

## Linking Nutrition with Agriculture- Nutrition Values and Interventions from Seed to Table and Beyond

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### Outline

- Introduction and objectives of the day (10 min)
- Part 1: Nutrition values from seed to table and beyond
  - Lectures (60 min)
    - Food and nutrition
    - Nutrition values from seed to table and beyond
    - Case studies
  - Group discussion and presentation (110 min)
- **Part 2: Nutrition interventions from seed to table and beyond**
  - Lectures (60 min):
    - Public health nutrition
    - Linking nutrition with agriculture
    - Case studies
  - Group discussion and presentation (120 min)



# Importance of vegetables in Human Nutrition


- Food and nutrition security
- Dietary needs and consumption patterns
- Enhancing nutrient supplies from farm to table

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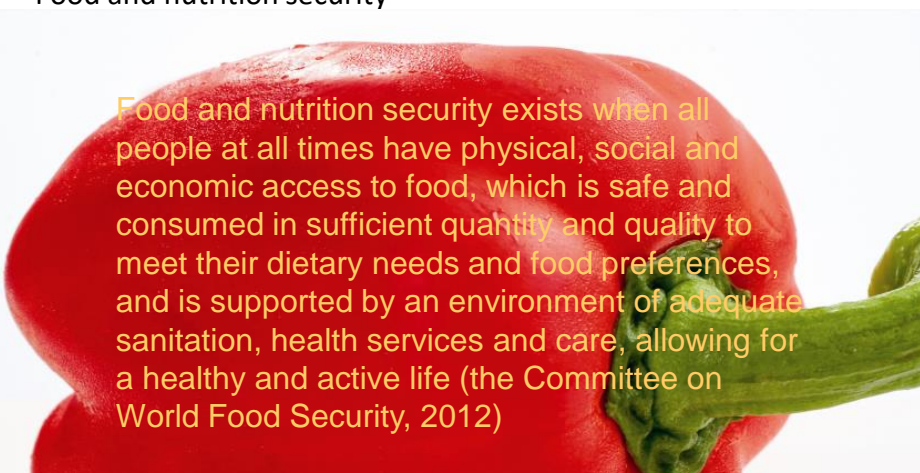
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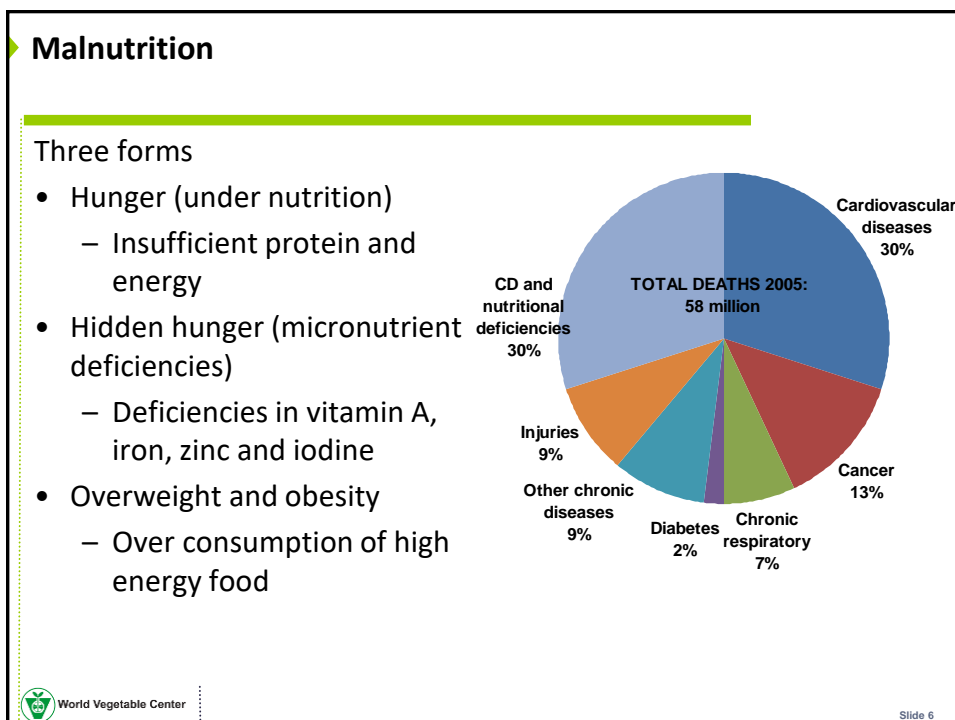
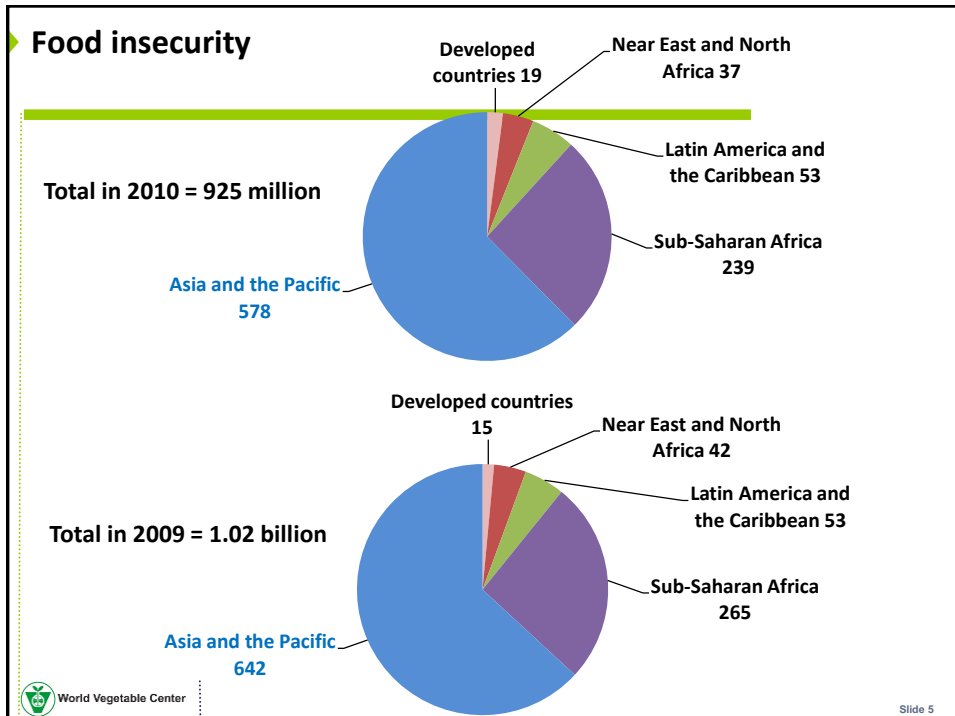
## ▶ Food and nutrition security



