Tools to improve the Evidence of the Importance of Biodiversity for Nutrition

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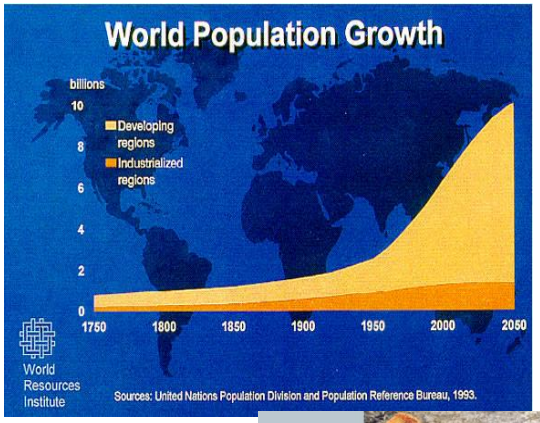
Where we are today (1)

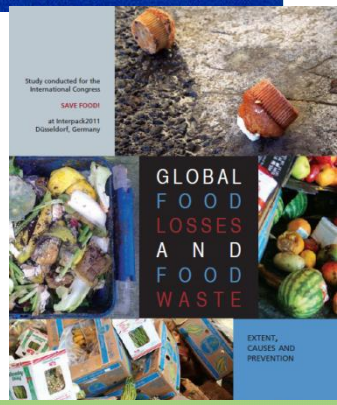


World Population is increasing. Today we have 7 billion people.

Environment is deteriorating. Erosion. **Climate change** is continuing (in 2010 increase of CO_2 emission of 6%) and threatens agriculture

Limited **natural resources:** Energy, water and agricultural land. Loss of soil fertility.

Food Waste: 30% of the produced food is lost or wasted (1.3 billion tons per year) = waste of inputs and unnecessary increase of CO_2



Biodiversity is decreasing: less varieties grown and **monoculture** of few cultivars.

Food security is threatened in many countries, worsened through increased **food prices** and financial crisis

Country	Number of varieties grown		
	Past	Present	Remark
Bangladesh	5,000	23	
Japan	1,302	-	>70% of area cultivated under three varieties
Rep. of Korea	4,227	12	
Philippines	-	13	
Sri Lanka	2,000	100	
Taiwan Province of China	1,679	50	> 82% of area cultivated under three varieties
Thailand	16,185	37	50% of area cultivated under two varieties

Source: Paroda, 1999

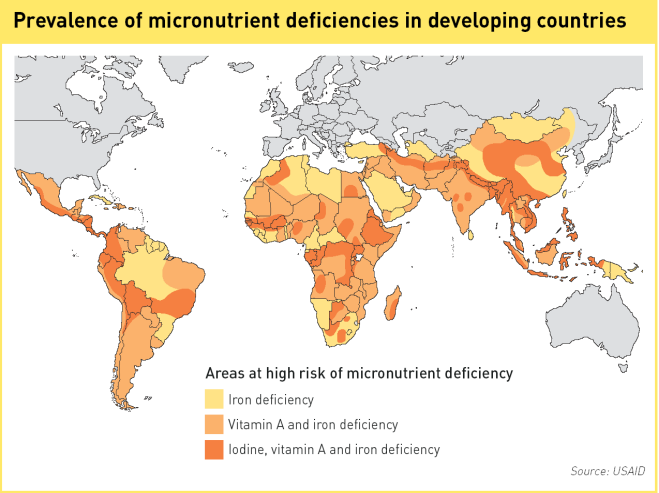
Where we are today (2)

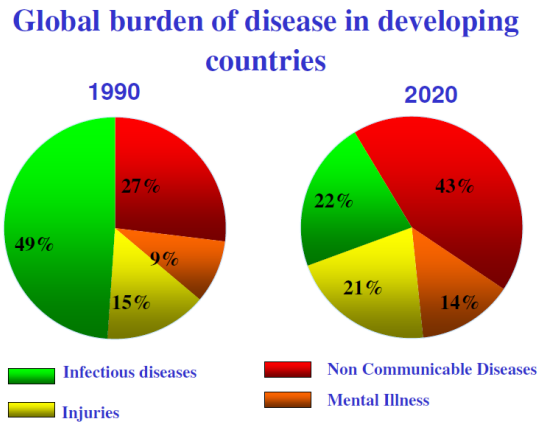
Double burden of malnutrition. Obesity endemic has reached developing countries. Non-communicable diseases are increasing worldwide. Undernutrition and micronutrient deficiencies are persisting

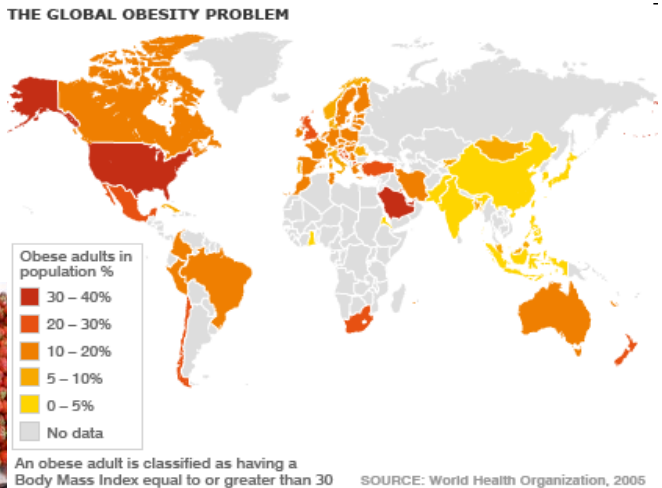
Increased consumption of animal products in e.g. China and India and of **processed foods**

