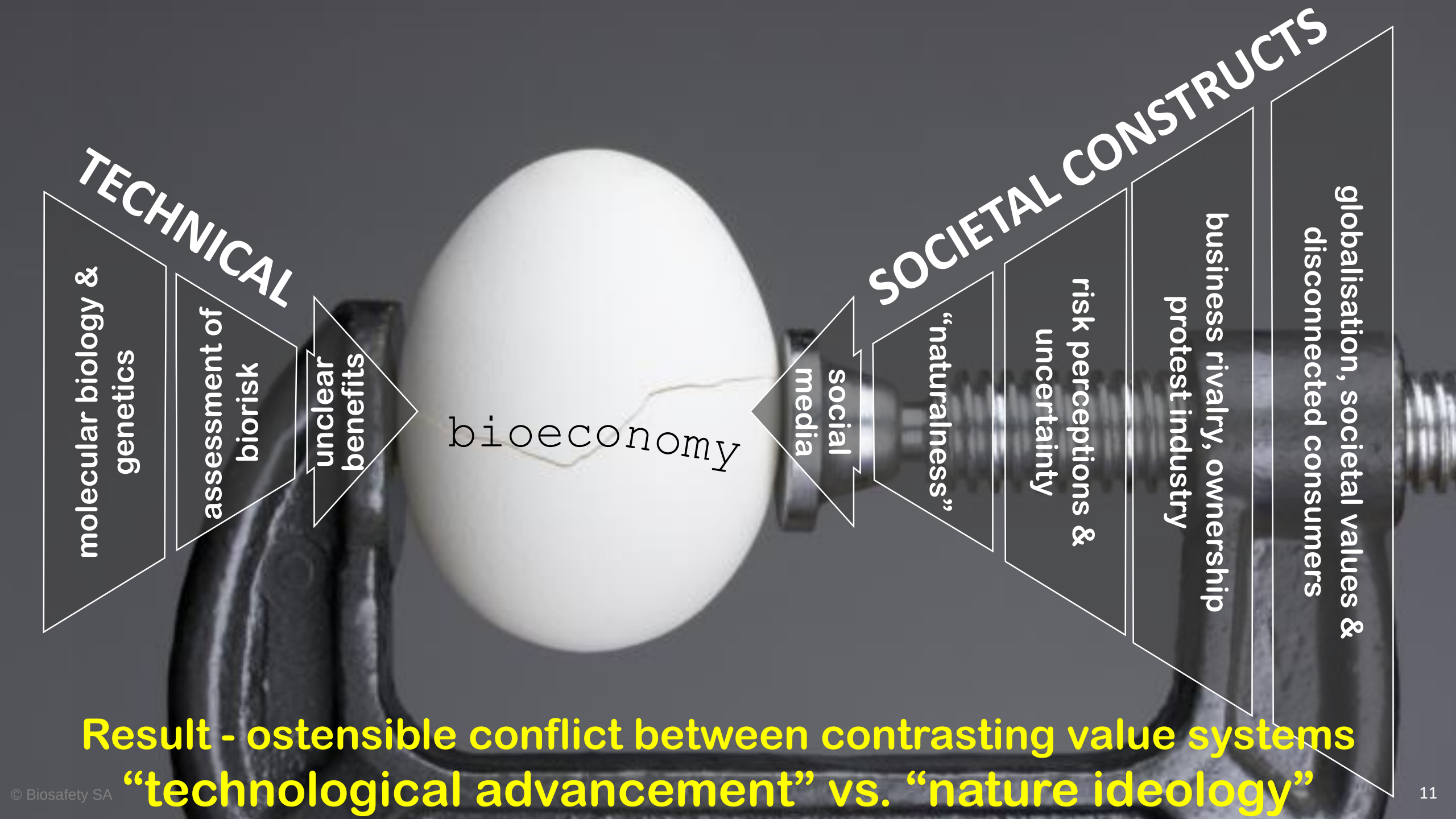
2004 79%

2015 59%

Source: South African Social Attitudes Survey (SASAS 2015).