- Sustainable and affordable diets and healthy life styles for all
- Food and nutrition security



Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life (the Committee on World Food Security, 2012)





# Malnutrition

## Three forms

- Hunger (under nutrition)
  - Insufficient protein and energy
- Hidden hunger (micronutrient deficiencies)
  - Deficiencies in vitamin A, iron, zinc and iodine
- Overweight and obesity
  - Over consumption of high energy food



## The multiple burden of malnutrition

- A: child stunting
- B: Child micronutrient deficiencies
- C: Adult obesity
- D: No significant malnutrition problem

Multiple burden:

- AB, ABC, BC, B, C, D

Source: Food system for better nutrition, FAO 2013

**Category A: Child stunting**

**Africa:** Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Democratic Republic of the Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Somalia, Sudan, \*Togo, United Republic of Tanzania, Uganda, Zambia, Zimbabwe

**Asia:** Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Democratic People's Republic of Korea, Lao People's Democratic Republic, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Tajikistan, Turkmenistan, Timor-Leste, Viet Nam, Yemen

**Latin America and the Caribbean:** Bolivia (Plurinational State of), Haiti, Honduras

**Category B: Child micronutrient deficiencies**

**Africa:** Algeria, Morocco

**Asia:** Brunei Darussalam, China, Kyrgyzstan, Malaysia, Sri Lanka, Thailand, Uzbekistan

**Europe:** Estonia, Romania

**Latin America and the Caribbean:** Brazil, Colombia, Guyana, Paraguay, Peru

**Category C: Adult obesity**

**Africa:** Egypt, Libya, South Africa, Swaziland

**Asia:** Armenia, Azerbaijan, Iraq, Syrian Arab Republic

**Europe:** Albania

**Latin America and the Caribbean:** Belize, Ecuador, El Salvador, Guatemala

**Oceania:** Nauru, Solomon Islands, Vanuatu

**Africa:** Tunisia

**Asia:** Georgia, Iran (Islamic Rep. of), Jordan, Kazakhstan, Kuwait, Lebanon, Oman, Saudi Arabia, Turkey, United Arab Emirates

**Europe:** Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Latvia, Lithuania, The former Yugoslav Republic of Macedonia, Montenegro, Poland, Republic of Moldova, Russian Federation, Serbia, Slovakia, Ukraine

**Latin America and the Caribbean:** Argentina, Chile, Costa Rica, Cuba, Dominica, Dominican Republic, Jamaica, Mexico, Panama, Suriname, Trinidad and Tobago, Uruguay, Venezuela (Bolivian Rep. of)

**Oceania:** Samoa, Tuvalu

**Category D: No malnutrition problem of public health significance**

**Africa:** Mauritius

**Asia:** Japan, Republic of Korea, Singapore

**Europe:** Austria, Belgium, Denmark, Finland, France, Greece, Italy, Netherlands, Norway, Sweden, Switzerland

**Malnutrition category:**

- Stunting and micronutrient deficiencies (AB)
- Micronutrient deficiencies (B)
- Micronutrient deficiencies and obesity (BC)
- Stunting, micronutrient deficiencies and obesity (ABC)
- Obesity (C)
- No malnutrition problem (D)

