

# Health and wellbeing: where does food fit?



functional  
food centre

profitable & sustainable food innovation

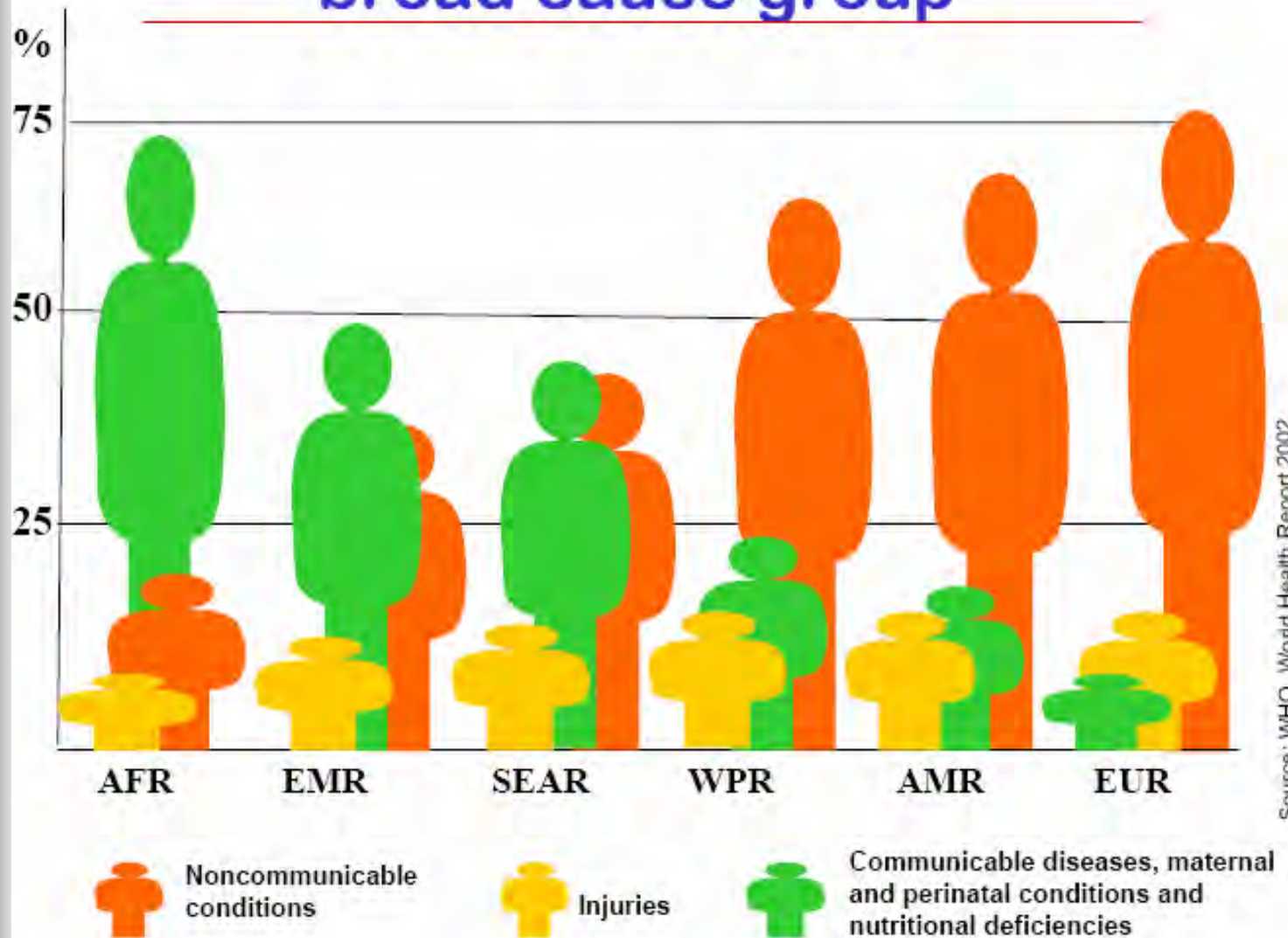


# Health and Wellbeing

- Relationship with our bodies
  - Optimal growth, development and aging
  - Absence of disease
- Relationship with our food
  - Understanding core foods
  - Smart formulated foods
- Relationship with our environment
  - Sustainable production
  - Healthy innovation