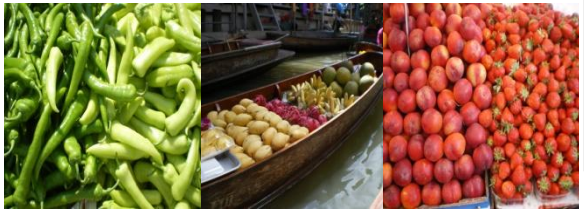
Simplification of diets and shift towards westernized diets

Medicalised approach (fortification and supplementation) is favored instead of food-based for nutrition



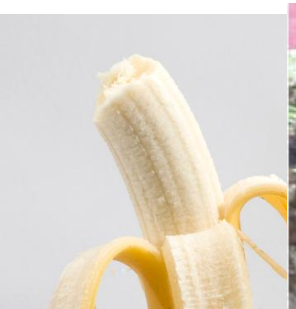






Vitamin A deficiency in Micronesia

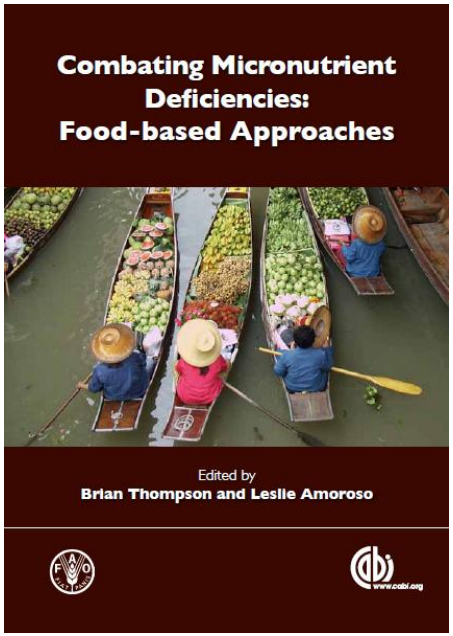
- Traditionally, vitamin A deficiency was **not known**
- With shift to **westernized diets** (e.g. white rice and mutton tails) vitamin A deficiencies arrived
- **Nutrition programme** developed based on green leafy vegetables did not work as considered ‘pig foods’
- Exploration of **traditional diets** showed that local varieties of bananas and taro were very rich in carotenoides –> current programme re-introduces the traditional diet seems to work. See http://www.islandfood.org



Prevention of micronutrient deficiency

1. **Food-based approach -> increased evidence that it works**

- Food biodiversity including wild and underutilized foods
- Traditional foods revival
- Nutrition education
- Change in agriculture production and increased home gardening



2. **Medicalised approach:** Fortification and/or supplementation -> **increase doubts**: read the commentary of Michael Latham 'The Great vitamin A Fiasco' at http://www.wphna.org/wn_commentary.asp

The Great Vitamin A Fiasco (M. Latham)

- "Vitamin A (capsule) programmes are **ineffective**. They use up precious human and material resources. Most of all, they **impede other approaches** to the prevention of vitamin A deficiency [...]. These include breastfeeding, and the protection and development of healthy, affordable and **appropriate food systems and supplies**. Such approaches also protect against other diseases, are sustainable, enhance well-being, and have social, cultural, economic and environmental benefits."
- "**capsules do not have a significant effect on mortality**" but de-worming and measles vaccination are effective
- "exceedingly rich sources of carotene such as palm and other fruits, tend to be overlooked [...], one reason being that they often **grow wild**, and even when cultivated do **not feature in international or national food composition tables** "

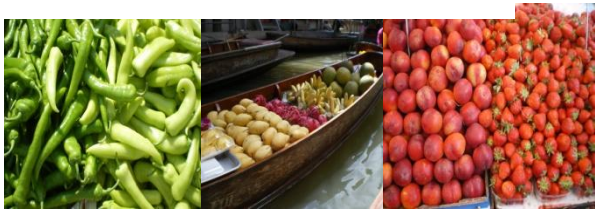
Biodiversity and nutrition

- Dietary energy supply *can* be satisfied without diversity
- Micronutrient supply *cannot* be satisfied without diversity

"Agricultural biodiversity is a matter of life and death for us.... We cannot separate agrobiodiversity from food security."

—Zambian delegate to the Conference of Parties, Convention on Biological Diversity, May 1998

The are as many differences in nutrient values among varieties of the same food as among different foods.



