Globalization of the Food System: Its Possible Impact on Non-Communicable Diseases

Ma. Concepcion C. Lizada

WTO members reaffirm "…that no Member should be prevented from adopting or enforcing measures necessary to protect human, animal or plant life or health"

Otherwise superior products: denied market access if deemed hazardous to human, plant or animal health and safety

SPS agreement - food safety
TBT agreement - nutrition

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Food and Agriculture Organization of the United Nations. Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit, 13–17 November 1996, Rome.

"Food is not only an agricultural and trade commodity but also an essential public health issue."

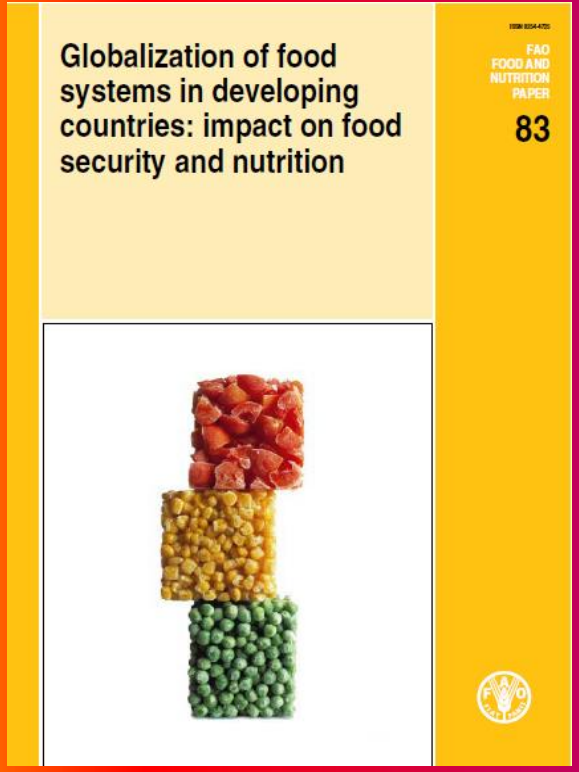
"The globalization of the world's food supply means the globalization of [food-related] public health concerns."

Gro Harlem Brundtland, 2001
Director-General, WHO

Updated Comprehensive Framework for Action (2010)

The UN System High Level Task Force on the Global Food Security Crisis affirmed the definition of food security:

- ***Production and availability of food***
- ***Access to food and nutrition***
- ***People's use of food and nutrition to lead their lives to the full potential***
- ***Stability of supply***



FAO forum (2004): Effects of globalization and urbaniza-tion of food systems (food supply, marketing and distri-bution) on smallholder and small enterprises; food consumption patterns; and nutrition, health outcomes in developing countries

Philippine case study reported interventions through nutrition programs, including urban agriculture

- ***home gardening***
- ***food production in the school and the community***
- ***need for technical support for cultivation technologies in urban areas***