Source: South African Social Attitudes Survey (SASAS) 2015

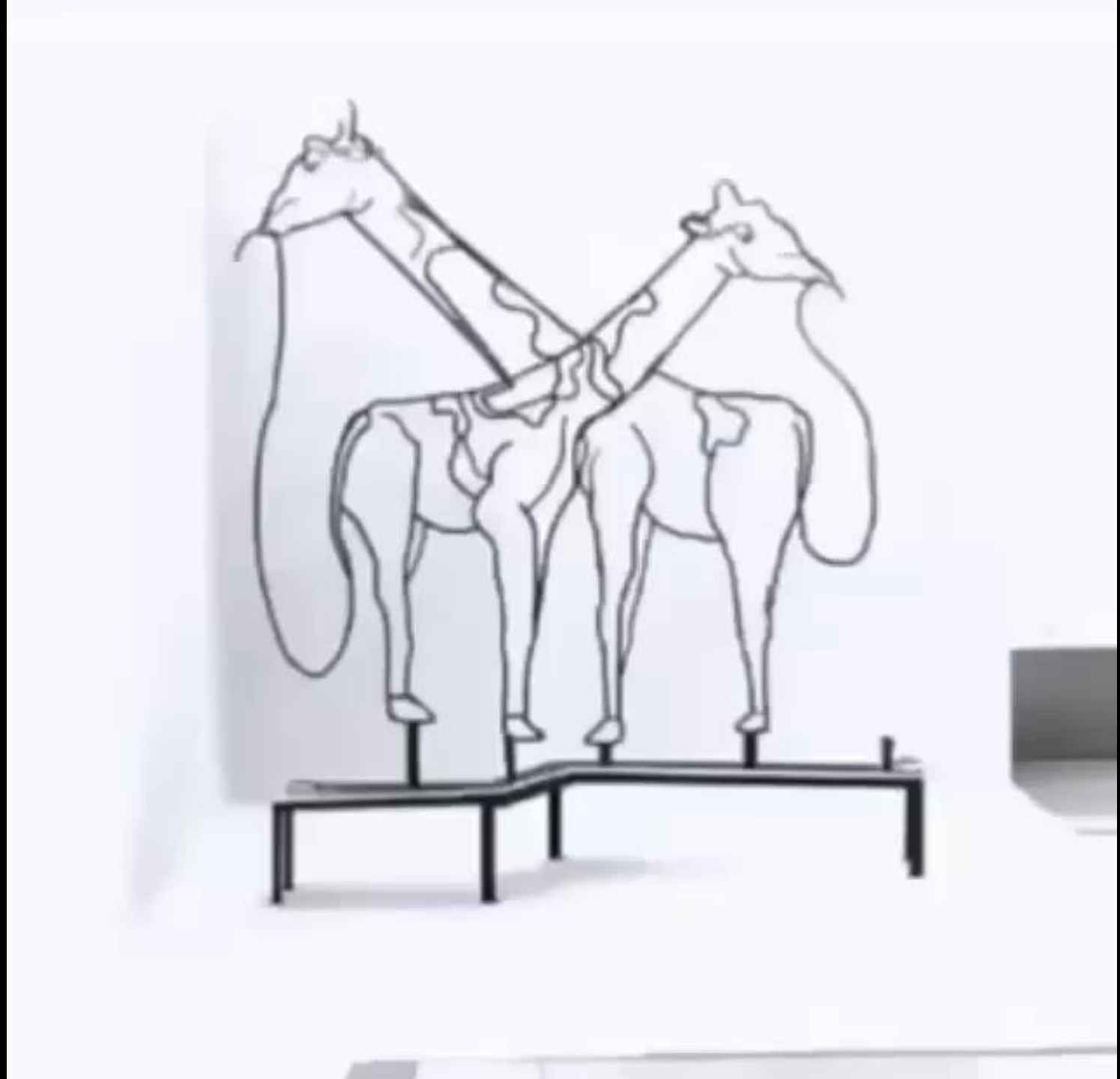


Result - ostensible conflict between contrasting value systems

"technological advancement" vs. "nature ideology"

risk

risk perception



RISK IN CONTEXT

- Hazard - is any potential source of harm (the possibility to cause harm).
- Harm - is an adverse outcome or impact.
- Risk - is the probability of a harm occurring under defined circumstances.

$$hazard \xrightarrow{exposure} harm$$

$$risk = likelihood\ x\ consequence$$

- There is no such thing as zero risk or absolute safety.
- Risk should be assessed in a relevant context (GM vs. conventional, "GMOs" vs. Bt maize).
- Risks can be managed.
- Potential benefits counterbalance the potentially associated risks.