Differences in food composition

	Protein g	Fibre g	Iron mg	Vitamin C mg	Beta-Carotenes mcg
Rice	5.6 - 14.6		0.7 - 6.4		
Cassava	0.7-6.4	0.9-1.5	0.9-2.5	25-34	<5-*790*
Potato	1.4-2.9	1-2.23	0.3-2.7	6.4-36.9	1-8
Sweet potato	1.3-2.1	0.7-3.9	0.6-14	2.4-35	100-23100
Taro	1.1-3	2.1-3.8	0.6-3.6	0-15	5-2040
Eggplant		9 - 19		50 - 129	
Mango	0.3 - 1.0	1.3-3.8	0.4-2.8	22-110	20 – 4320
GAC					6180 – 13720
Apricot	0.8-1.4	1.7-2.5	0.3-0.9	3.5-16.5	200-6940 (beta carotene eq.)
Banana			0.1-1.6	2.5-17.5	<1 – 8500

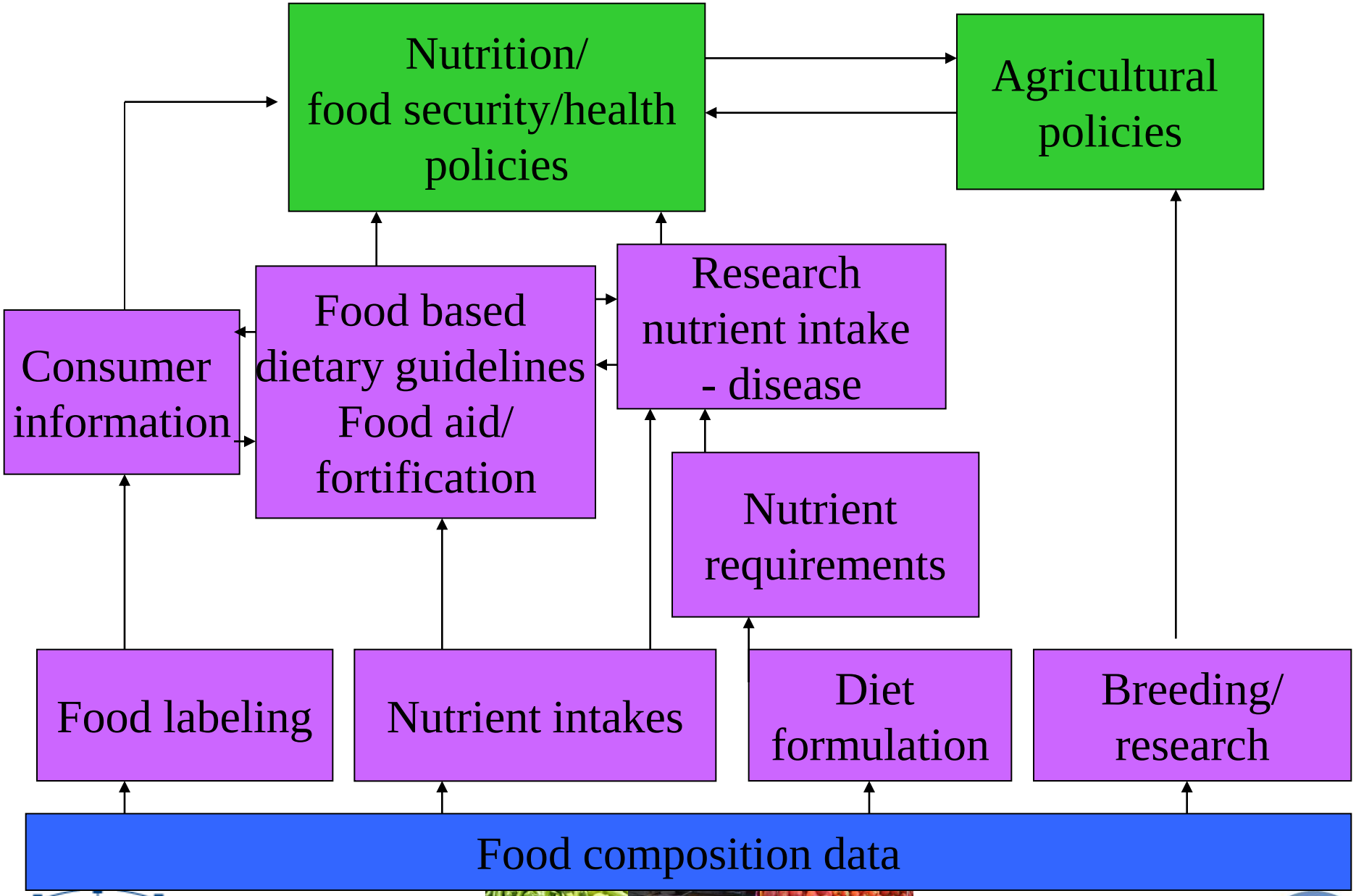
Impact of food biodiversity on dietary adequacy

Protein content	Protein content (g/100 g)	Cassava intake in Congo g/d/p	Part of the RDI for protein covered by cassava intake, in %
Average	3.24	286	20.6
Minimum	0.95	286	6.0
Maximum	6.42	286	40.8