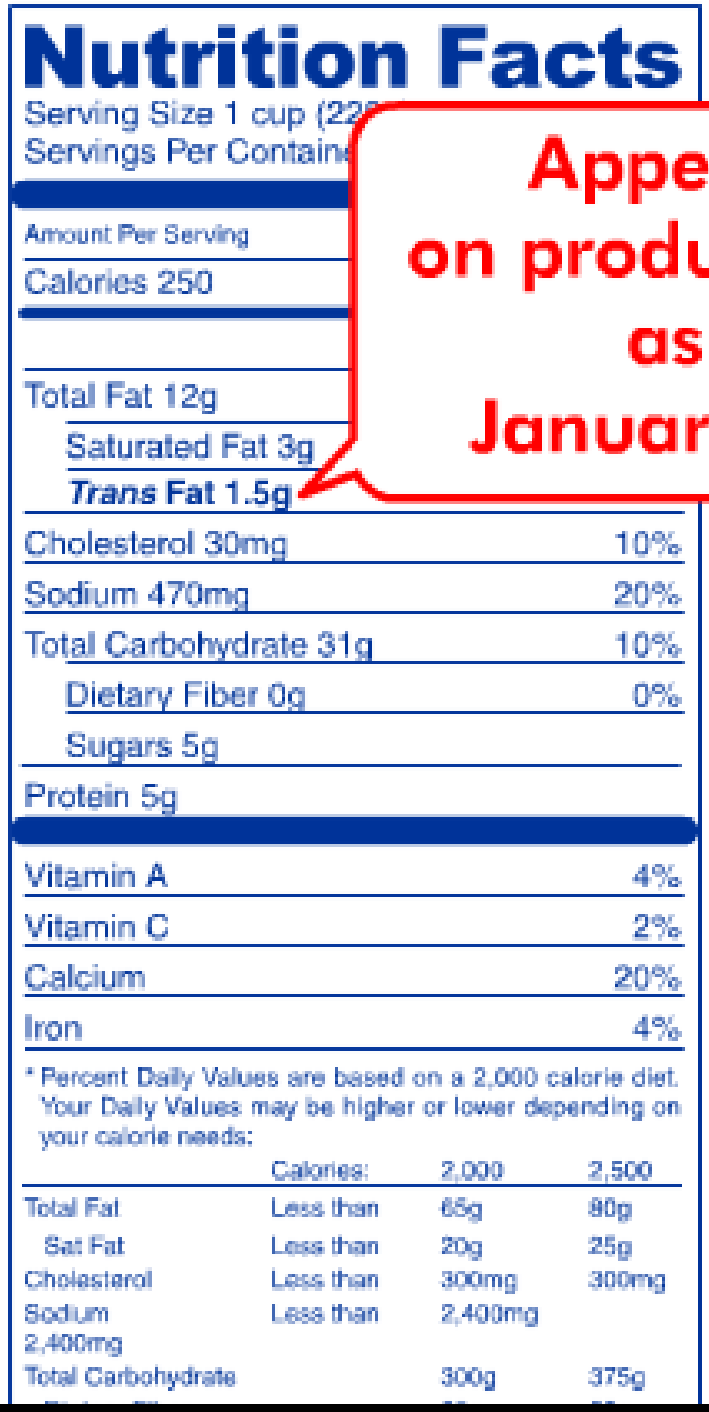
Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk: A Systematic Review and Meta-analysis

Rajiv Chowdhury, et al. 2014. Ann Intern Med:398-406

Conclusion: Current evidence does not clearly support cardio-vascular guidelines that encou-rage high consumption of poly-unsaturated fatty acids and low consumption of total saturated fats

DiNicolantonio JJ. The cardiometabolic consequences of replacing saturated fats with carbohydrates or Ω-6 polyunsaturated fats: Do the dietary guidelines have it wrong?. Open Heart 2014.

"…the benefits of a low-fat diet (particularly a diet replacing saturated fats with carbohydrates or Ω-6 polyunsaturated fatty acids) are severely challenged. Dietary guidelines should assess the totality of the evidence and strongly reconsider their recommendations"



Appearing on product labels as of January 2006

http://www.fda.gov/food/ingredientspackaginglabeling/labelingnutrition/ucm274590.htm#choice2

GUIDELINES ON NUTRITION LABELLING CAC/GL 2-1985

Where the amount and/or type of fatty acids or the amount of cholesterol is declared, follow immediately the declaration of the total fat in accordance with Section 3.4.3.

The following format should be used:

Total Fat		...	g
	saturated fatty acids	...	g
of which	trans fatty acids	...	g
	monounsaturated fatty acids	...	g
	polyunsaturated fatty acids	...	g
Cholesterol		...	mg