Metrics:

## Burden of disease in DALYs by broad cause group



Source: WHO, World Health Report 2002

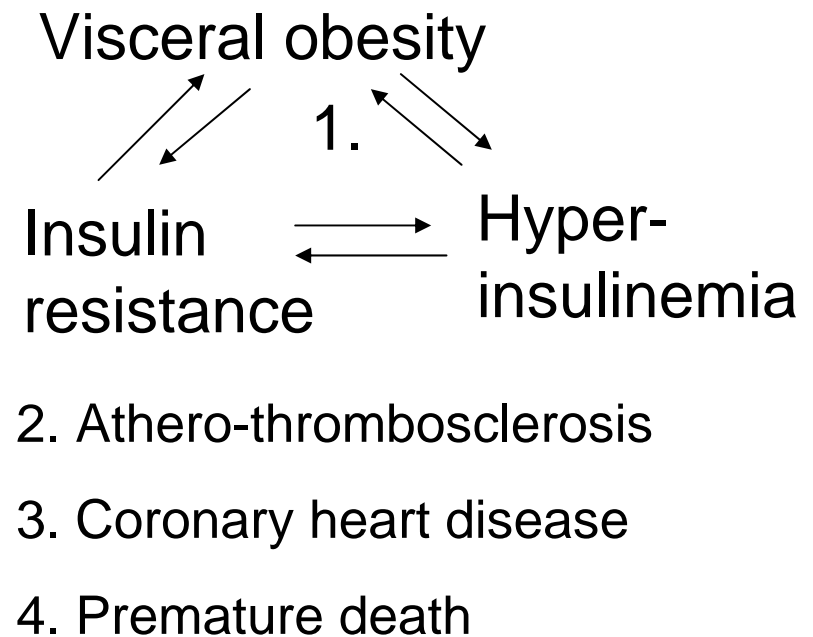
# Metabolic Syndrome

(Adapted from Lean M, Clinical Handbook of Weight Management, MD, London 2003, p14)

## Patients present with:

- Glucose intolerance/ diabetes
- Arterial hypertension
- Low HDL-cholesterol
- Hypertriglyceridemia
- Haemostatic disturbance
- Fibrinolytic abnormalities

## Pathology







# Metabolic Syndrome: IDF Consensus Definition 2006 (www.idf.org)

- Central Obesity\*
  - Males >95cm; females >80cm
- Plus 2 of the following
  - Trigs >1.7mmol/L
  - HDL-C > 1.03mmol/L (M); 1.29mmol/L (F)
  - SPB >130mmHg and/or DBP>85mmHg
  - Fasting plasma glucose > 5.6mmol/L
- \*Euroid value (Males: 90cm for South Asian, Chinese; 85cm for Japanese; Females 90cm Japanese)



# Obesity Diabetes Heart Disease

(Diabetes Australia. The Economic Costs of Obesity.  
Diabetes Australia, October 2006)

In 2005

- 3.25M Australians obese (15.1%men, 16.8% women)
- **RR diabetes (3.2); CHD (1.8); stroke (1.8); hypertension (2.35)**
- **Obesity caused 10.8% T2DM; 14% hypertension; 12%CHD; 12% stroke**
- Cost obesity \$3,767B
  - Loss of productivity (\$1.7B)
  - Direct healthcare costs (\$873M)
  - Carer costs (\$804M)
- Prevalence rates expected to double by 2025



