Sustainable Diets and traditional food systems

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Sustainability Issues

- **Diets are not sustainable**
  - 795 million hungry people
  - 2 billion people with micronutrient malnutrition
  - 2 billion people overweight and obese
- **Environments are not sustainable**
  - ecosystems degraded
  - biodiversity forever lost
  - climate change
- **Agriculture is not sustainable**
  - monoculture, intensive livestock industries, agricultural chemicals, waste/losses, inefficiencies

25 September 2015: The 193-Member United Nations General Assembly formally adopted the 2030 Agenda for Sustainable Development, along with a set of bold new Global Goals, which SG Ban Ki-moon hailed as “a universal, integrated and transformative vision for a better world.”

Goal 2: End hunger, achieve food security & improved nutrition & promote sustainable agriculture

2.1 End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, to safe, nutritious and sufficient food all year round

2.2 End all forms of malnutrition, including stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

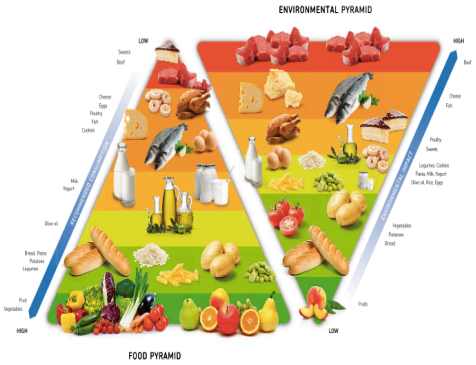
2.4 Ensure ***sustainable food production systems*** and implement resilient agricultural practices that increase productivity and production, that help ***maintain ecosystems***, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

2.5 ***Maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species,*** including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

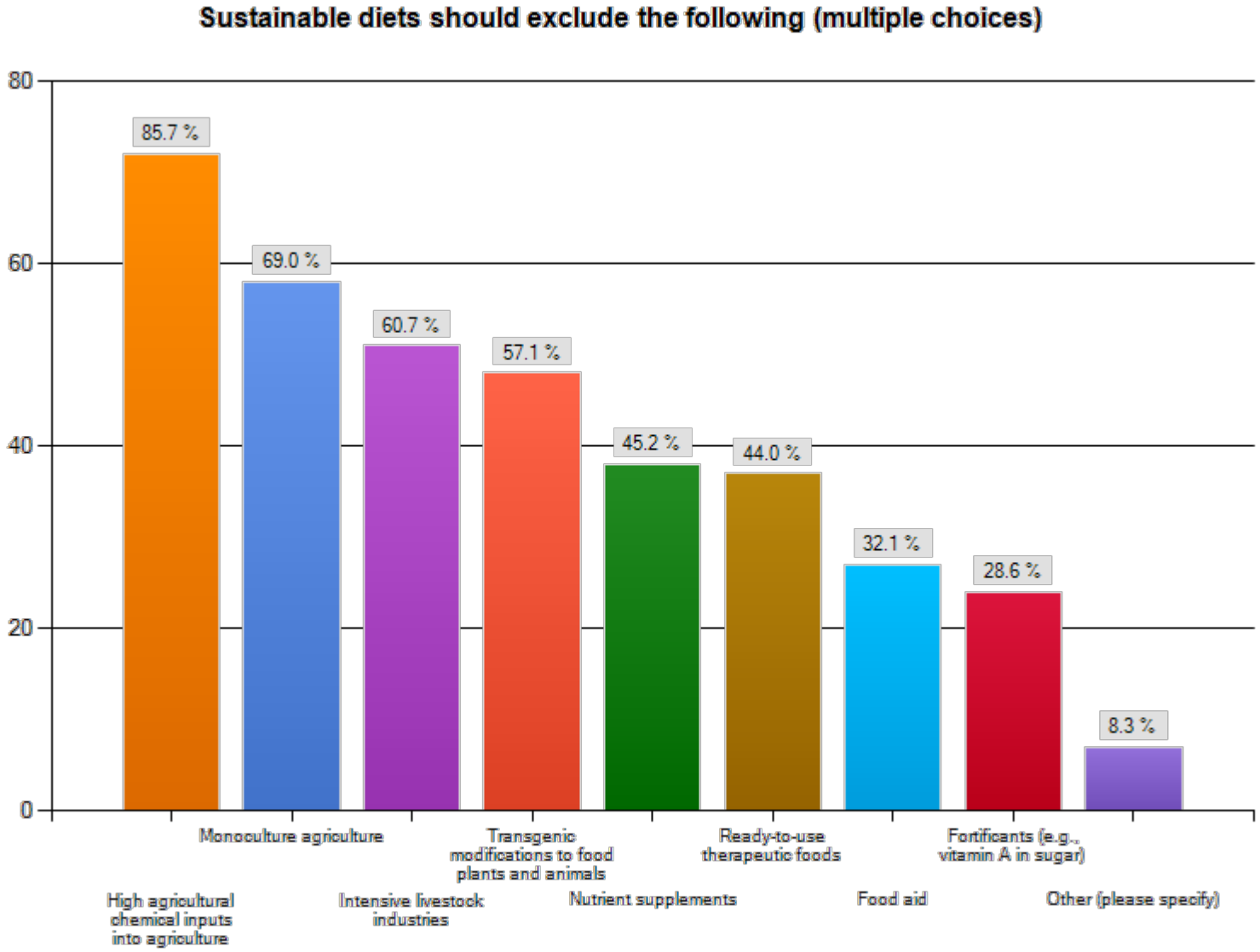
What is the basic unit of nutrition?

- Nutrient?
- Food?
- Diet?
- Gene?