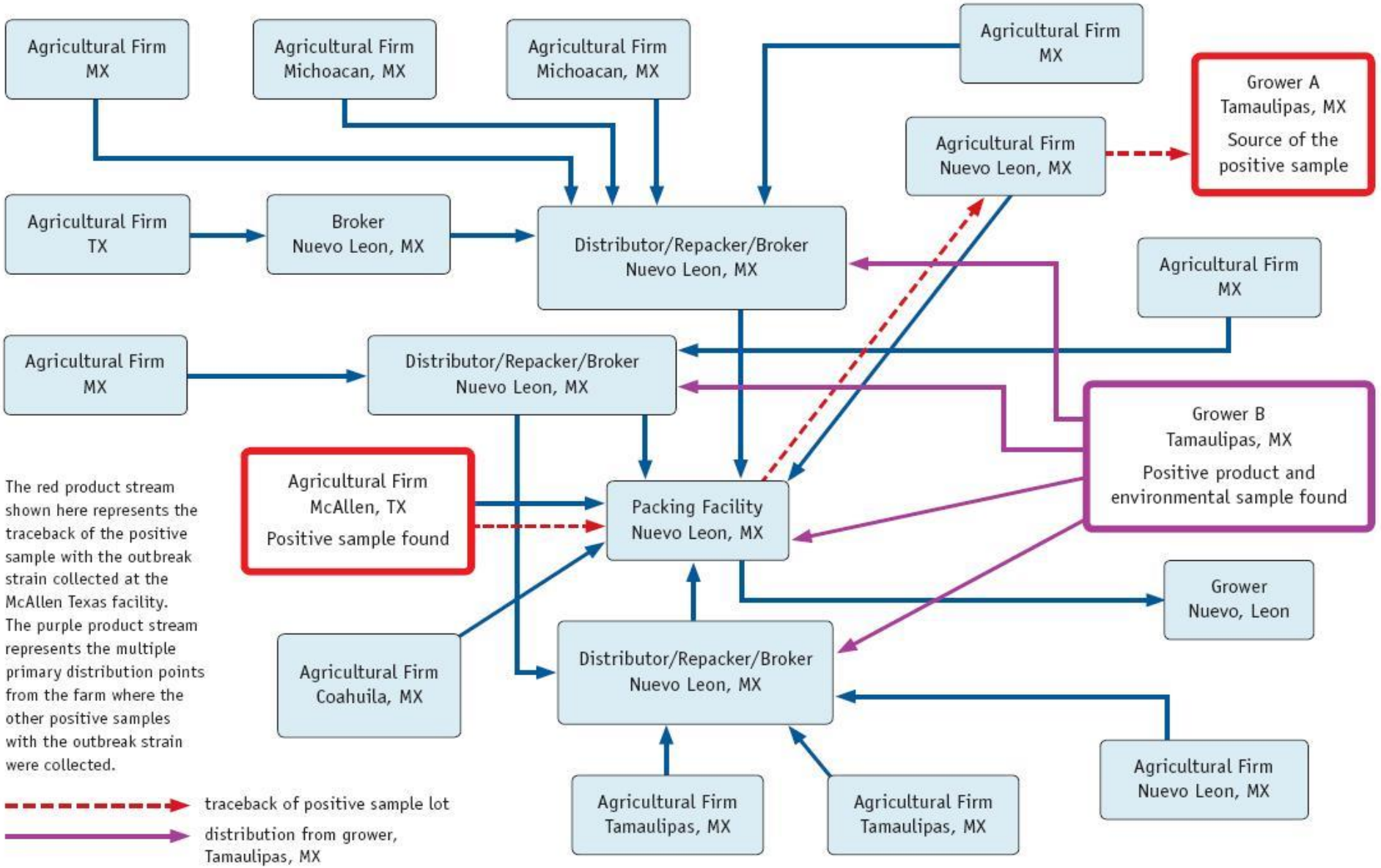
Adopted 1985. Revisions 1993 and 2011. Amendment 2003, 2006, 2009, 2010, 2012 and 2013.

Salmonella Saint Paul

- *initial epidemiologic investigations – cause was contamination of tomatoes grown in SW US?*
- *drastic ↓ tomato consumption → estimated $200 M loss*
- *later - strain isolated from jalapeño and serrano peppers grown on Mexican farm*
- *contaminated peppers eaten raw — probably in many cases with tomatoes*
- *role of wild birds?*

Salmonella Saintpaul Outbreak Traceback & Distribution

Partial view of the traceback & distribution of peppers from Mexico: July 16 – July 30, 2008




WA 17
OR 11
CA 74
ID 15
NV 6
MT
WY 2
UT 5
AZ 12
CO 15
NM
ND 13
SD 4
NE 1
KS 2
OK 2
TX 6
MN 36
IA 3
MO 12
AR 5
LA
WI 3
IL 6
MS 6
MI 30
IN 7
OH 80
KY 3
TN 11
AL 2
GA 6
FL
SC
NC 6
VA 21
WV 2
PA 17
NY 22
VT 4
NH 11
ME 4
MA 47
RI 4
CT 9
NJ 23
DE
MD 8
AK
HI 4
1-4 cases
5-29 cases
≥ 29 cases

EHEC O104:H4 Outbreak Germany (May to July 2011)

- *outbreak characterized by haemolytic-uremic syn-drome (HUS) and bloody diarrhea associated with enterohemorrhagic E.coli (EHEC) of the serotype O104:H4*
- *855 cases of HUS; 2,987 acute gastroenteritis*
- *53 deaths reported*

EHEC O104:H4 Outbreak Germany (May to July 2011)

- *legal action by Spanish producers vs. the EC over the EUR210m (US$286.8m) aid to compensate cucumber, lettuce, tomato, courgette and pepper producers*
- *half the value of goods withdrawn from the market*
- *significant decline in demand for fresh produce wrongly linked by authorities to outbreak*
- *eventually traced to sprouts from Egyptian-grown fenugreek seeds*