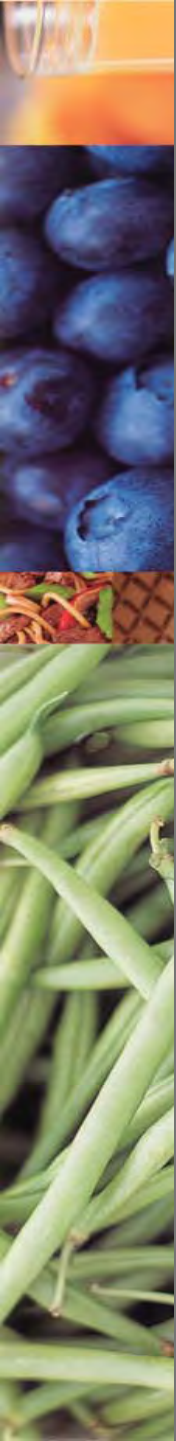
# Multiple systems are at play

(Phinney S, AJCN 2005;82:1151-2; Berglund L, AJCN 2005;82:1153-4)

- Pancreatic endocrine function
- Adipose tissue
  - Regulating energy metabolism
  - Serving endocrine functions
  - Skeletal muscle and liver deposits
- Skeletal muscle
  - Type and quality

'You are what you eat'

# Fat



- energy source
- cell structural components
- metabolic precursors
- gene regulators





# Genetic Expression

Regulation of gene expression by dietary fats has the greatest impact in the development of insulin resistance

Clarke, J Nutr 2001;131:1129-1132.



# Personalised Nutrition

(Gibney, ILSI Malta May 2007)

- Different responses to nutrient effects based on different genotypes
  - dietary fat and insulin resistance (Kluijtmans et al Eur Heart J 2001;22:294-299)
  - folate and homocysteine (Luan J et al Diabetes 2001;50:686-689)
- Optimal nutrients – optimal meal patterns
- Shifts from supermarkets to e-shopping
- ‘The greater the extent of personalised nutrition, the more radical the present model must change’



**FOOD**





# Food composition: tree nuts (per 100g)

Nutrient	Walnut	Almond	Pecan	Macada.	Pistach.	Cashew	Hazel.
Energy	654	578	<b>691</b>	<b>718</b>	557	566	628
PTN	15.2	<b>21.3</b>	9.2	7.9	<b>20.6</b>	18.2	15.0
CHO	13.7	19.7	13.9	13.8	<b>28.0</b>	<b>27.1</b>	16.7
<b>Fat</b>	65	50.6	<b>71.9</b>	<b>75.8</b>	44.4	46.9	60.8
SFA	6.1	3.9	6.2	<b>12.1</b>	5.4	<b>8.3</b>	4.5
MUFA	8.9	32.2	40.8	<b>58.9</b>	23.3	25.5	<b>45.7</b>
PUFA	<b>47.2</b>	12.2	21.6	1.5	13.5	8.4	7.9

Derived from Rajaram & Sabate BJN 2006;96:S85; Source USDA Aug 2005

# Food composition: tree nuts (per 100g)

Nutrient	Walnut	Almond	Pecan	Macad.	Pistachio	Cashew	Hazel
Fibre	6.7	11.8	9.6	8.6	10.3	3.3	9.7
Mg	158	275	121	130	121	292	163
$\alpha$ Toco	2.9*	26.2	4.1*	0.6	4.6	1.5	15.2
Lys:Arg	0.2	0.3	0.3	0.4	0.6	0.5	0.2
Cu	1.0	0.9	1.2	0.3	1.2	2.2	1.5
Phyto-nutrients	?	?	?	?	?	?	?