- Health sector model
- Ag sector model
- Multi-sector model
- Biotech model

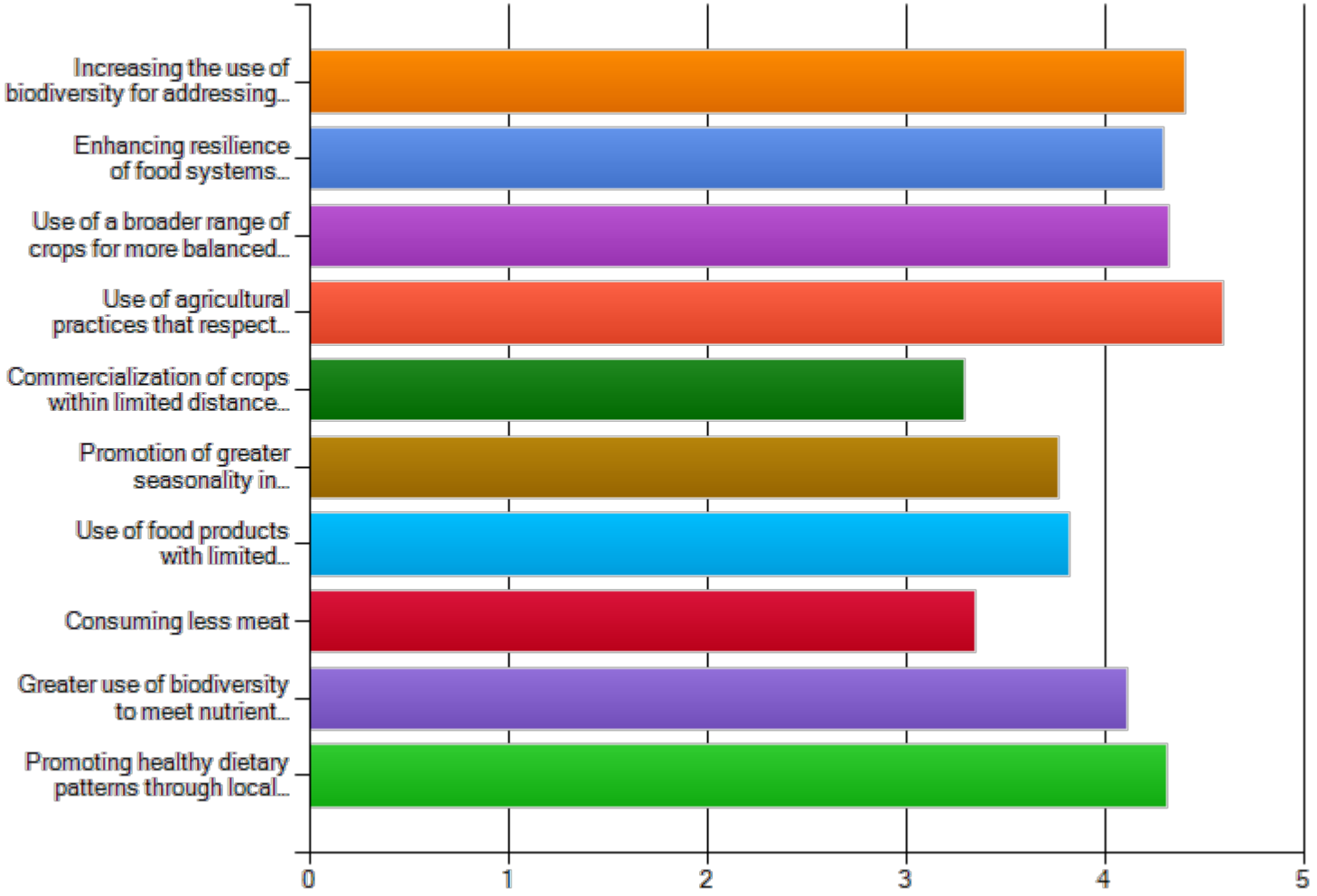


Survey Results



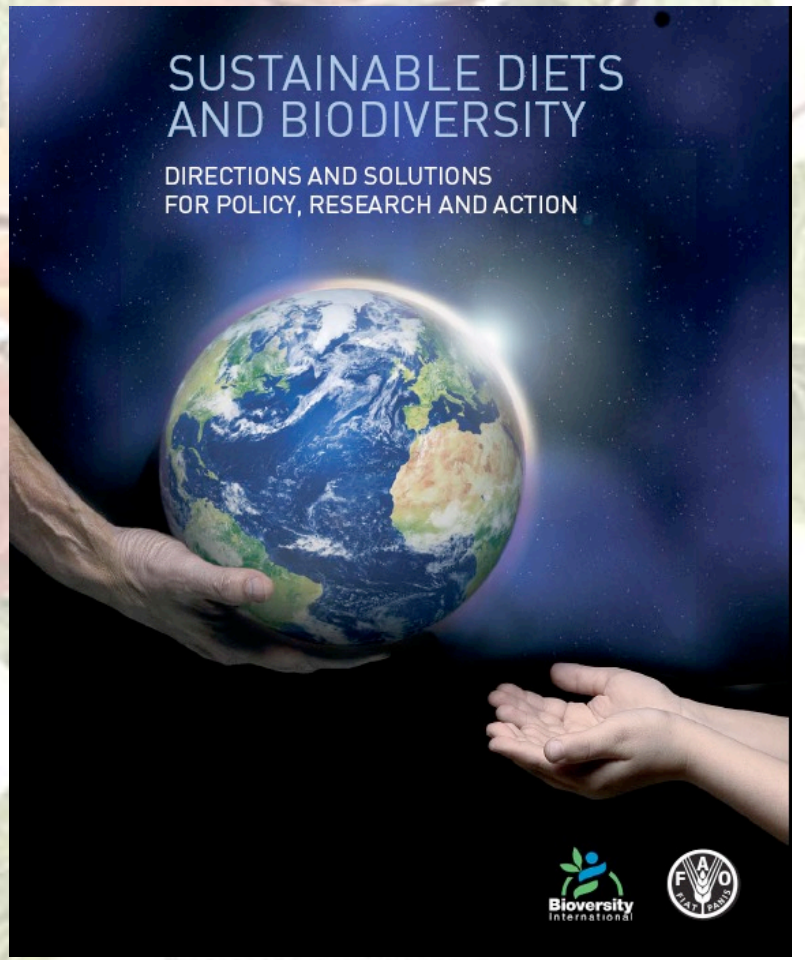
Survey Results

Rate the importance of each of the following elements for sustainable diets1 (Not important)2 (Of minor importance)3 (Moderately important)4 (Very important)5 (Essential)



Sustainable Diets

Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.