WTO:

"Agriculture remains a cornerstone of many economies, especially in developing countries. Agricultural production and processing are activities which offer many low-income countries the possibility to trade their way out of poverty."

http://www.wto.org/english/tratop_e/sps_e/sps_agreement_cbt_e/intro1_e.htm

WTO membership - need to ensure compliance with commitments without compromising domestic interests

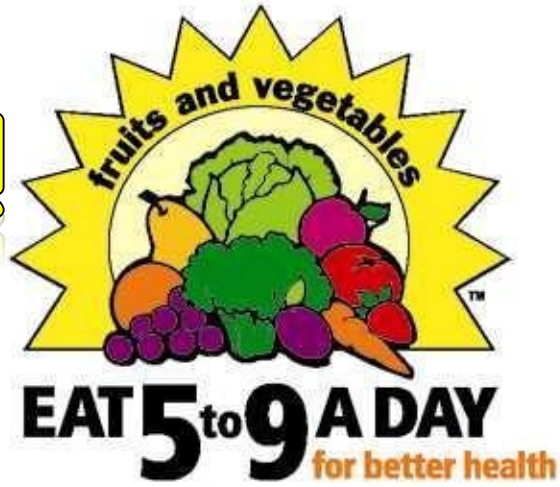
Horticultural crops as a key contributor to food security

- *higher value → increased farmers' incomes → enhanced access to food*
- *promotes diversified production*
- *promotes diversified consumption for both producer and consumer (species, varieties, maturities, fresh or processed, etc.)*
- *provides gustatory pleasure*
- *promotes health*
  - *macro-, micro-nutrients*
  - *functional properties*

fruits & veggies more matters®

get more info

PHILIPPINE VERSION: GIVE ME 5!



Recent Fruit and Vegetable Initiatives

- *FAO and WHO in 2004 – joint Fruit and Vegetable Initiative for Health*
- *CIRAD, ISHS, AVRDC in 2006 - Global Horticulture Initiative (GHI) in Montpellier $2.5 million pledged to mobilize R & D resources for horticultural systems development in poorest countries*
- *USAID CRSP in 2010- support to horticultural production and marketing*

ASIA-EUROPE MEETING

Chair's Summary

The ASEM High - Level Conference on Food Security

Chiang Mai, Thailand, 9-11 May 2011

Among the recommendations:

- *Promote diversification (consumption, production)*
- *Incease food productivity, promote sustainable production through R&D, technology transfer (e.g. postharvest losses)*

BIODIVERSITY

- *heirloom vegetables*
- *chia, quinoa*
- *wheat, barley grass*
- *squashes*

PH loss assessment for perishables in PH

- *highly variable (negligible to >50% for the same crop, for example); need to intervene no longer contentious*
- *less costly survey of traders Department of Agriculture in the 60s and 70s – loss figures compare well with those obtained through experimental studies in 80s*
- *cannot afford delay between loss assessment and reduction; appropriately designed studies to develop interventions provide baseline loss figures anyway*

Need to revisit 1985 FAO-RAPA Expert Consultation recommendation that scarce resources better deployed for intervention

Postharvest loss in high value horticultural perishable a highly complex problem

Metabolic processes in produce continue through to consumption

- ***pre- and harvest stress (stress hormone, C_2H_4)→ latent losses down the chain***
- ***storage conditions → ↑ post-storage development of latent disease (might not be evident in storage)***
- ***covert sensory, nutrient loss dependent on pre- , post-harvest conditions through chain***