Derived from Rajaram & Sabate BJN 2006;96:S85; Source USDA Aug 2005

\* $\gamma$  tocopherol 17.2mg; 19.1mg respectively





# Working with food (N-G Asp ILSI Malta May 2007)

- Foods can be improved by
  - Optimising nutrient content/energy density
  - Providing physical and mental benefits (health, wellbeing, performance)
  - Benefits communicated in the context of the whole diet
- Functional Foods ILSI Europe
  - 1999: Foods with demonstrated function beyond adequate nutrition
  - 2007: Foods with health claims

# Proving the benefits of whole foods

Example: Walnuts as a delivery agent for PUFA  
(Gillen et al JADA 2005;105:1087-96)

Table 1 Outline of dietary advice provided to each advice group (n=58)

Food category	LF (control) group	MF group	MFW group
<b>Carbohydrate-rich</b>	No. portions	No. portions	No. portions
	Distribution	Distribution	Distribution
	CHO type	CHO type	CHO type
<b>Protein-rich</b>	Serving size	No. portions	No. portions
		Fish portions	Fish portions
<b>Milk allowance</b>	Type of milk	Total (ml)	Total (ml)
		Type milk (LF/PUFA)	Type milk (LF/PUFA)
<b>Spreads/oils/nuts</b>	Type of spread/oil	Total (g) Type fat (MUFA/PUFA)	Total (g) Type fat (MUFA/PUFA)
	<b>Walnuts</b>	-	-