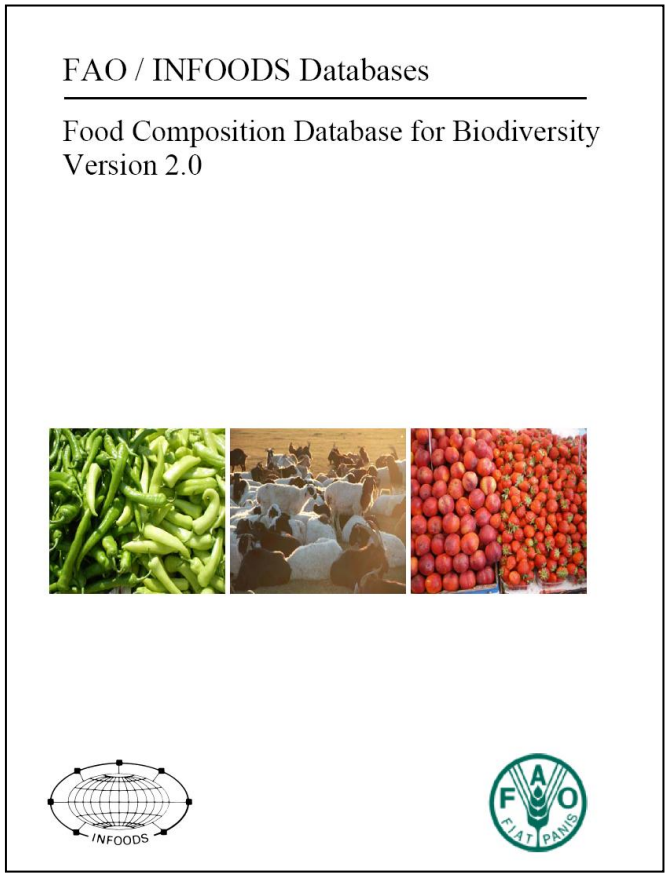
Banana	β-carotene content in mcg/100 g	Banana intake in Philippines in g/d/p	Vitamin A intake through banana in mcg RE/d/p	RDI for vitamin A covered by banana intake, in %
USDA	26	93	4	0.7
Lacatan	360	93	56	9.3
Utin Iap	8508	93	1318.7	219.8

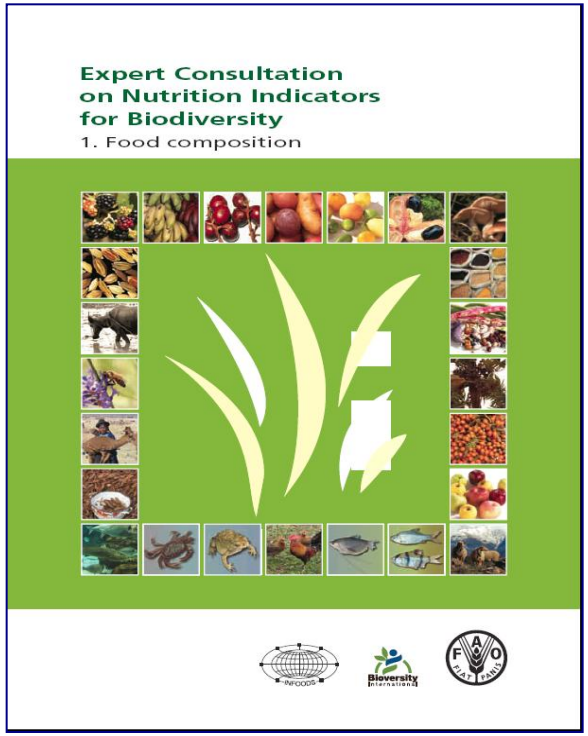
International Network of Food Data Systems (INFOODS)

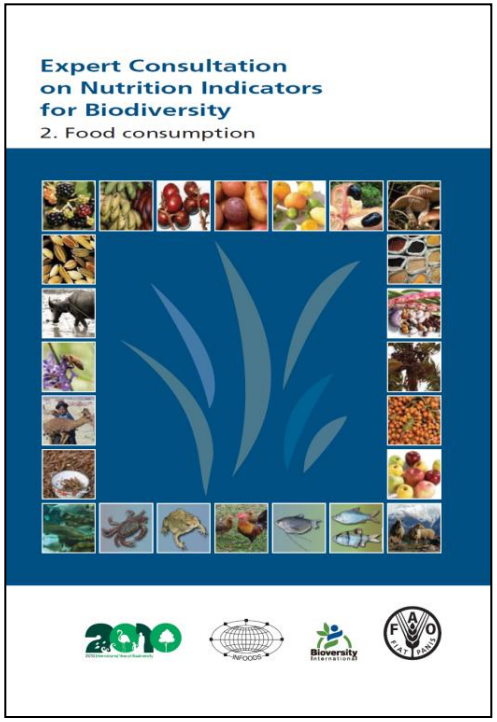
- Established in 1984
- Under UNU and FAO.
- IUNS Task Force
- Coordination since 1999 in FAO
- **Objective**: to stimulate and coordinate efforts to improve the quality and availability of food analysis data worldwide


Nutrition/
food security/health
policies
Agricultural
policies
Consumer
information
Food based
dietary guidelines
Food aid/
fortification
Research
nutrient intake
- disease
Nutrient
requirements
Food labeling
Nutrient intakes
Diet
formulation
Breeding/
research
Food composition data

Improving the Evidence







Food Biodiversity

- **Two Nutritional Indicators for Biodiversity** in English, French and Spanish:

1. **on food composition** (FAO, 2008) ➔ yearly reporting (in 2008 over 4700 foods reported, in 2011 a total of 12800 mainly from scientific literature)
2. **on food consumption** (2010 and 2011) ➔ reporting every second year (in 2009 over 3000 food reported in food consumption surveys on food biodiversity, in 2011 increase to 4900 foods)

Nutrition indicators for biodiversity

It is a **count of the number of foods**

- at variety/ cultivar/ breed level for common foods
- species level for wild or underutilized foods

- with at least one value for component or a food reported to be consumed
- reported by at least one participant in a food consumption survey

Interpretation

- show the interest and awareness of importance of biodiversity and the degree of its explored knowledge of food composition and consumption