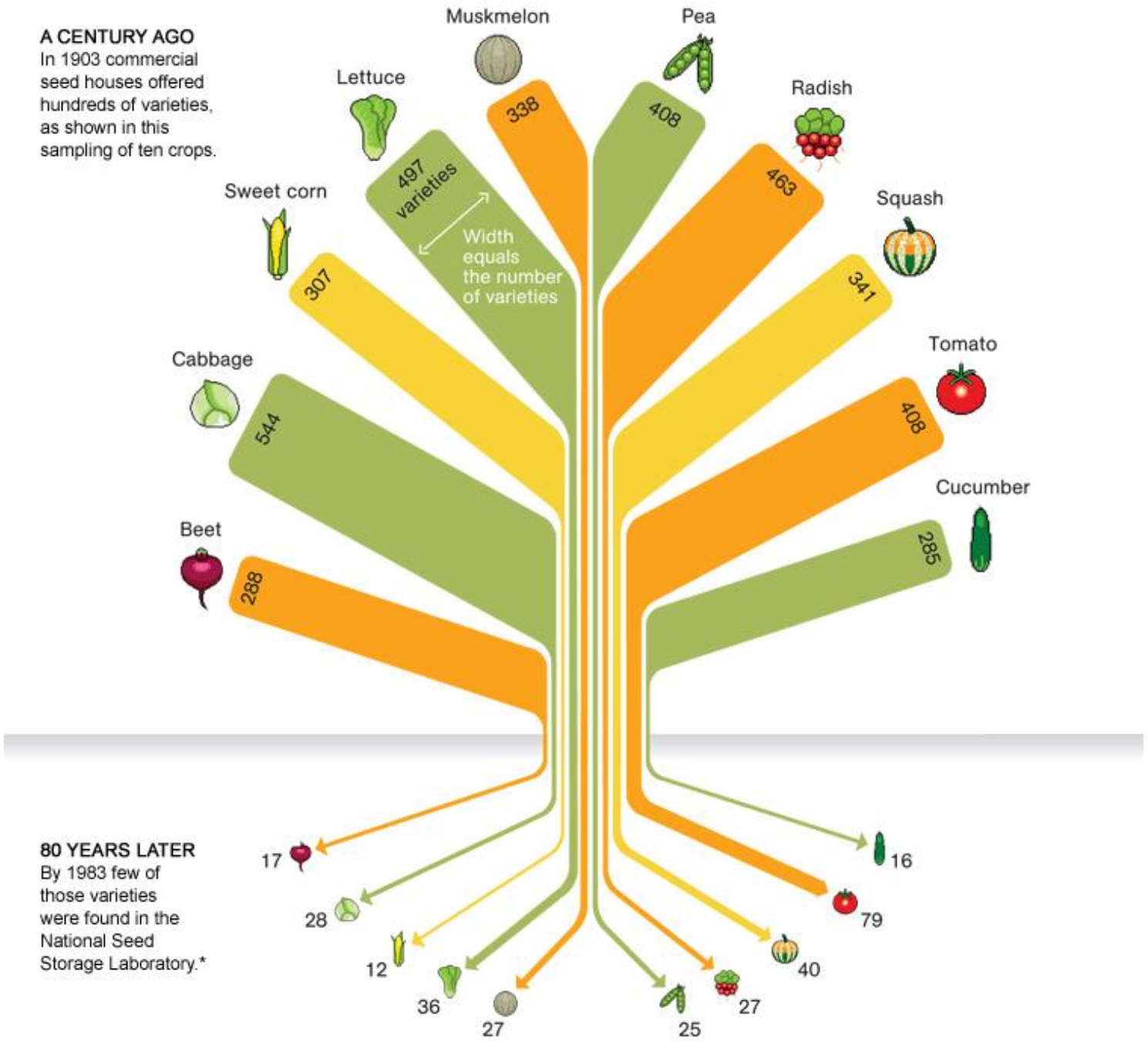
Source: FAO, 2010

Code of Conduct for Sustainable Diets Preamble

- Recognizing that the health of humans cannot be isolated from the health of ecosystems;
- Conscious that food is an unequalled way of providing ideal nutrition for all ages and life cycles/stages;
- Recognizing that the conservation and sustainable use of food biodiversity is an important part of human and ecosystem well-being;
- Recognizing that when ecosystems are able to support sustainable diets, nutrition programmes, policies and interventions supporting the use of supplements, RUTF, fortificants, and infant formulas are inappropriate and can lead to malnutrition, and that the marketing of these food substitutes and related products can contribute to major public health problems…

Decline in agro-biodiversity

- The world has over 75,000 edible plants and just 200 species are used regularly
- Rice, maize and wheat provide 56% of the food energy supply
- Just 9 crops supply 75% of food energy (wheat, rice, maize, sorghum, millet, potatoes, sweet potatoes, soybean and sugar)
- Most cereals are consumed in a highly refined form and are therefore high in carbohydrates but low in micronutrients and other macronutrients