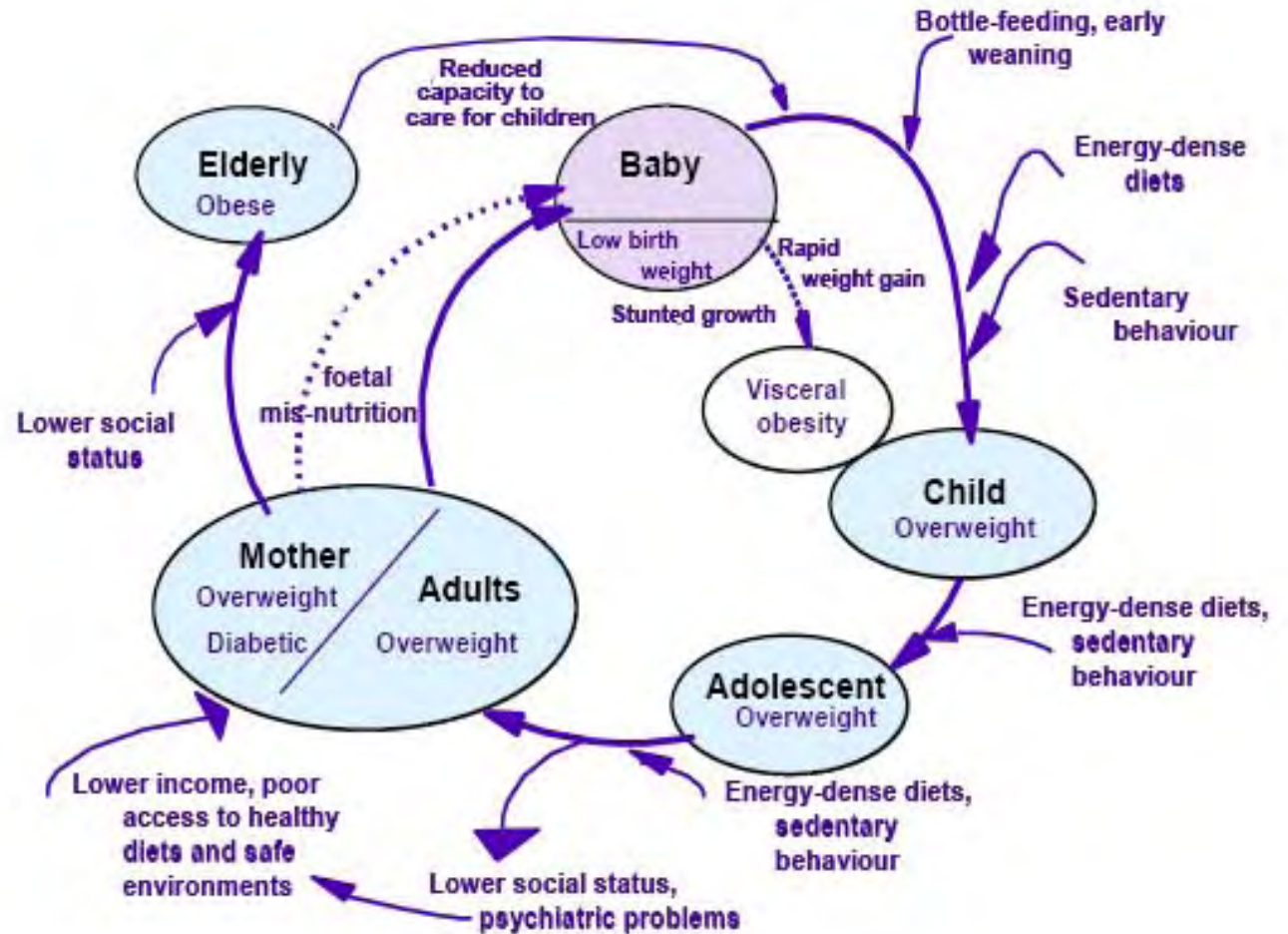


# Substantiation of benefits

- A dietary strategy inclusive of 30g walnuts per day in a balanced diet achieved an ideal fatty acid profile for diabetes management (T2DM)
- This dietary intake produced favourable changes in disease risk factors

(Tapsell et al Diabetes Care 2004;27:2777-83)

# Environment



Life course risk factors for obesity

Pietinen ILSI Malta 2007

<http://europe.ilsa.org/events/past/FFSympopresentations.htm>

## Guiding principles

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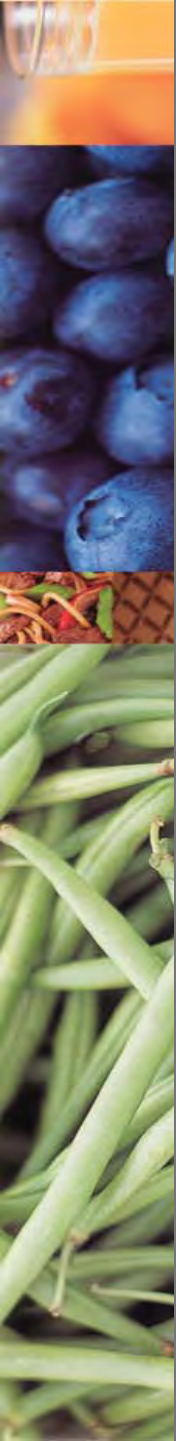
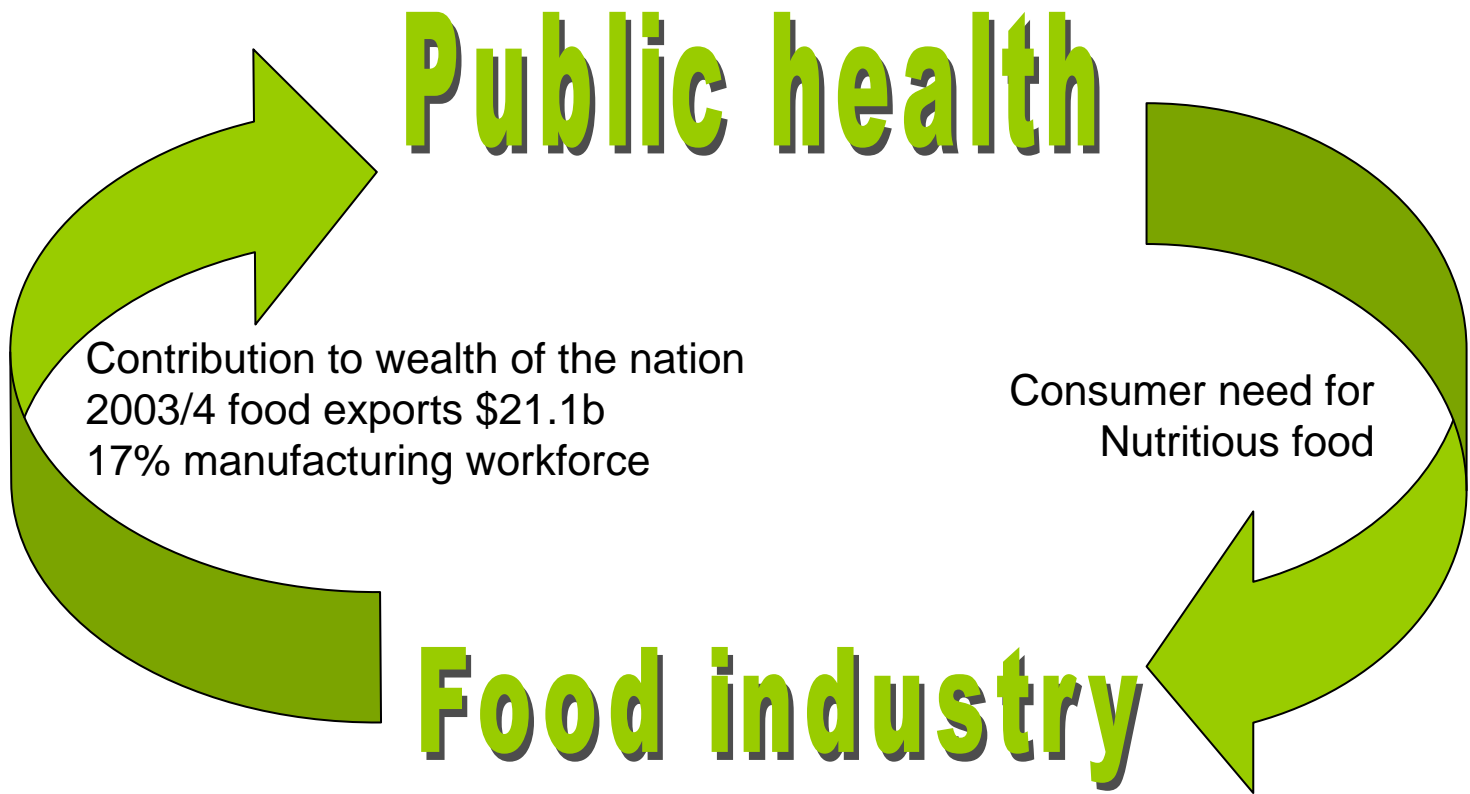
- Greater responsibility of government and society and involvement of all stakeholders
- Special focus on children and on lower socioeconomic population groups
- International coordination
- Action should be taken at the overall policy level and in different settings
- Policy tools range from legislation to public/private partnerships, with particular importance attached to regulatory measures