Schema of taxonomic names

Schema	Plant – example	Plant – example	Fish - example	Animal – example
Family	*Rosaceae*– Rose family	*Poaceae*– Grass family	*Pleuronectidae*	*Bovidae Caprinae*
Genus	*Prunus* L. – plum	*Triticum* L. – wheat	*Platichthys*	*Ovis*
Species	*Prunus domestica* L. – European plum	*Triticum aestivum* L. – common wheat	*Platichthys flesus* (Linnaeus, 1758)	*Ovis aries* – sheep
Subspecies	*Prunus domestica* L. subsp. *domestica*			(rarely used)
Variety Cultivar Breed	*Prunus domestica* L. var. *domestica* – European plum *Prunus domestica* 'Cacak's Beauty'	*Triticum aestivum* 'Pioneer 2163'	*Platichthys flesus* var. *marmorata* Nordmann, 1840 - European flounder	Suffolk

Number of foods reported for Nutrition Indicator for Biodiversity - 1. Food Composition (2008-2011)

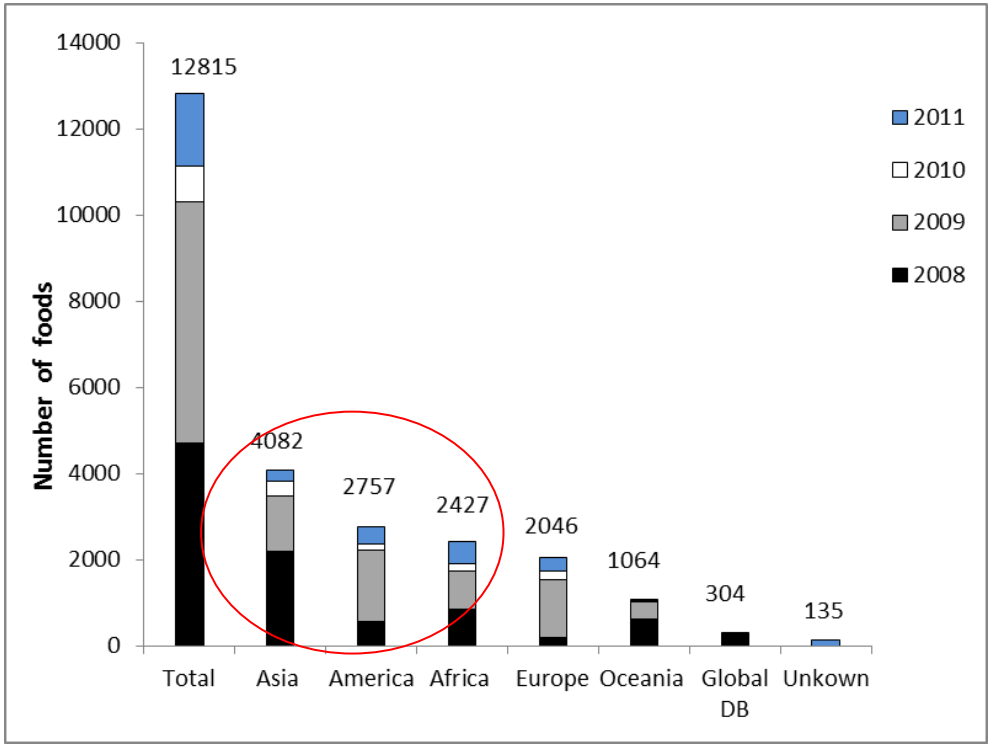


Figure 1: Number of foods per continent reported for the Biodiversity Indicator on Food Composition (2008-2011)

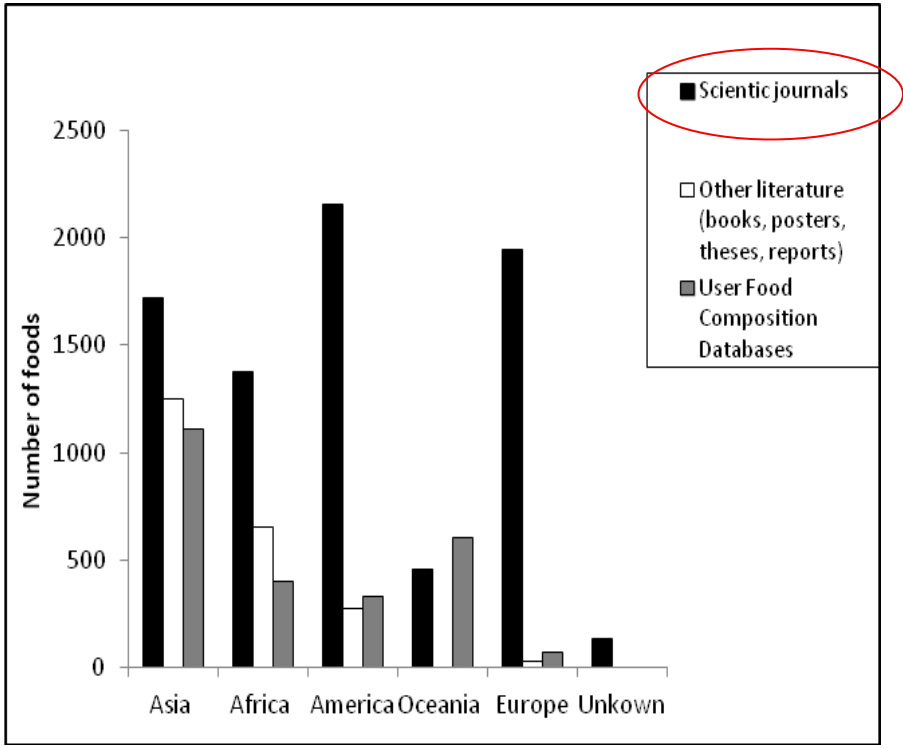


Figure 2: Overview of foods derived from different literature sources. Data are presented per continent (2008-2011)