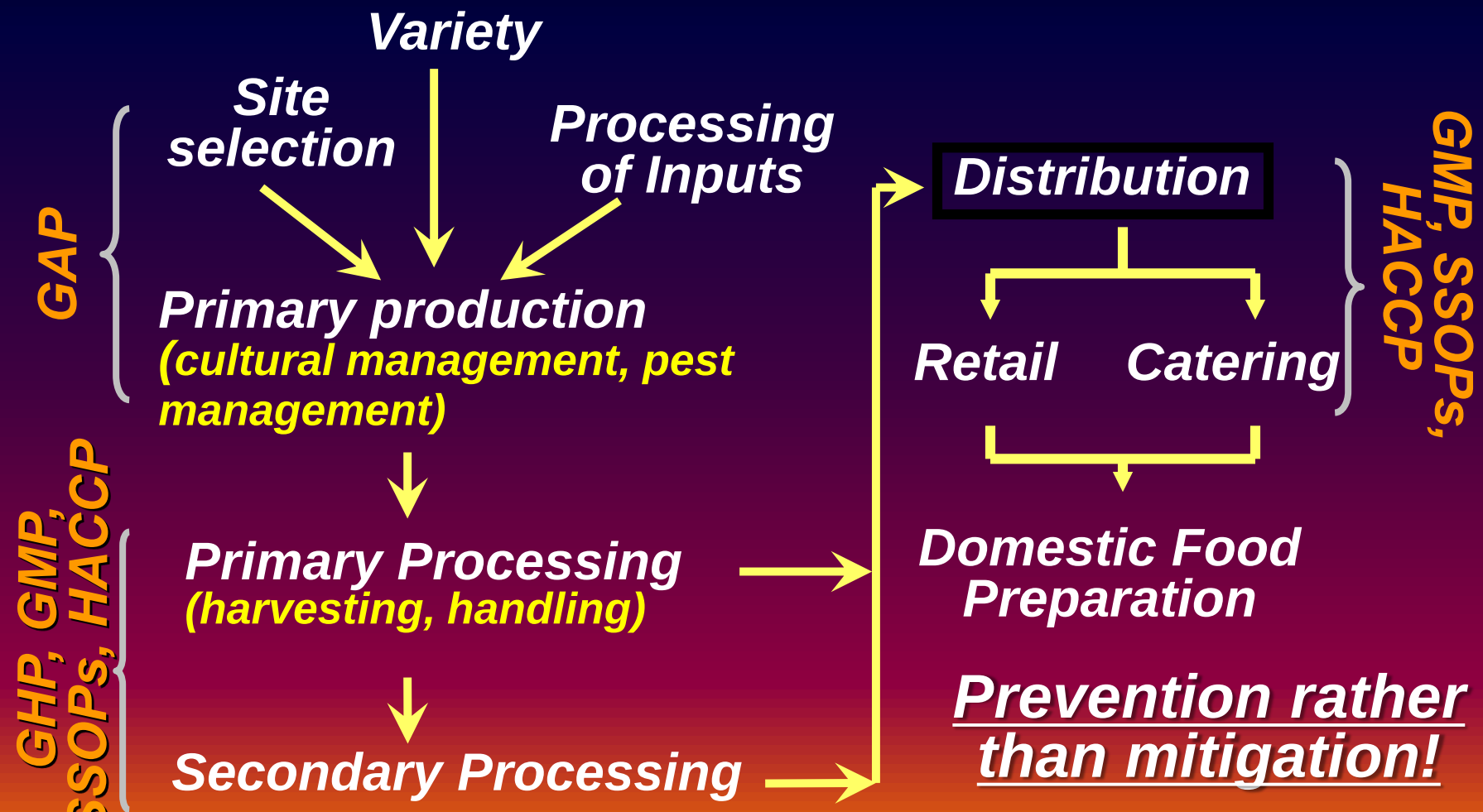
Above → difficulty in PH loss assessment (crop/variety-, environment-, situation-specific)

Produce – genotype (morpho-anatomy, physiology, etc.)

Manage interactions to improve safety, quality and functionality

Food Safety: Farm-to-Fork Management Systems

Food Safety throughout the Food Chain



Food safety implications and value-adding opportunities

Gorris, L. 2004. Performance objectives and performance criteria – Two sides of the food chain. Mitt. Lebensm. Hyg. 95: 21–27.

Government food safety policy

Appropriate Level of Protection (ALOP)

Level of protection deemed appropriate by the member (country) establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory (imported food).

Food Safety Objective (FSO)

The maximum frequency and/or concentration of a (microbial) hazard in a food at the time of consumption that still provides the ALOP.