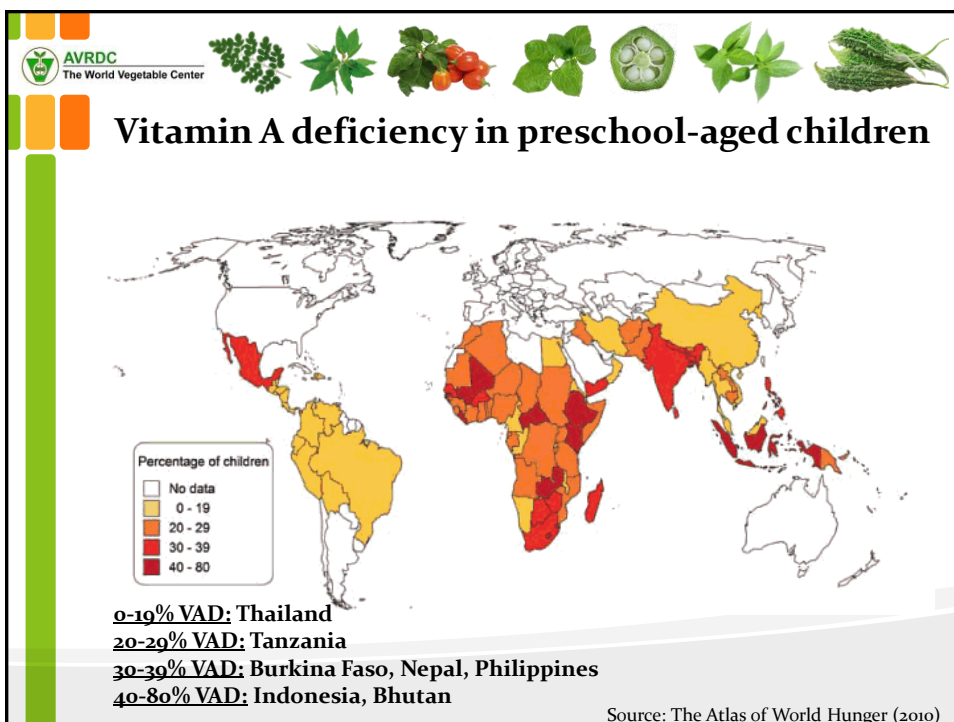
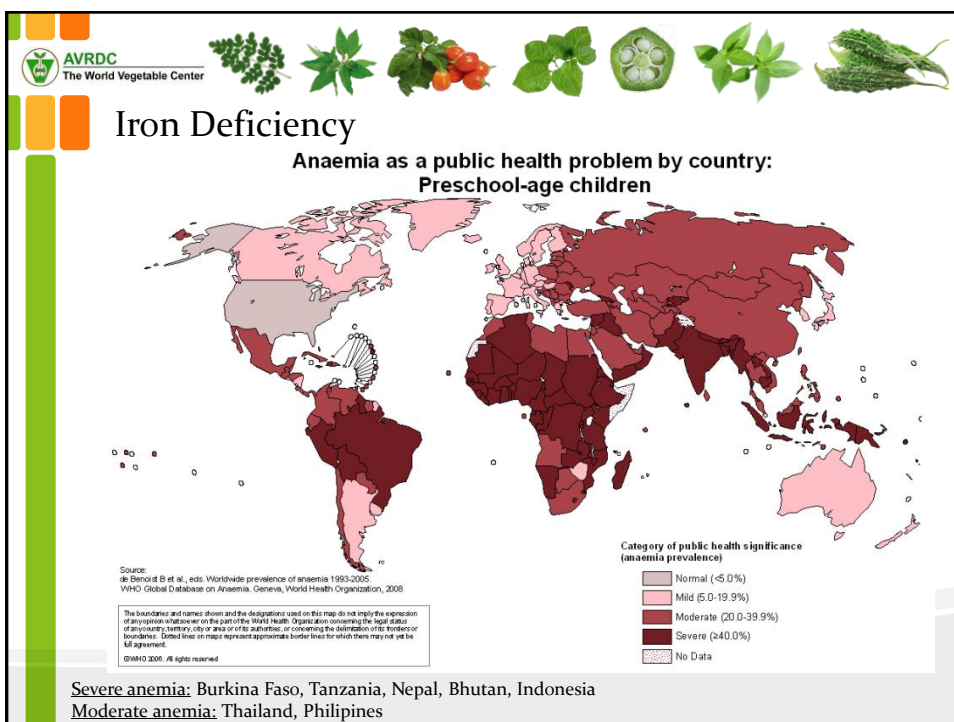
## Undernutrition in children