Nutrition Indicator for Biodiversity
1. Food Composition (new in 2011)

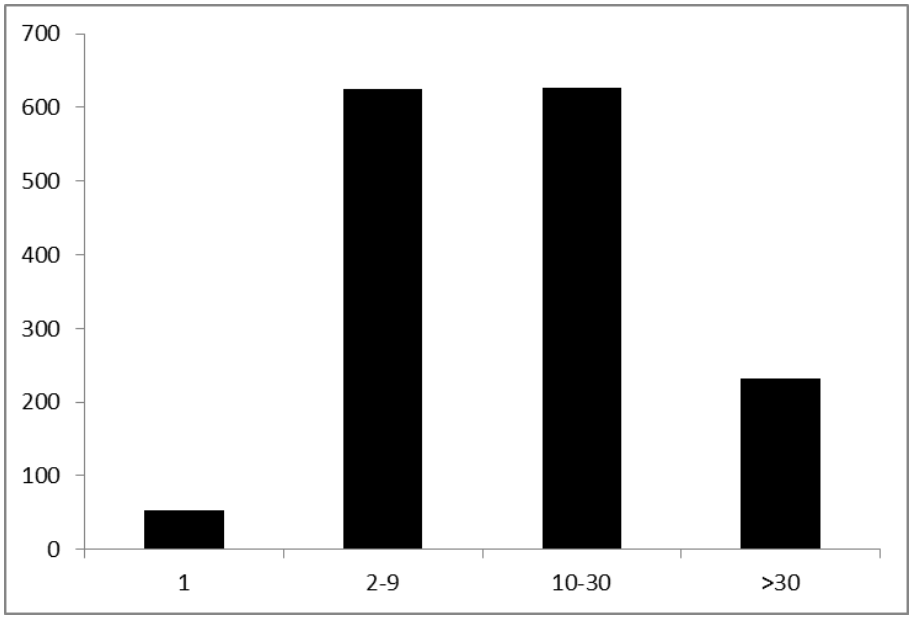
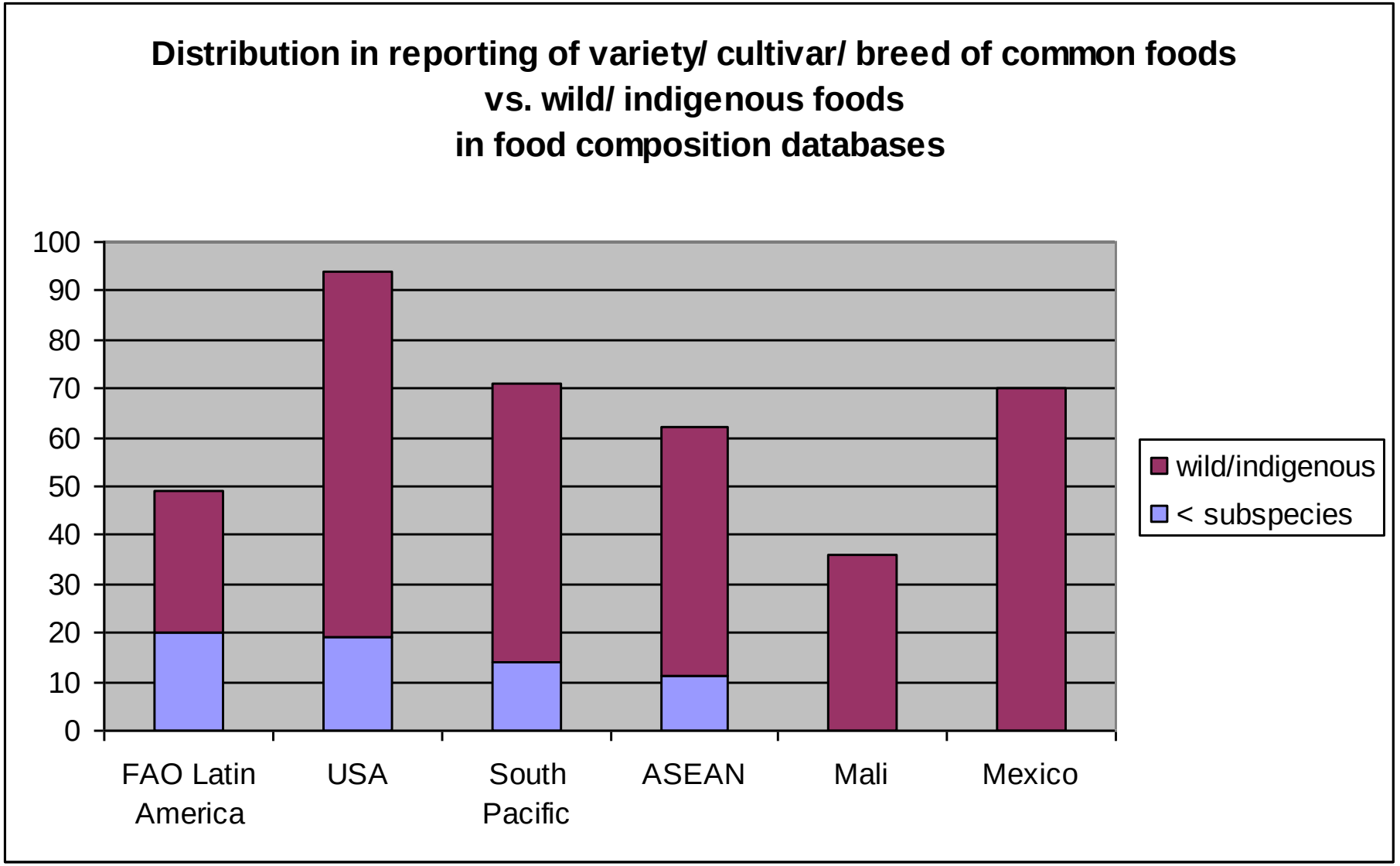