GLYPHOSATE DISCUSSION

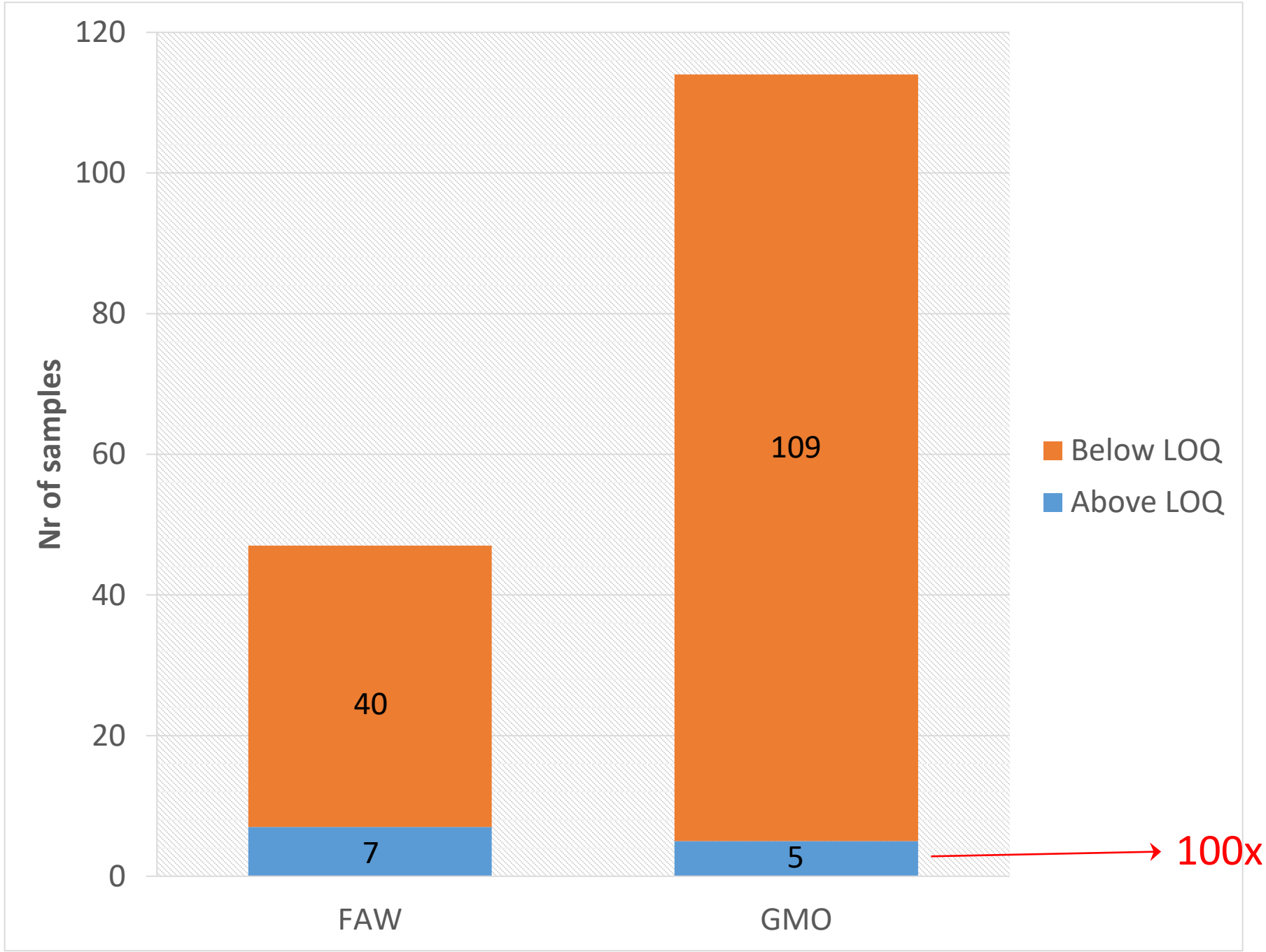
- Safety evaluated & re-evaluated numerous times since 1975.
- Association with GMO crops has led to much scrutiny, but not a "GMO issue" only.
- Same body of knowledge led to apparently contradicting conclusions by IACR and risk assessors.
- IARC finding – two facets: (i) the scientific accuracy of the IARC's judgement and (ii) glyphosate is safe to use despite the outcome!

$$hazard \xrightarrow{exposure} harm$$

- Many well-respected international bodies have re-evaluated risk and found that "*the use of glyphosate does not pose a cancer risk to humans*".