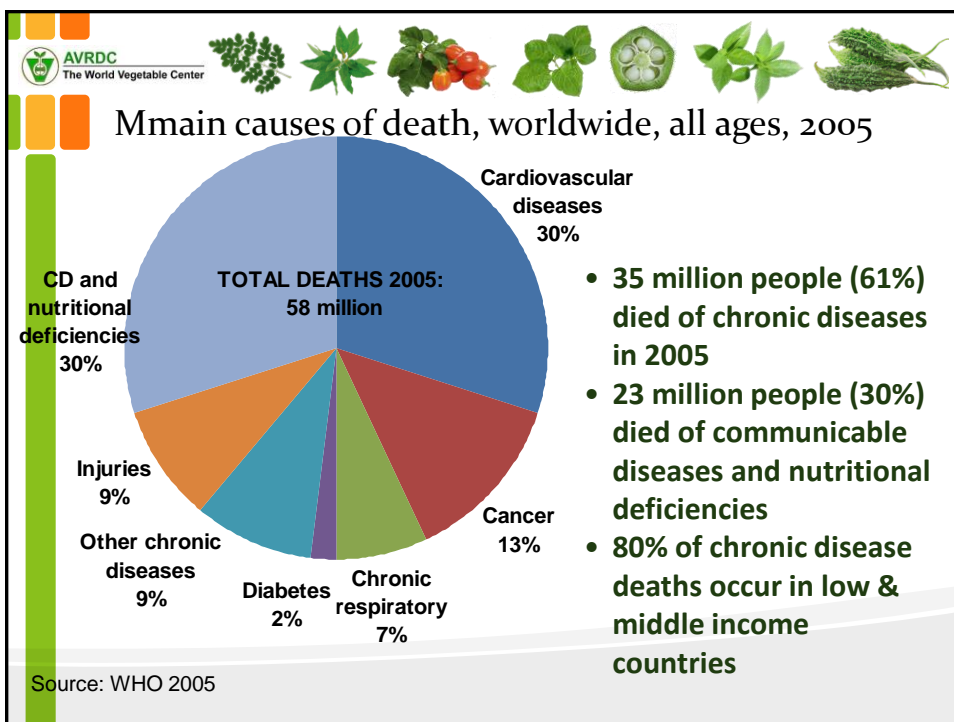
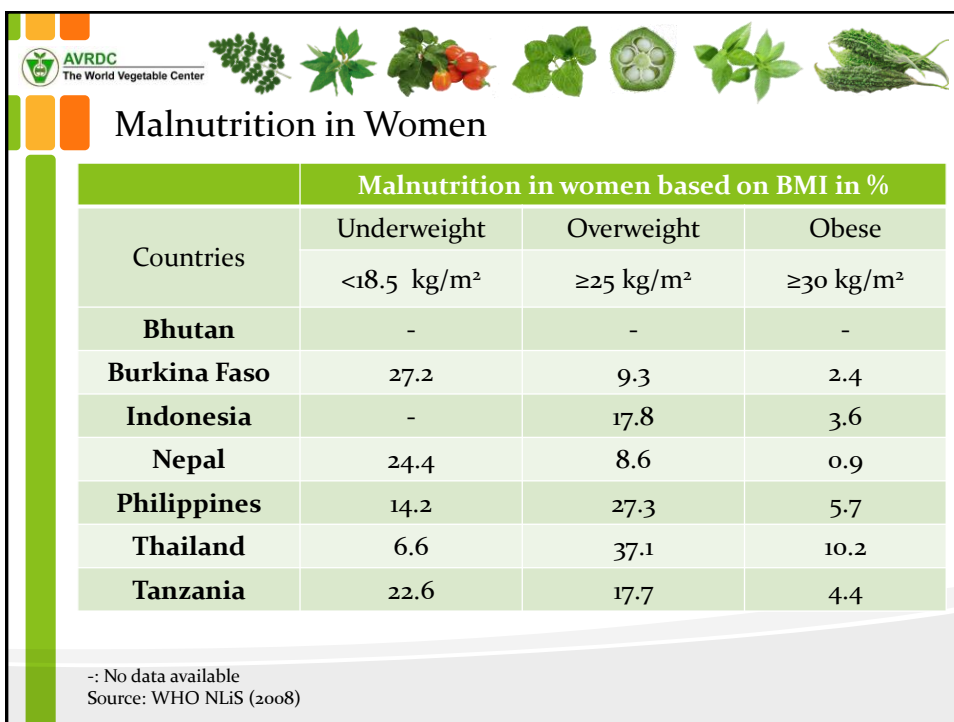
- Stunting: low height for age
  - Child’s height is shorter than an average child his or her age due to malnutrition
- Underweight: low weight for age
  - Child’s weight is less than an average child his or her age due to malnutrition
- Wasting: low weight for height
  - child’s fat and muscles are wasting away, making them thin due to being hungry or starving recently