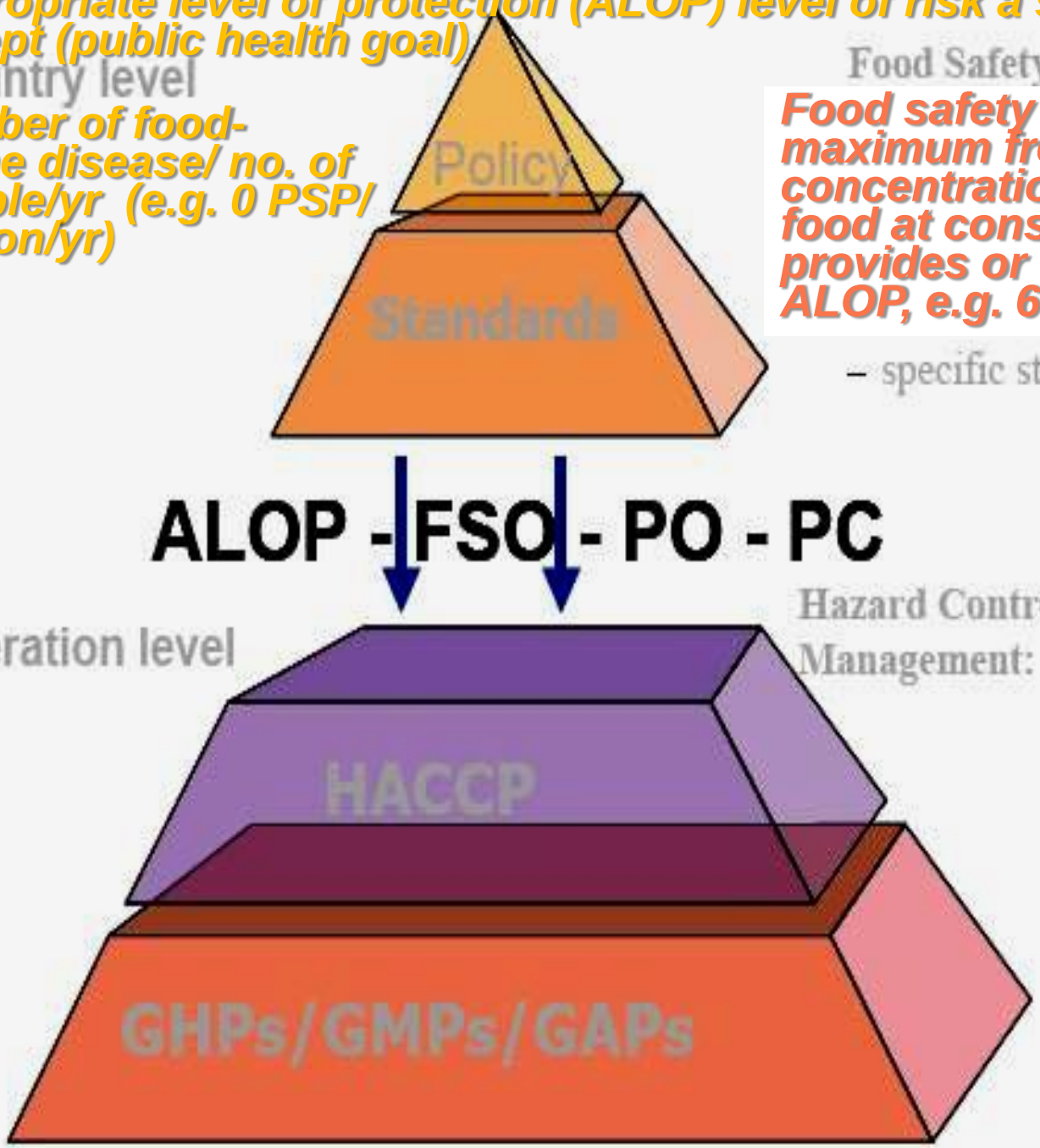
Appropriate level of protection (ALOP) level of risk a society is willing to accept (public health goal)

Country level

number of food-borne disease/ no. of people/yr (e.g. 0 PSP/ million/yr)

Food Safety Control/Risk

Food safety objective (FSO) maximum frequency and/or concentration of a hazard in a food at consumption that provides or contributes to ALOP, e.g. 65 ug STX/100 g



Food-borne hazard

Government ↙

Public health risk (assessment)

↓

ALOP, FSO Standards to guide industry (management)

↘ for FBO[1]

Risk of contamination[2] Business risk (assessment)

↓

HACCP plan guided by FSO, standards, validated with PO, PC

[1] Risk manager
[2] Hazard analysis

Hazard evaluation - a component of HACCP (Schmidt and Newslow, 2007)

- *actually involves an assessment of the **risk of contamination of a food product by an identified hazard!***
- *HACCP is specific for a product-process-environment combination*

HACCP further development requires

- *process performance criteria / numbers*
- *food science to specify, develop process performance criteria*
- *HACCP task - setting of controls in a process to achieve a desired Appropriate Level of Protection (ALOP) / Food Safety Objective (FSO) (e.g., illness per 100,000 people; deaths per 1,000,000 people)*
- *process safety management : Cook control for a **5D reduction of Salmonella** (Performance criterion, PC) to get **<1 Salmonella/ 100 g** (Performance objective, PO)*
- *FSO sometimes expressed as PO provided that relationship between the two is defined (easily measured; equivalent measures)*

Risk Analysis: Who does what?