* CHANGED ITS NAME IN 2001 TO THE NATIONAL CENTER FOR GENETIC RESOURCES PRESERVATION

JOHN TOMANIO, NGM STAFF. FOOD ICONS: QUICKHONEY
SOURCE: RURAL ADVANCEMENT FOUNDATION INTERNATIONAL

Food Biodiversity

	Resource	Nutrient
Wheat, cultivated and wild	***Triticum*** **four species 106 varieties**	**Protein, amino acids, B-vitamins, vitamin E, fatty acids**
Apricots	***Prunus armeniaca*****, more than 140 varieties**	**ß-carotene, lutein, lycopene, anthocyanins, vitamin C**
Grapes	***Vitis vinifera*** **Thousands of varieties**	**Vitamin C, organic acids, anthocyanins, resveratrol, many phytochemicals**

Extent of genetic uniformity in rice

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

Cultivar Differences in Nutrient Content

Nutrient	Range	Average	Variety with highest nutrient content	Variety with lowest nutrient content
Protein (n=1339)	5.55 – 14.58 g/100g	8.55	Indica CR1707 (Costa Rica)	Indica Rd 19 (Thailand)
Iron (n=95)	0.70 – 6.35 mg/100g	2.28	Long grained[a] red (China)	Undermilled Red[a] (Philippines)
Zinc (n=57)	0.79 – 5.89 mg/100g	3.34	Ganjay Roozy (IRRI)	Long grain[a] Fragrant (China)
Calcium (n=57)	1.0 – 65.0 mg/100g	26	ADT-21, red (India)	Brown Japonica[a] (Korea)
Thiamin (n=79)	0.117 – 1.74 mg/100g	0.475	Juchitan A-74 (Mexico)	Glutinous rice[a] special grade (China)
Riboflavin (n=80)	0.011 - .448 mg/100g	0.091	Tapol Dark Purple (Philippines)	Mun-pu red (Thailand)
Niacin (n=30)	1.97 – 9.22 mg/100g	5.32	Long grained[a] purple (China)	Glutinous round[a] grained (China)
Amylose (n=1182)	1.0-76.0 g /100g	22.36	Ingra 410 (Brazil)	Bpi-Ri-3 (Philippines)

[a] These data come from Food Composition Tables, and do not strictly represent rice varieties

Sweet potato varieties: α - and β-carotene, mg/100g fresh wt

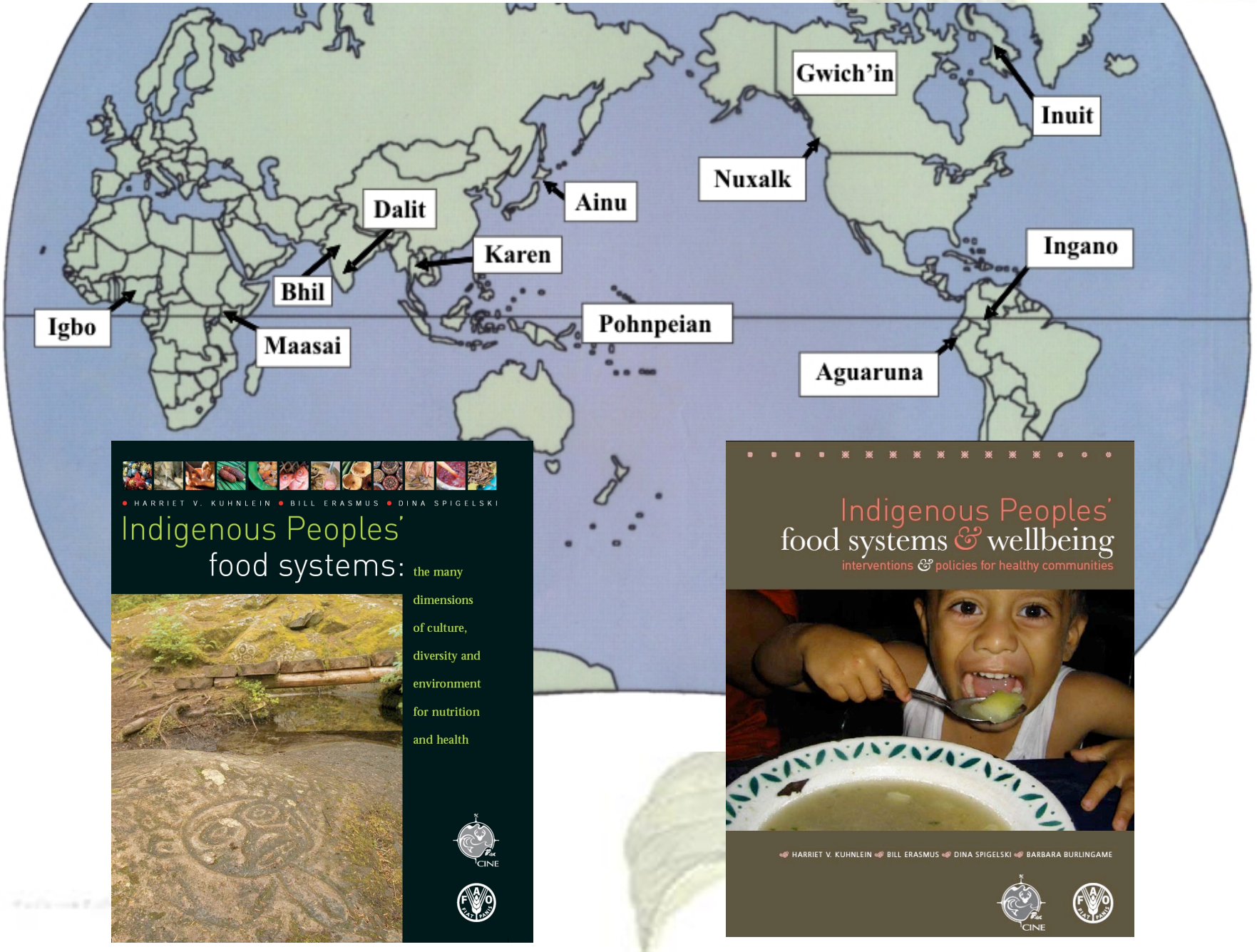
Variety	%Moisture	β	α
Orange Flesh			
Excel	77.8 (0.8)	12.8 (0.1)	< 0.1
Kona B #	77.8 (0.6)	6.7 (0.2)	1.5 (0.2)
Regal	77.2 (2.1)	13.1 (0.7)	< 0.1
UH 71-5 #	70.3 (1.1)	8.0 (0.1)	< 0.1
Yellow/White Flesh			
Hoolehua Red #	70.4 (2.7)	0.2 (0.1)	< 0.1
Satsuma #	68.3 (0.2)	0.6 (0.1)	< 0.1

n=6, values in parentheses are standard errors. # Varieties are recommended by the University of Hawaii Extension Service for good yield and disease resistance. *Source*: A. S. Huang, L. Tanudjaja, D. Lum. Journal of Food Composition and Analysis, Vol. 12, No. 2, Jun 1999, pp. 147-151.