Pietinen ILSI Malta 2007;

<http://europe.ilsa.org/events/past/FFSympopresentations.htm>



# Public health - food industry Interdependence



# Public health nutrition and ecological sustainability

**Agriculture**

Cost of transporting food

Impact of global food systems on local food choice<sup>2</sup>

Benefits of food trade

Sustainable Diets

Energy, land and water resource costs of meat vs. vegetarian diets <sup>1</sup>

**Nutrition**

Diet-disease relationships

Individual behaviour change<sup>2</sup>

Dietary Guidelines

**Health**

Gussow JD. Am J Clin Nutr 1995;61:1383S-9S

<sup>1</sup> Pimentel D&M. Am J Clin Nutr 2003;78:660S-3S

<sup>2</sup> Caraher M, Coveney J. Public Health Nutr 2004;7:591-8.



# Implications for agriculture

(O'Brien Am J Clin Nutr 1995;61:1390S)

- Applications of dietary guidelines have implications for commodity disappearance rates
- Shifts towards healthier diets could be met, but mix and volume would change.
- Implications for pesticide, water use and trade with increased fruit and vegetable production
- Implications for feed-livestock with shifts in meat consumption, sector re-structuring



# Public health nutrition interventions

(Seymour et al Preventive Medicine 2004;39:S108-S136)

- Intervention targets of food availability, access, pricing, point-of-purchase information (n=38; June 1970-2003)
- Dual concerns of health and taste not considered
- Sustainability of environmental change never addressed.