Commodities Covered

COMMODITY	PESTICIDE	MRL
Maize meal	Glyphosate	2,0
	2,4 D	0,5
Sugar	Glyphosate	0,5
	2,4 D	-
Potatoes	2,4 D	0,1
Wheat Flour	2,4 D	0,5
Sorghum	2,4 D	0,5
Soya	Glyphosate	2,00
	2,4 D	2,00


120
100
80
60
40
20
0
Nr of samples
40
7
109
5
FAW
GMO
Below LOQ
Above LOQ
100x < than SA MRL

We need to engage more effectively with society!

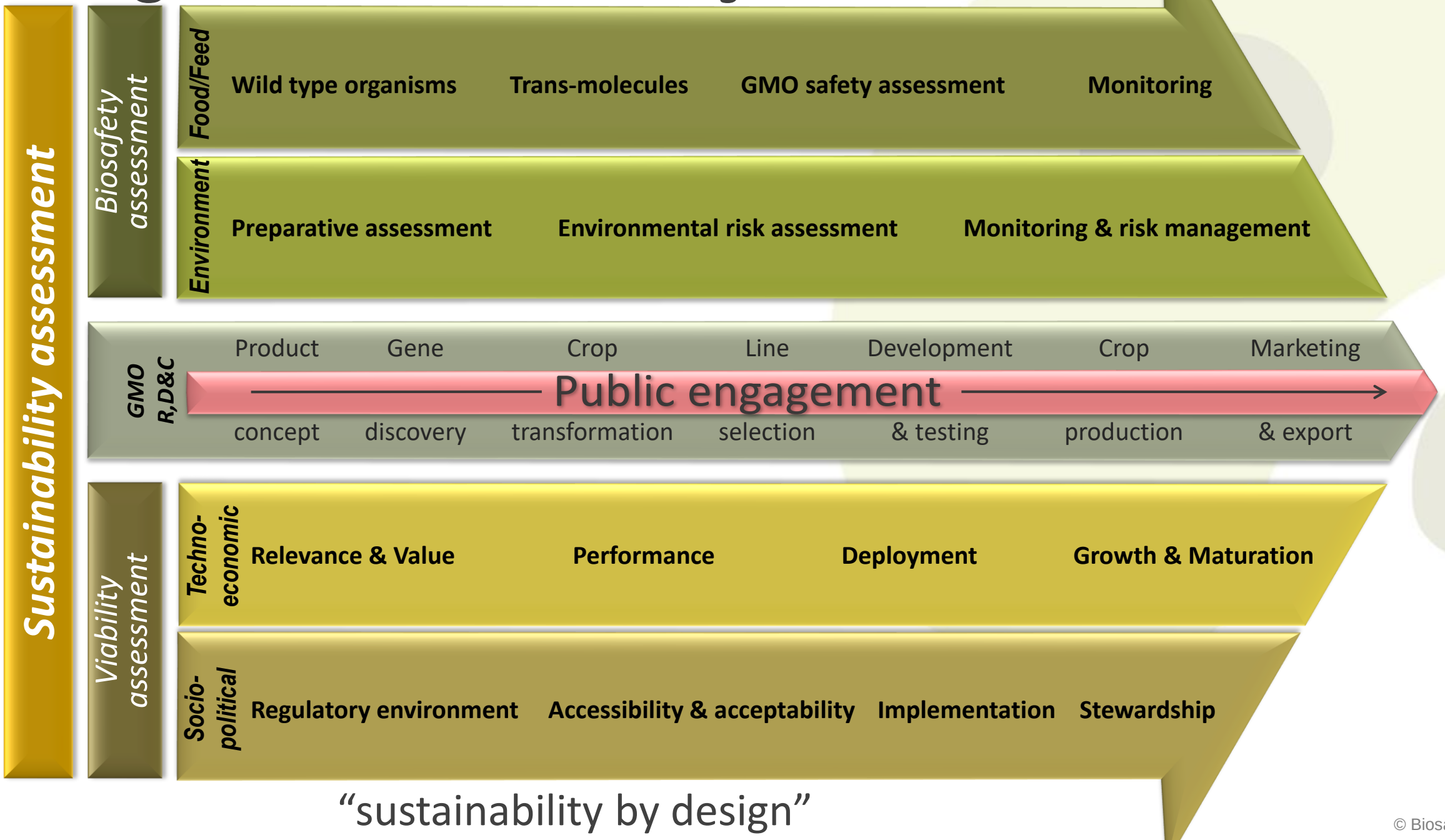
How to communicate effectively

- TRUST > knowledge
- Start with WHY
- Get diverse allies to vouch for sound information
- Seeing is believing!