Examples of nutrient composition within varieties (per 100 g edible portion, raw).

	Protein, g	Fibre, g	Iron, mg	Vitamin C, mg	Beta-carotene, 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	1–2.29	0.3–2.7	6.4–36.9	1–7.7
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
Breadfruit	0.7–3.8	0.9	0.29–1.4	21–34.4	8–940
Eggplant		9–19		50–129	
Mango	0.3–1.0	1.3–3.8	0.4–2.8	22–110	20–4320
Banana			0.1–1.6	2.5–17.5	<1–8500
Pandanus			0.4	5–10	14–902
GAC					6180–13720
Apricot	0.8–1.4	1.7–2.5	0.3–0.85	3.5–16.5	200–6939 (beta-carotene equivalent)

Source: *Burlingame et al./Journal of Food Composition and Analysis 22 (2009) 361–365*


Gwich'in
Inuit
Nuxalk
Ainu
Dalit
Karen
Ingano
Bhil
Igbo
Pohnpeian
Maasai
Aguaruna

HARRIET V. KUHNLEIN • BILL ERASMUS • DINA SPIGELSKI
Indigenous Peoples' food systems:
the many dimensions of culture, diversity and environment for nutrition and health
CINE

Indigenous Peoples' food systems & wellbeing
interventions & policies for healthy communities
HARRIET V. KUHNLEIN BILL ERASMUS DINA SPIGELSKI BARBARA BURLINGAME
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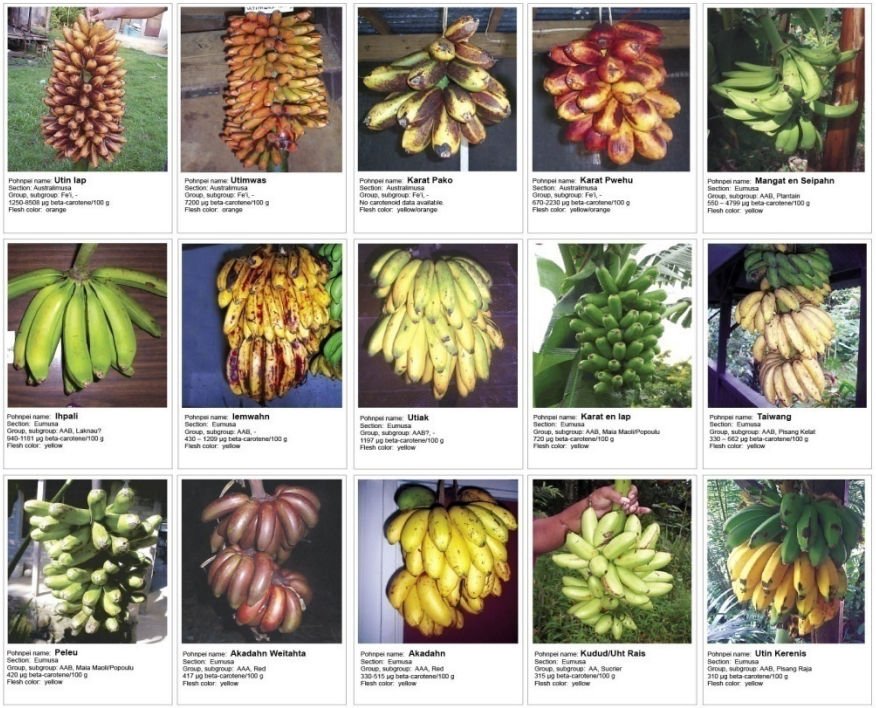
Bananas and vitamin A

<5 µg carotenes

>8500 µg carotenes

Developing and Using Local Food Posters: Food Composition Data and Health Messagess

POHNPEI BANANAS (UHT KAN EN POHNPEI): CAROTENOID-RICH VARIETIES



Grow and eat orange- and yellow-fleshed varieties for your health to help protect against diabetes, heart disease, certain cancers, vitamin A deficiency, and anemia.

Padok oh sakan soangen uht kan me oangoahng pwehn sewese omwi roson: soumwahu en suke, soumwahu en mohngiong, cancers, seuitar en vitamin A, oh seuitar en nta.

A project of the Island Food Community of Pohnpei.
Funding support by the Centers for Disease Control and Prevention (CDC); Department of Health, Kan Isaac, Pohnpei Department of Education; and the Secretariat of the Pacific Community (SPC) and the Pacific Germon Regional Forestry Program (PGRFP). Poster development and all photographs but Karat en Iap by Dr. Luis Englberger in collaboration with Adelino Lorens, Pohnpei Agriculture; Mark Evaska, College of Micronesia-FSM; Stanko Paul, Pohnpei Health, Pohnpei, and Amy Levendusky, US Peace Corps. Acknowledgements are extended: Dr. Mary Taylor, SPC, for assistance in getting the poster printed; Jeff Domedy for the Karat en Iap photo and the banana descriptions; and to the University of the South Pacific, Fiji; DSM Nutritional Products, Switzerland; University of Adelaide, Australia; Cancer Research Centre of Hawaii, United States; for laboratory results. Layout/art work: SPC Media Center. Printed by Oceania Printery, Suva, Fiji 2004.