## Malnutrition in Children

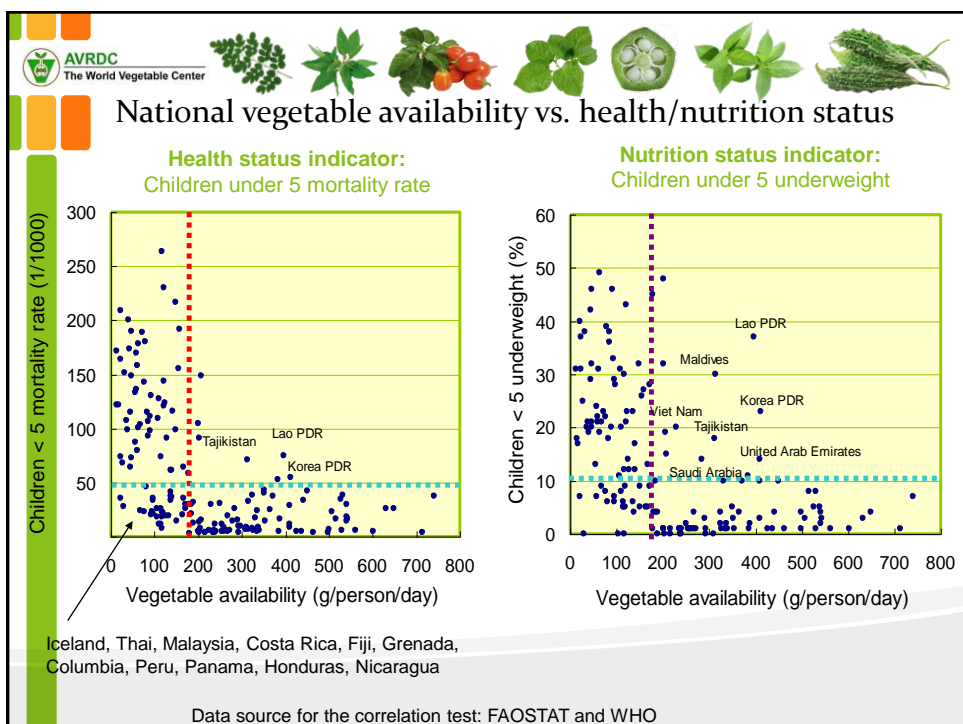
Countries	Children under five (2003-2008) in %				% Low birth weight <2500 g
	Underweight		Wasting	Stunting	
	Moderate & Severe	Severe	Moderate & Severe	Moderate & Severe	
Bhutan	14	3	3	48	9.9
Burkina Faso	32	-	19	36	16.2
Indonesia	18	5	14	37	8.8
Nepal	39	11	13	49	21.2
Philippines	21	5	6	34	21.2
Thailand	7	1	5	16	6.6
Tanzania	17	4	4	44	9.5

-: no data available  
 Source: UNICEF State of the World’s Children (2012); WHO NLiS (2008)









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**The strength of evidence for obesity, type 2 diabetes, cardiovascular disease (CDV), and cancer**

	Obesity	Type 2 diabetes	CVD	Cancer
High intake of energy-dense foods	C↑			
High intake of NSP (dietary fibre)	C↓	P↓	P↓	
Wholegrain cereals			P↓	
<b>Fruits and vegetables</b>	C↓	P↓	C↓	P↓
Whole fresh fruits				
Sugars-sweetened soft drinks and fruit juices	P↑			
Overweight and obesity		C↑	C↑	C↑
<b>Physical activity, regular</b>	C↓	C↓	C↓	C↓
Heavy marketing of energy-dense foods, and fast-food outlets	P↑			