Figure 5: Number of components analysed for 1, 2-9, 10-30 and > 30 components


Distribution in reporting of variety/ cultivar/ breed of common foods
vs. wild/ indigenous foods
in food composition databases
100
90
80
70
60
50
40
30
20
10
0
FAO Latin America
USA
South Pacific
ASEAN
Mali
Mexico
wild/indigenous
< subspecies

Nutrition Indicator for Biodiversity - 2. Food Consumption (2009-2011)

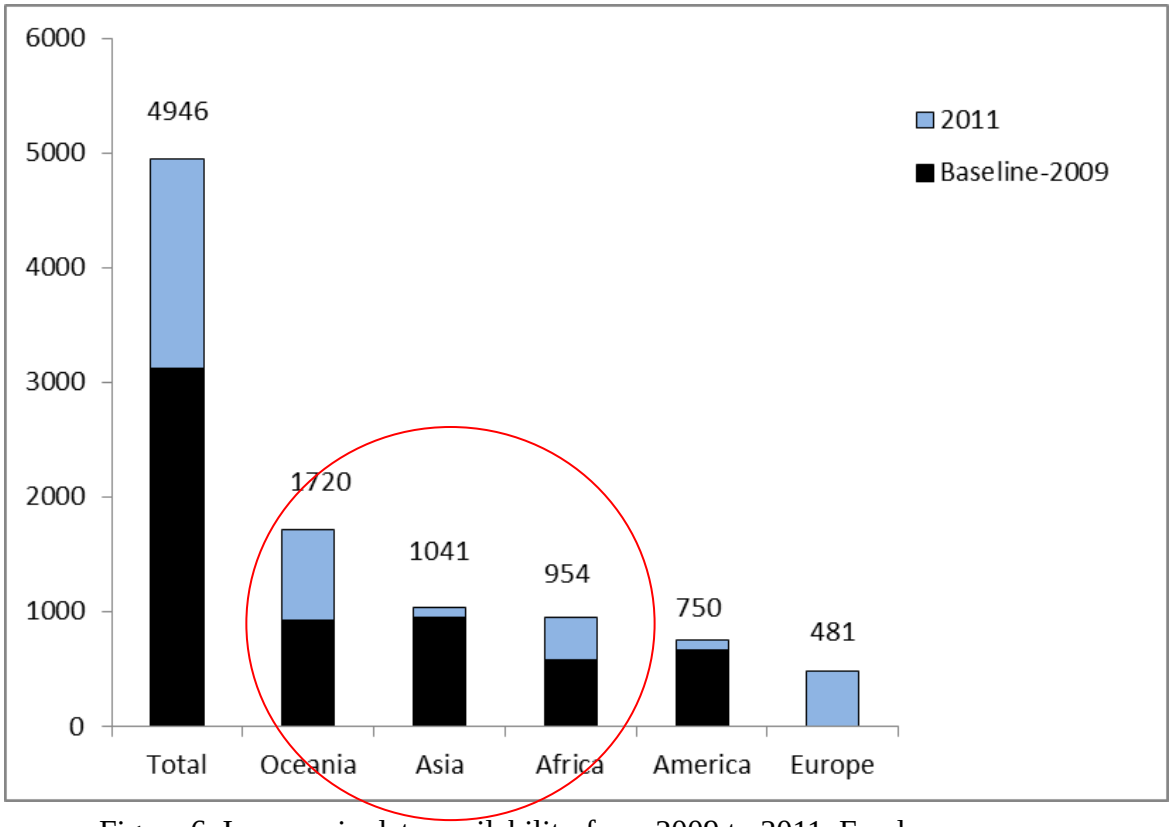
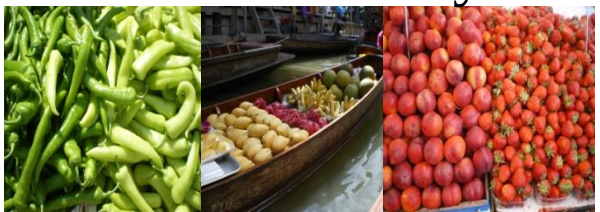


Figure 6. Increase in data availability from 2009 to 2011. Food consumption Indicator