Note: µg (microgram) is a weight unit (one millionth of a gram). After beta-carotene is consumed, it may be changed into vitamin A (VA) in the body. Of all provitamin A carotenoids, beta-carotene contributes the most to VA status.

Kisin mwengehn Pohnpei kan me kolokol “Vitamin A” laud

Pohnpei Carotenoid-Rich Foods

Grow and eat yellow varieties to help protect against:

- Vitamin A deficiency
- Anemia
- Heart disease
- Diabetes
- Cancers

Rice 0 µg

Beta-carotene/100g

Poadukidi oh kang kisin mwenge poh oangoahng kan pwe ren sewese perehdi:

- Souitar en Paidamihn A (vitamin A)
- Souitar en nta
- Soumwahuen mohngiong
- Soumwahuen suke
- Kanser (cancers)

A project of the Island Food Community of Pohnpei (IFCP).
Funding support by the Centre for Indigenous Peoples' Nutrition and Environment (CINE); Sight and Life; Australian Embassy, New Zealand Embassy, and Pacific German Regional Forestry Project. Poster development and photographs by Dr. Luis Englberger, IFCP, in collaboration with Adelino Lorens, Pohnpei Agriculture/OEA; Melchior Hagilmal, College of Micronesia-FSM; Stanko Paul, Pohnpei Department of Health; Kan Isaac, Pohnpei Department of Education; and Amy Levendusky, US Peace Corps. Acknowledgements are extended: Dr. Mary Taylor, SPC, for assistance in getting the poster printed, and to the University of the South Pacific, Fiji; DSM Nutritional Products, Switzerland; University of Adelaide, Australia; Cancer Research Centre of Hawaii, United States; and Arnezco Laboratory, California, United States for laboratory results. Layout/art work: SPC Media Center. Printed by Bluebird Printery Limited, Suva, Fiji 2006.

Note: µg (microgram) is a weight unit (one millionth of a gram). After beta-carotene is consumed, it may be changed into vitamin A (VA) in the body. Of all provitamin A carotenoids, beta-carotene and other carotenoids develop with ripeness. The data here are for beta-carotene content of samples of giant swamp taro and ripe banana, breadfruit, and pandanus. Samples were analyzed as raw or cooked samples, according to use.

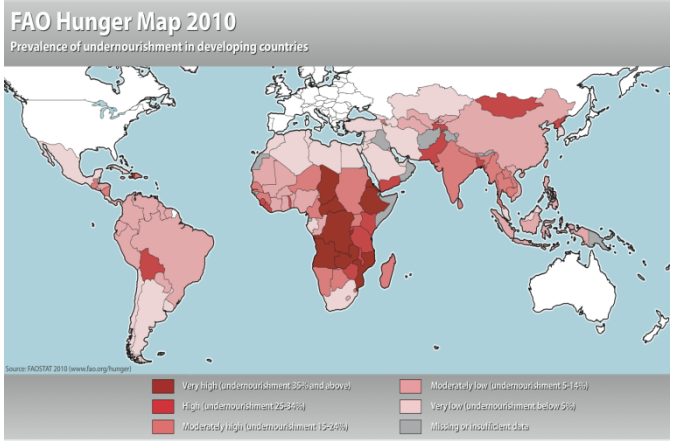
Table 6.7 Mean daily intake of selected nutrients by Mand female adults (*n* = 44) and young children (*n* = 27) by local or imported food source in two non-consecutive 24-hour recalls, August 2005

	Energy *kcal*	*Protein* *g*	*Fat* *g*	*Total Vitamin A* *µg RE*	*Retinol* *µg*	*ß-carotene* *equivalents-µg*	*Vitamin C* *mg*
Female adult intake							
Nutrient intake: local foods	648	43	26	141	78	335	60
Nutrient intake: imported foods	1 796	69	57	82	60	113	6
Total intake: local + imported	2 445	111	83	223	138	448	66
Percent contribution of imported food to total nutrient intake	73%	62%	69%	37%	43%	25%	9%
Child intake							
Nutrient intake: local foods	258	17	9	47	25	190	29
Nutrient intake: imported foods	1 349	45	44	69	40	164	2
Total intake: local + imported	1 608	62	53	116	55	354	31
Percent contribution of imported food to total nutrient intake	84%	73%	83%	59%	73%	46%	6%

Note: This dietary assessment was conducted during the height of the breadfruit season, which contributed thus to greater local food intake.

Nutrients, ecosystems and traditions

- Mongolia
  - landlocked
  - food insecure
- n-3 fatty acids
- Mares' milk, local breed, genetic trait
- Biodiversity of grasslands