FBO – analysis of risk of contamination with a hazard of significance (HACCP) → risk of product failure

Core competence – food science/technology (familiarity with product, operations, business)

Competence needed by FBO, service providers, auditors

- *sourcing of valid information*
- *use of predictive microbiology tools, e.g. ComBase Predictor*
- *reaction kinetics tool*
- *documentation (records indispensable)*

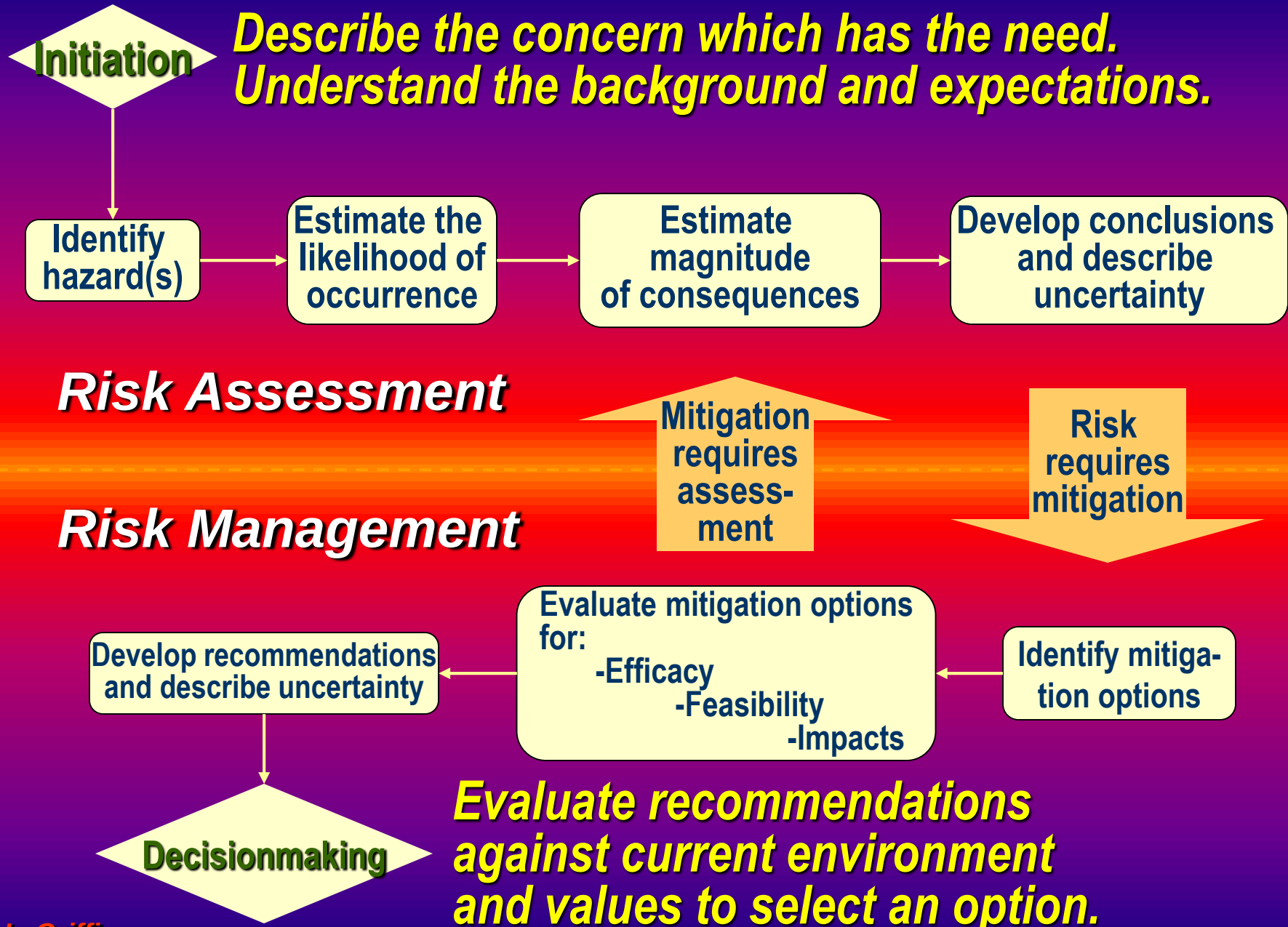
FBO Food Safety (Risk) Policy

Performance Objective (PO) - maximum frequency and/or concentration of a hazard at a specified step in the chain before consumption that still provides or contributes to the achievement of an FSO or ALOP, as applicable