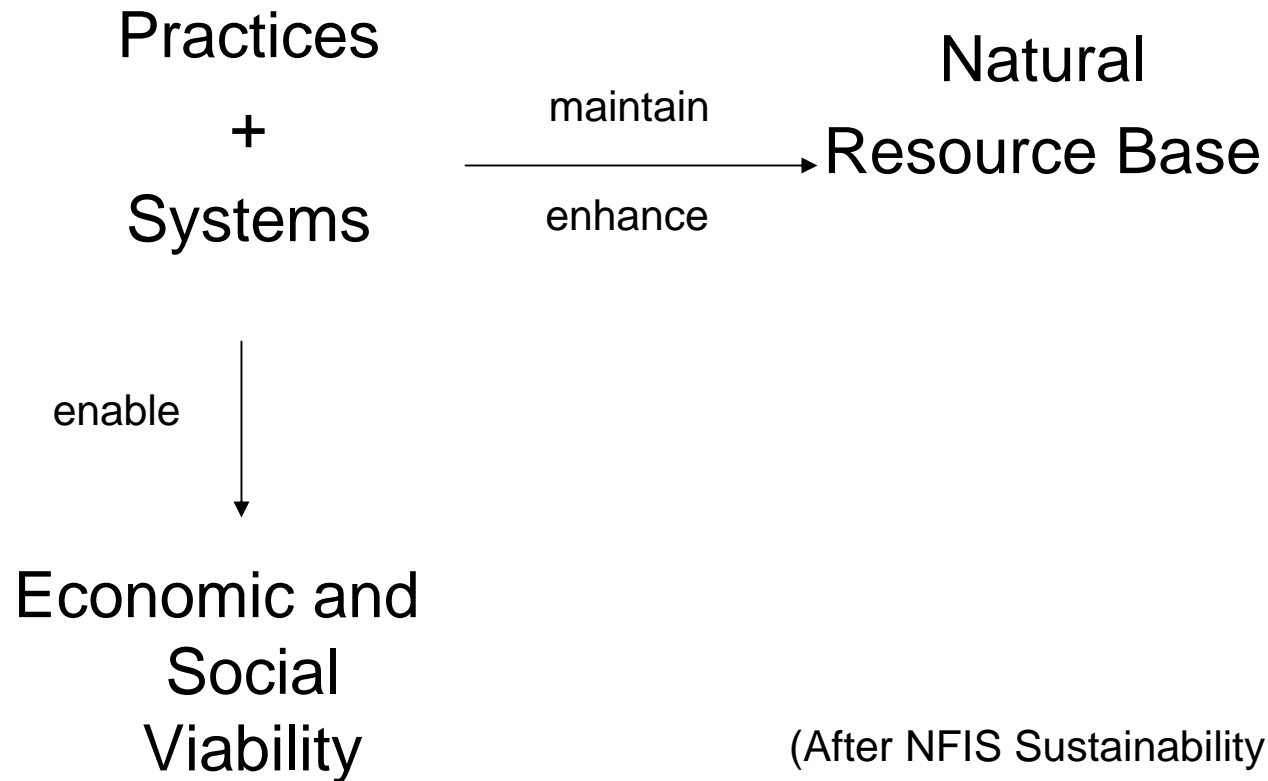


# Sustainability and health

- **Sustainability and health** (Brown et al Sustainability and Health. Allen and Unwin. 2004)
  - Sustainability and health, science, economics, environmentalism
  - Linking knowledge cultures of sustainability and health: evidence base, multiple knowledges, synthesis
- **Cuisine and health in Hangzhou, China** (Mark et al Asia Pacific J Clin Nutr 2004:13:121-4)
  - Integrative study of the food chain, food culture and food science ...manifest by environmental sustainability, economic progress, social cohesion, health status