lessons learnt from agri biotech

- The perceived risk/benefit balance stands central to product acceptance
- Society is an integral part of the innovation process & good governance - build confidence & trust & ensure product sustainability
- Transparency & consultation is vital, but has limitations & disagreements are inevitable
- Build & integrate relevant competencies / institutional support

Integrated sustainability assessment



"sustainability by design"

- ACCEPTANCE is key
- TRUST precedes knowledge
- Develop products that BENEFIT the end-consumer directly
- Be BOLD!

for bioeconomies to be transformative

Biosafety SA's C&E strategy

WHO **WHAT** **WHOM** **HOW**

a sustainable & effective communication

STRATEGY

BIOSAFETY SA'S COMMUNICATION POSITION

Increase
AWARENESS of
&
CONFIDENCE in
South African biosafety system

OBJECTIVES

Network

Capacitate

Ownership

Monitoring

Baitsaanape ba saense ba Aforika Borwa batshwanetse go bula gore ba go dira eng le go fiwa lekwalo tetla pele ba letlelwa go simolla go dira dipatlisiso dingwe le dingwe tsa mokgwa wa go fetolela kaolo.

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Suid-Afrika het 'n streng regulatoriese stelsel wat alle aspekte van GMO-gebruik beheer, insluitende afgeslote navorsing, veldproewe, kommersiële gebruike en oorgrensbewegings.

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South Africa has a rigorous regulatory regime governing various aspects of GMO use, including contained use and research, trial release, commercial release and transboundary movement.

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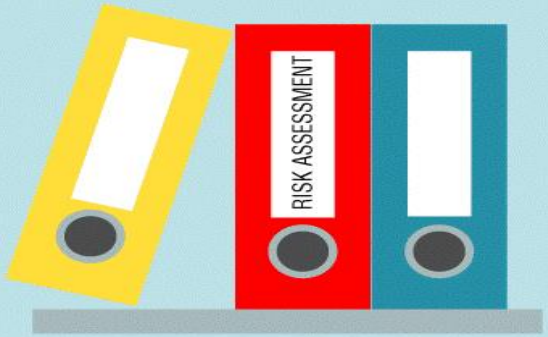
Not only are strict risk assessments done before and during product development of GMOs, but they are also closely monitored after they have entered use.



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GENOME EDITING - the what, how & why

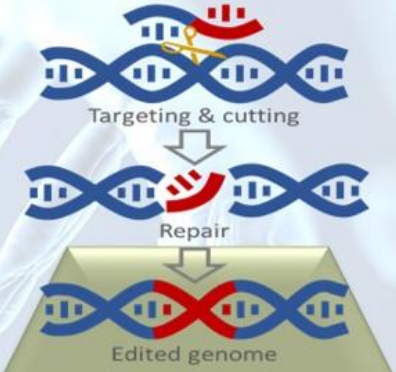
Genetic variation is the basis of biological diversity

The genetic material (genome/ DNA) of an organism codes for all the necessary molecular functions that underlie growth and development, and in doing so, determines the observable traits (phenotype) of an individual. Genetic codes are not stable, mutations and other variations occur naturally and are some times inherited by subsequent generations where these genetic variations result in altered traits.

Harnessing genetic variation has lead to superior crops & livestock

Humans have harnessed this natural genetic variation over the ages, through selection and breeding programs, to improve crop plants and domesticated animals. We have also actively induced genetic variation using techniques such as random mutagenesis and genome multiplications to introduce traits like higher yields, pest resistance and seedlessness.

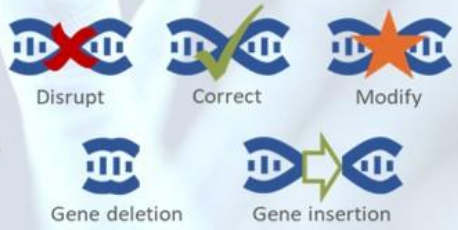
Genome editing enables the precise alteration of genetic codes



Genome or gene editing refers to the practice of making precise changes to the genetic code of an organism in order to alter its phenotypic traits. A combination of naturally occurring molecular tools, e.g. CRISPR-Cas9, purposefully redesigned for every specific edit, and the cell's own DNA repair mechanisms are used to accurately identify, cut and repair the target sequence.