REVIEW OF KEY ISSUES ON BIODIVERSITY AND NUTRITION

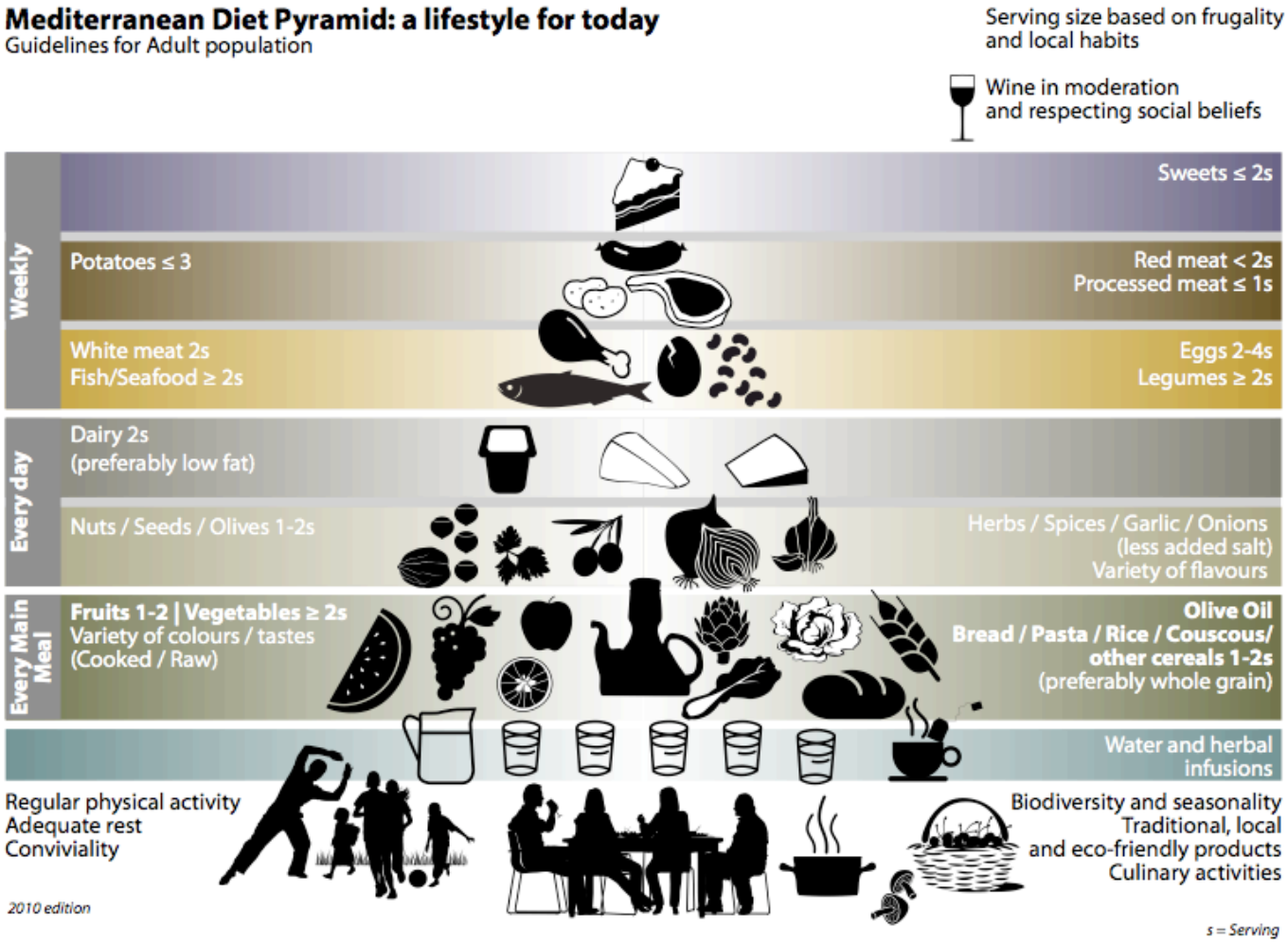
Commission on Genetic Resources for Food and Agriculture (CGRFA)