Performance Criterion (PC) – parameter to control to meet or contribute to meet a PO

Control Measures (CM) - any action used to prevent or eliminate a food safety hazard or to reduce it to an acceptable level

Modified from ***Gorris, L. 2004. Performance objectives and performance criteria – Two sides of the food chain. Mitt. Lebensm. Hyg. 95, 21–27.***



R. L. Griffin
IPPC

(modified from WHO, 1996)

Safe Food

SHARED RESPONSIBILITY

- *concerned sectors play different but complementary roles (collaboration)*
- *specific role defined by the sector's objective/core function, competence*
- *different sectors need to appreciate each other's role, accountabilities*
  - *public health – government*
  - *safety of a product and business implication – industry, each FBO*
  - *informed decision to protect family, community– consumers, NGO*
  - *knowledge, valid data – academe*

Food-borne hazard

for FBO

Business risks

↓

Alerts, recalls, damaged reputation, litigation, lost income, closure (lost jobs)

Government

Public health risk

↓

FBI, death(s)

Risk matrix – useful risk assessment/ communication tool, but core competence frequently not appropriately considered

Mitigate	Fix Now!	Avoid!	Avoid!	Avoid!
Lower Priority	Mitigate	Fix Now!	Avoid!	Avoid!
Lowest Priority	Lower Priority	Mitigate	Fix Now!	Avoid!
Lowest Priority	Lowest Priority	Mitigate	Mitigate	Fix Now!
Lowest Priority	Lowest Priority	Lowest Priority	Mitigate	Mitigate

Consequence Severity Increases ——>

Consequence					
People/Health Issues-->	No health/injury risks	First aid case or slight health problem	Lost time injury or potential health problem	Partial disability or major health problem	Total disability/ fatality(s) severe health problem
Assest Or Financial Loss-->	Slight damage is less than $10,000	Noticable damage exceeds $10,000	Large damage exceeds $0.1 million	Major damage exceeds $1 million	Severe damage exceeds $10 million
Local, National, or International Reputation-->	Slight to moderate impact	Loss of community reputation	Loss of state reputation	Loss of national reputation	Loss of international reputation

RISK-BASED DEFINITION

Food safety is the assurance that available food, if used as intended, does not pose any unacceptable risk to human health.

(Lizada, 2010)

Opinion of the Scientific Panel on Contaminants in the Food chain on a request from the European Commission to perform a scientific risk assessment on nitrate in vegetables, The EFSA Journal (2008)Journal number, 689, 1-79.

Nitrate

- *naturally occurring (endogenous formation in plants; depends on cultural conditions)*
- *used as a fertilizer*
- *can be an environmental contaminant*
- *an approved food additive*
- *ADI of 0-3.7 mg/kg body weight*
- *exposure routes for humans:*
  - *endogenous formation*
  - *exogenous exposure from dietary (vegetables, preserved meat and drinking water) and non-dietary sources*

Mean nitrate concentrations (mg/kg or ppm)

148

279

933

1066

1332

311

4677

2292

2445

875

Mean nitrate concentrations (mg/kg or ppm)

185

894

314

416

1416

1103

Maninang, J.S., Lizada, M.C.C. and Gemma, H. 2009. Inhibition of alde-hyde dehydrogenase enzyme by durian (Durio zibethinus Murray) fruit extract. Fd. Chem. 117:352-355.

Anecdotal reports on the adverse effects of durian-alcohol interaction(Croft,1981; Fuller, 2007; Singh, 1941)

- ***nausea, other unpleasant effects reminiscent of alcohol-disulfiram (Antabuse) interaction***
- ***cardiac episodes***
- ***deaths***

Disulfiram - known to inhibit aldehyde dehydrogenase → accumulation of alcohol-derived acetaldehyde

2007 FSN student study in UP Diliman - demonstrated in vitro inhibition of yeast ADH inhibition by durian extracts

Concept of intended use

Disulfiram-ethanol like reaction elicited by durian and alcohol

- *further characterization → data → food safety risk mitigating measures (e.g. varietal selection, processing options)*
- *study on other S-rich fruits and vegetables, e.g. Brassica and Allium sp. to determine similar risks*
- *might confer health benefits, but effects dependent on physiological status of consumer (e.g. disease, epigenetic state)*
- *bioactive S components known to act as defense compounds elicited by stress, induced by environmental factors during production and postharvest handling*