Genome editing is used to alter gene expression in specific ways

Genome editing techniques can be used to make small changes, similar to mutations that may also occur naturally, but more precisely, to disrupt, correct or modify gene activity. Alternatively, whole genes may be deleted or inserted. Inserted genes may originate from a sexually compatible organism (cisgenesis) or from an non-compatible one (transgenesis / genetic modification).



The precision, efficiency & low cost of genome editing makes it a powerful biotech innovation tool

The potential of genome editing is wide-ranging - it can be used to treat or eradicate diseases, develop pest resistant, high-yielding, environmentally adapted crops and livestock, nutritionally enhanced foods and much more. Genome edited organisms are not necessarily GMOs, as the designed genetic changes may be similar to genetic variation that may occur naturally, still, they will have to comply with relevant legislation to ensure their sustainability.

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sustainable biotech innovation

www.biosafety.org.za

March 2018

What is biosafety video

GM product labelling

GM FOOD LABELLING IN SOUTH AFRICA

- **2004 Dep of Health (DOH)**
  - Foodstuffs, Cosmetics and Disinfectants Act – Reg. 25
  - "where they differ significantly from existing foodstuffs in terms of their composition, nutritional value, mode of storage, preparation or cooking, allergenicity or genes with human or animal origin"
  - Have not yet been triggered

- **2008 Dep of Trade and Industry (dti)**
  - Consumer Protection Act (CPA, 2008) – Reg. 293
  - Mandatory labels for ALL GM goods
  - Labels: (i) "containing GMOs" where the GM content is at least 5%; (ii) "produced using genetic modification" for food produced directly from GMO sources; or (iii) "may contain GMOs" when argued that it is scientifically impractical and not feasible to test food for GM content.

- Safety vs. value-based (right to knowledge)

A PHILOSOPHICAL MINEFIELD

- Why is labelling based on the premise of the consumer's intrinsic right to information a controversial issue?

- In short – because it asserts the obligation to distinguish between products, based on an esoteric value decision alone.
- The right of a consumer to information is not disputed, but rather the value of that knowledge, especially because the system is open to abuse.

- Consider other <u>voluntary</u> value-based labels…

A PHILOSOPHICAL MINEFIELD

- Still, why not just slap on a GM label and get it over with?

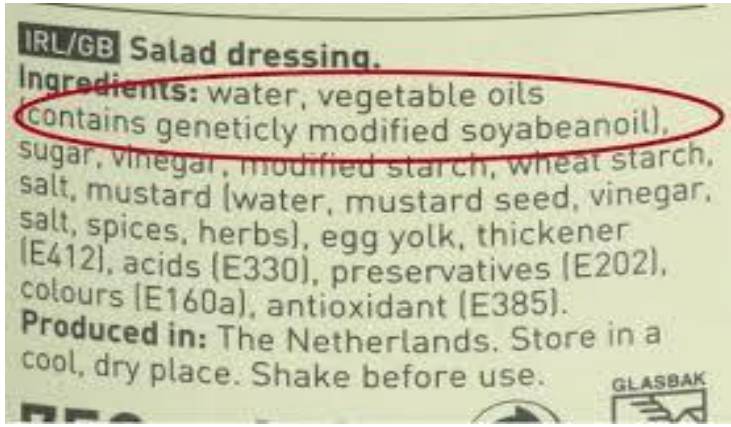
- COST
  - Direct cost increase to the consumer depends on many factors, but between 9% and 12%.
  - Majority of the market bears the cost to maintain a value-system-based choice of a minority.

- UNFAIR DISCRIMINATION
  - Although GM foods carry an official stamp of approval, a label can be used to unduly influence consumer choices using the disputed information in the public domain, supporting unfair discrimination.

PRACTICAL CHALLENGES

- Label as “GM free” when no GM version exists?
- Label vs. advertisement.

vs.



- %GM content
  - Labelling threshold per ingredient or per total?
  - When per ingredient you could end with >100% GM content.
- Varying detection sensitivity & accuracy in different products.
- Exemptions for restaurants, informal vendors, etc?
- Policing?

For more information see
http://biosafety.org.za/information/know-the-basics/gmo-safety/the-labelling-of-gm-foods-in-south-africa

THANK YOU!

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