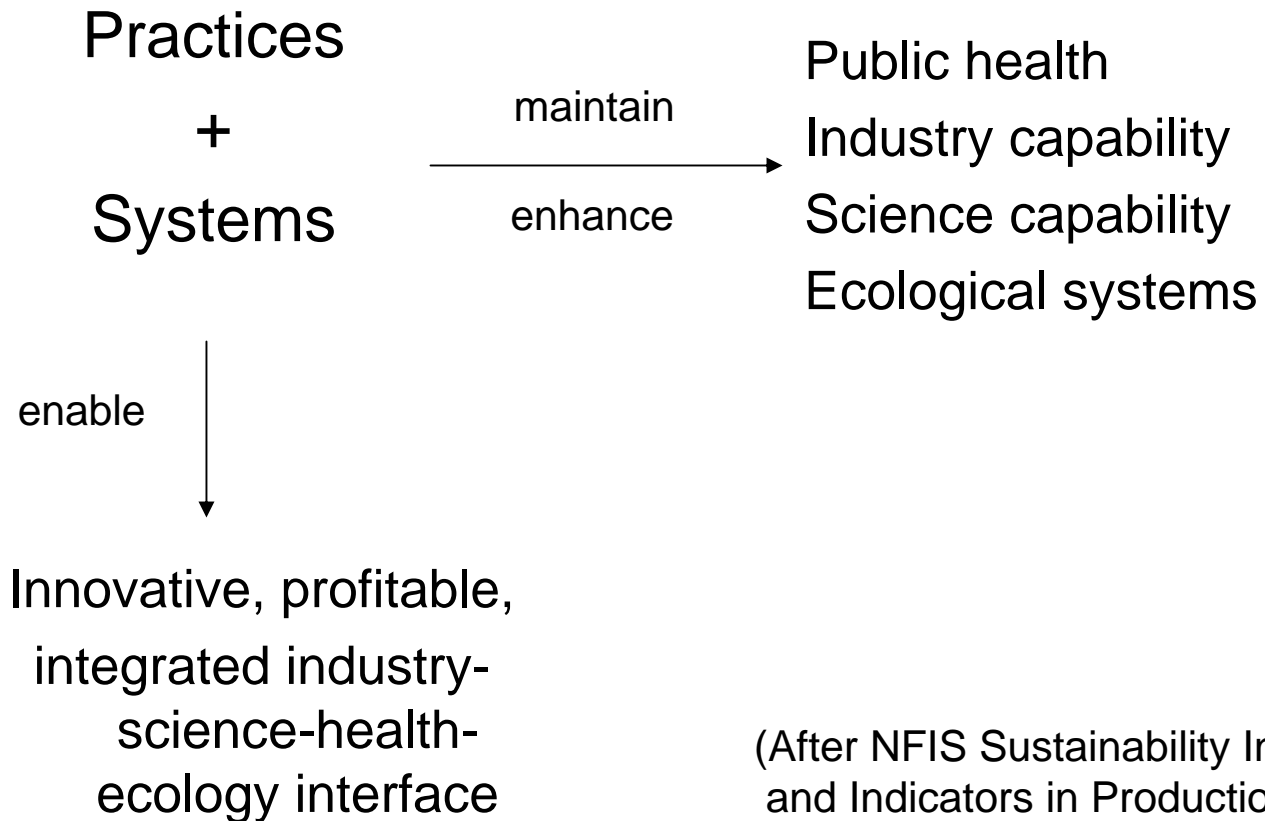


# Sustainability



(After NFIS Sustainability Initiatives  
and Indicators in Production  
Processes:  
Sustainable Agriculture. March 2004)

# Sustainability and healthy innovation



(After NFIS Sustainability Initiatives and Indicators in Production Processes: Sustainable Agriculture. March 2004)



# Health and wellbeing: Where does food fit in?

- The human body requires ideal nutrient and bio-active intakes to sustain life and prevent disease
- Food is naturally formulated to support the survival of the organism throughout the lifecycle
- Food composition can be improved to support human health and wellbeing
- Proving the benefit requires a food focus
- Public health, the environment and the food value chain are interdependent
- Future foods for future health might well work from this 'big picture'