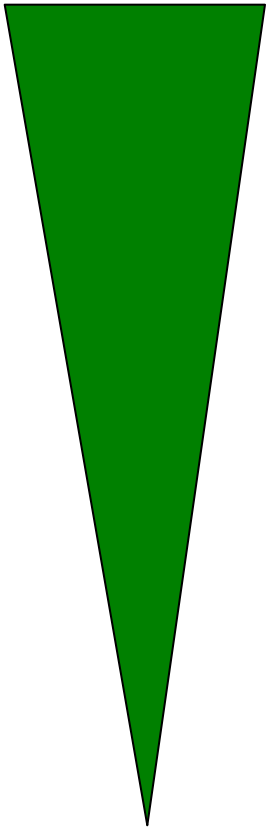
Fourteenth Regular Session

April 15-19, 2013, Rome, Italy

The Commission

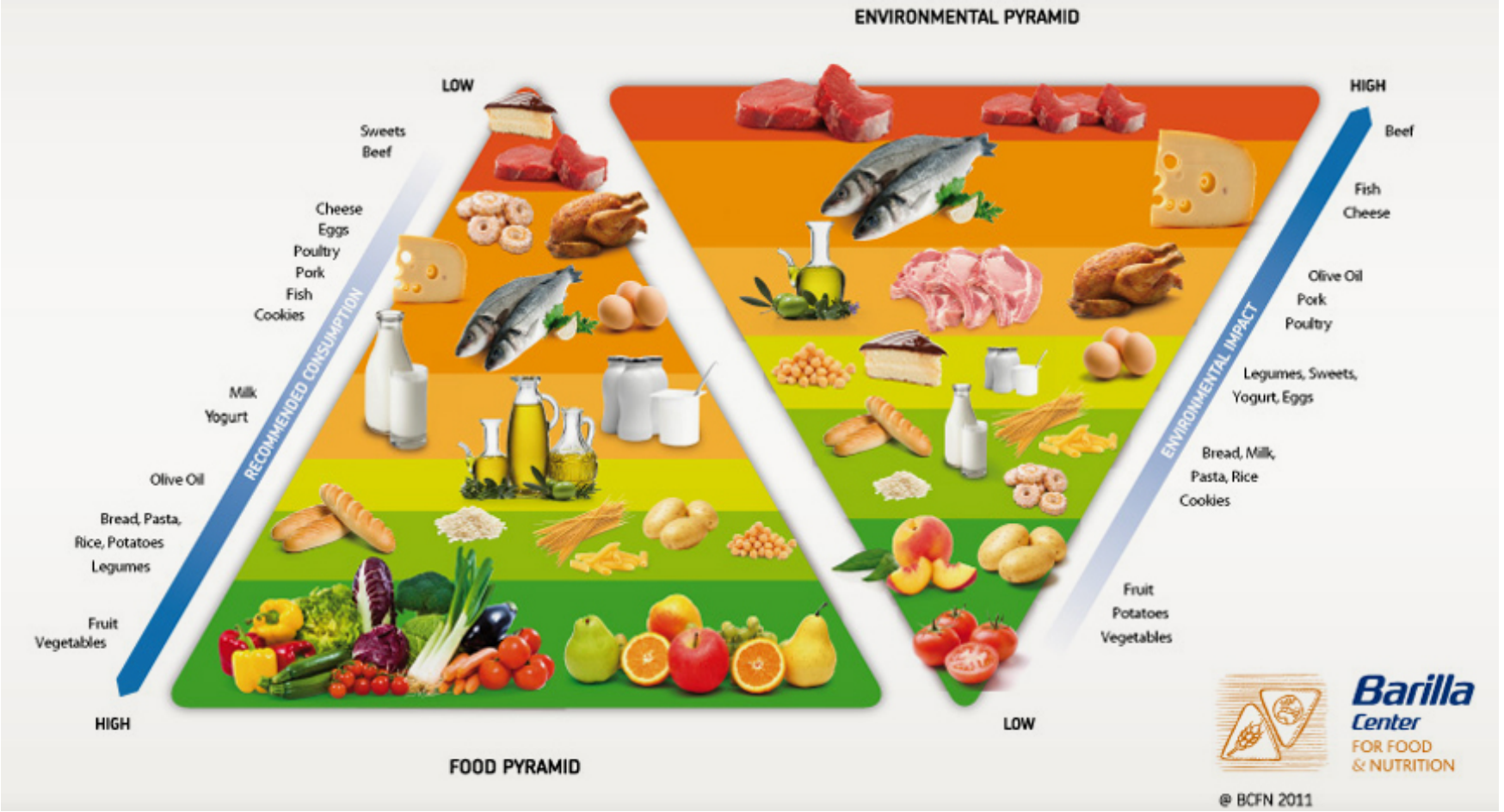
- Requested…to develop work on biodiversity and nutrition, recognizing the importance of linking food biodiversity and the environment sector to human nutrition and healthy diets
- Recommended that the concept that nutrients in food and whole diets, as well as food, should be explicitly regarded as ecosystem services
- Requested …draft guidelines for mainstreaming biodiversity into policies, programmes and national and regional plans of action on nutrition
- Requested…continue to incorporate biodiversity into relevant nutrition activities and to further mainstream nutrition within its work on biodiversity





Source: Mediterranean Diet Foundation, 2010

Double Pyramid



Detentions and Confiscations at US Borders

- 2014-June 2016, 105 shipments
- 63 were food or food-related
- NZ's most common violations
  - 241 and 260: PESTICIDE The article is subject to refusal of admission pursuant to Section 801(a)(3) in that it appears to bear or contain a pesticide chemical residue, which causes the article to be adulterated within the meaning of section. *ADULTERATION*
  - 315: ADDED BULK The food appears to have a substance added to, mixed or packed with it so as to increase its bulk or weight, or reduce its quality or strength, or make it appear better or of greater value than it is. *ADULTERATION*
  - 482: NUTRIT LBL The article appears to be misbranded in that the label or labeling fails to bear the required nutrition information. *MISBRANDING*
  - 403(a)(1), 801(a)(3): FALSE, MISBRANDING The article is subject to refusal in that it appears to be misbranded within the meaning of the FD&C Act in that the labeling is false or misleading. *MISBRANDING*

•NZ 4/2016, 6/2016; AUS 6/2016 2nd seafood

Detentions and Confiscations at EU Borders

- 2014-June 2016, 39 food products
- NZ's most common violations
  - cadmium (2.0810 mg/kg - ppm) in frozen scampi (*Metanephrops* spp) from New Zealand
  - mercury (0.9 mg/kg - ppm) in frozen snapper (*Pagrus auratus*) from New Zealand
  - dioxins (1.063 pg WHO TEQ/g) and dioxin-like polychlorobifenyls (1.135 pg WHO TEQ/g) in mixed bile acids from New Zealand

NZ 4/2016, 6/2016; AUS 6/2016 2nd seafood

United Nations A/HRC/25/57

General Assembly

Distr.: General
24 January 2014

Report of the Special Rapporteur on the right to food, Olivier De Schutter

- To reshape food systems for the promotion of sustainable diets and effectively combat the different faces of malnutrition;
- Where local ecosystems and resources are able to support sustainable diets, systematically ensure that such interventions prioritize local solutions;
- Any prescription to increase yields that ignores the need to transition to sustainable production and consumption, and to reduce rural poverty, will not only be incomplete, it may also have damaging impacts, worsening the ecological crisis and widening the gap between different categories of food producers;
- Moving towards sustainable modes of agricultural production is vital for future food security and an essential component of the right to food. Agroecology has enormous potential in that regard.

Future: what is added value?

- Geographic indications of quality (GI Act is expected to come into force in 2017).
- Native food biodiversity
  - Unique species, varieties, breeds
  - Conservation through sustainable use
- Organic, non-intensive farming systems
- Smallholder farmer
- Nutrition, as sustainable diets, for NZ'ers

- Traditional food systems
- Characterise agro-ecological zones (*terrôir*)
- Food biodiversity inventory
  - NUS
  - Taxonomically below species
- Food composition
  - Nutrients, beneficial bioactive non-nutrients
  - Toxicants, contaminants
- Sensory evaluation
- Policies, regulations

Grand Challenges

Research, policies, programmes, projects, initiatives, actions to:

- Collectively acknowledge and correct mistakes of the past;
- Provide multi-sectoral solutions to present day problems;
- Protect the future.

Source: Burlingame, B. (2014). Grand challenges in nutrition and environmental sustainability, Specialty Grand Challenge. Frontiers in Nutrition. doi: 10.3389/fnut.2014.00003 http://journal.frontiersin.org/Journal/10.3389/fnut.2014.00003/full#sthash.rOQTlIRN.Qp3MxHAf.dpuf