Food Composition Database on Biodiversity

- contains **only analytical** data for 182 components (macronutrients, vitamins, minerals and heavy metals, phytochemicals, FA, AA)
- Launched in December 2010 with 2400 foods: 1514 entries on potatoes (over 700 varieties), 27 on other roots and tubers, 444 on milk (from 14 species with 5 to 54 breeds per species), 316 on fruits, 30 on cereals, 24 on legumes, 30 on nuts and seeds, and 32 on vegetables
- in June 2012 second edition with expected 6000 foods: more on fish, vegetables, fruits, meat, insects
- Download free-of-charge from INFOODS website http://www.fao.org/infoods/biodiversity/index_en.stm

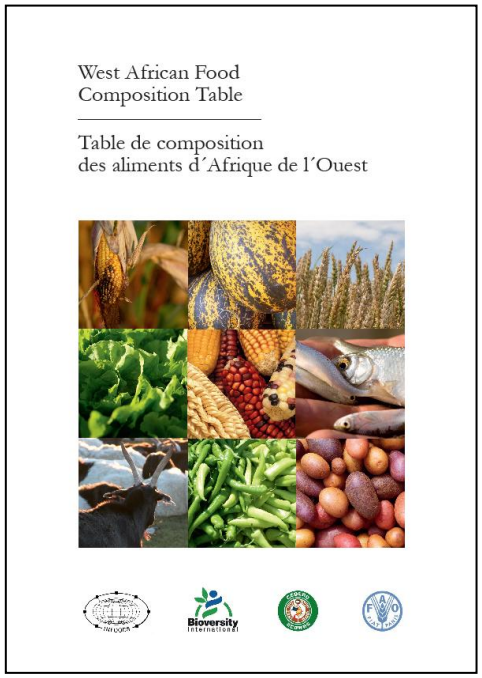


Food Composition Database for Biodiversity - Objective

To provide analytical data on the composition of foods at the level of food biodiversity free-of-charge to any professional in need of such data enabling them to:

- include more food biodiversity data into national and regional FCDB
- study the contribution of food biodiversity to nutrition (e.g. adequacy) and food security
- select foods with an interesting nutrient profile for increased **agricultural** research and production, and for nutrition education
- provide alternatives for food fortification or supplementation

Biodiversity in Food Composition Tables



The ***West African Food Composition Table*** (FAO, 2012) details the composition of 472 foods from the Western Africa region. The publication includes nutrient data on the various ways foods are prepared (i.e. boiled, grilled, and stewed) and covers food **biodiversity of local varieties and cultivars**.

Biodiversity & Nutrition – implications (1)

For food composition database compilers:

- Sample and generate nutrient data for wild foods and individual cultivars, also by ecosystem
- Compile these data comprehensively, systematically and centrally, and disseminate widely

For food consumption surveys

- Include biodiversity questions and/or prompts in food consumption surveys
- Report food consumption also by ecosystem and/or ethnic group
- Communicate to food composition database compilers the need for compositional data for these specific foods
- Calculate more precise nutrient intake estimations

For nutrition education

- Investigate traditional foods and varieties
- Promote the most nutritious among them

Biodiversity & Nutrition – implications (2)

For agriculture policies and programmes

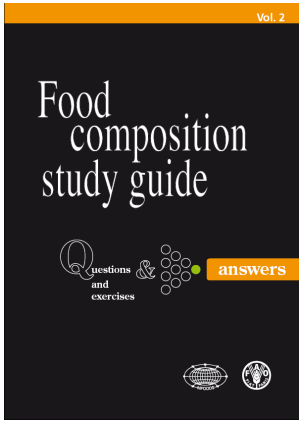
- Explore existing biodiversity, including its compositional data
- Nutrient content needs to be among criteria in promoting food biodiversity
- Include criteria on compositional data to develop and produce more **nutrient-rich foods on large scale**

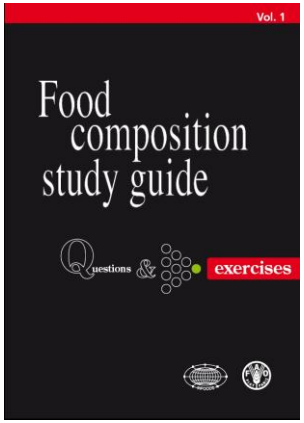
For nutrition and health policies and programmes

- Explore existing biodiversity, including its compositional data
- Reconsider fortification and supplementation programmes – evaluate them for efficiency and impact on mortality and morbidity
- Promote a food-based approach to combat all form of malnutrition

Training

- Since 1992, about 600 professionals were trained in over 20 courses, most of them did not include biodiversity
- FAO/INFOODS Food Composition Study Guide includes one module on biodiversity (free-of-charge at http://www.fao.org/infoods/publications_en.stm)





Next steps

- Establish guidelines on how to integrate biodiversity into food consumption survey tools
- Populate the FCDB for Biodiversity

=>Please participate in WG and send us data

Conclusions

- **Most professionals** in nutrition, health, environment and agriculture are **not aware** of biodiversity facts and do not take the nutritional differences among varieties and species into account in their work. This needs to change.
- Once more high-value nutritional crop varieties of local preference are grown with good yield and pest-resistance, and are marketed at reasonable prices it will become more likely that the population will **reach nutritional adequacy through foods** themselves which would decrease the need for fortification and supplementation and make the food system more sustainable.

⇒ in-line and a pre-requisite of FAO's food-based approach to combat malnutrition.

⇒ Improve food supply and assist agriculture to cope with **climate change**.

Acknowledgement

Inputs to the Food Composition database for Biodiversity

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Thank you

- INFOODS website http://www.fao.org/infoods/index_en.stm
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