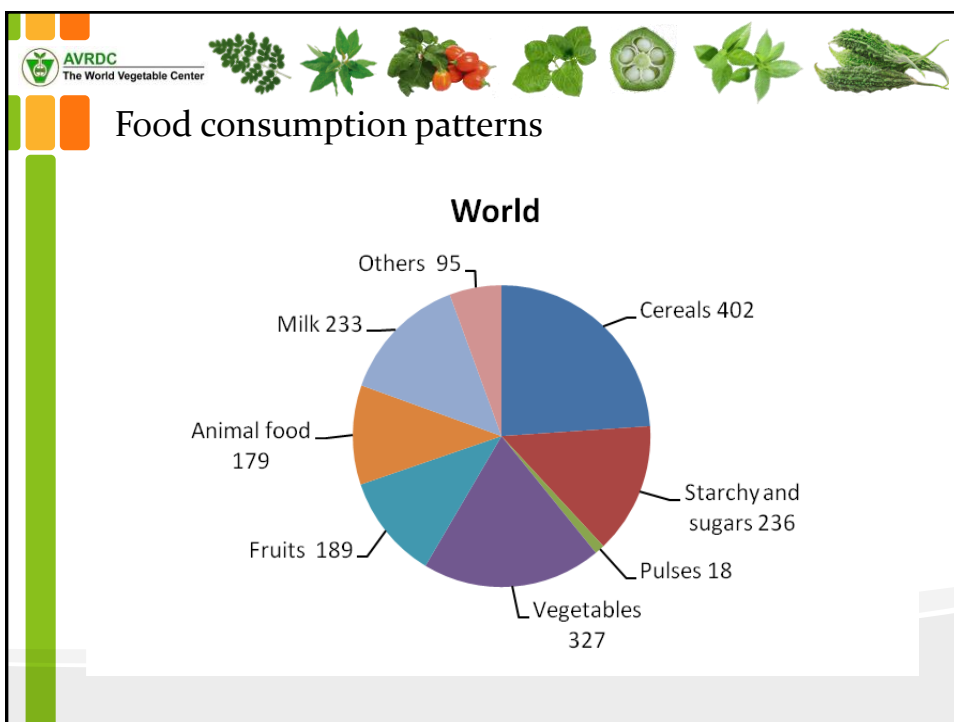
C↑: Convincing increasing risk; C↓: convincing decreasing risk; P↑: Probable increasing risk; P↓: Probable decreasing risk; P-NR: Probable, no relationship;

WHO Technical Report Series 916, 2003







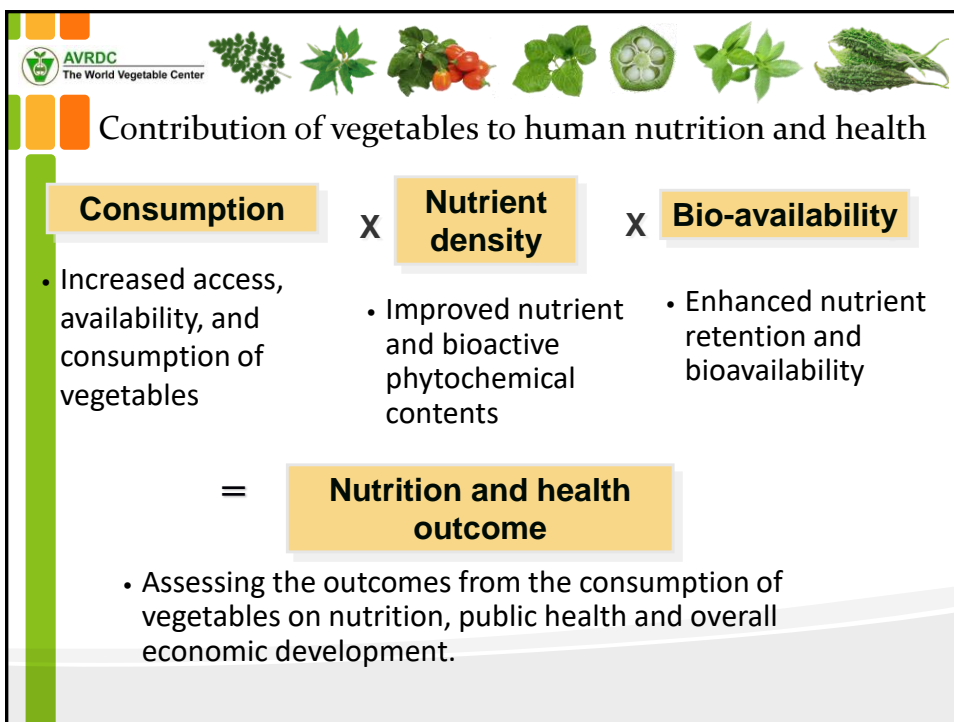
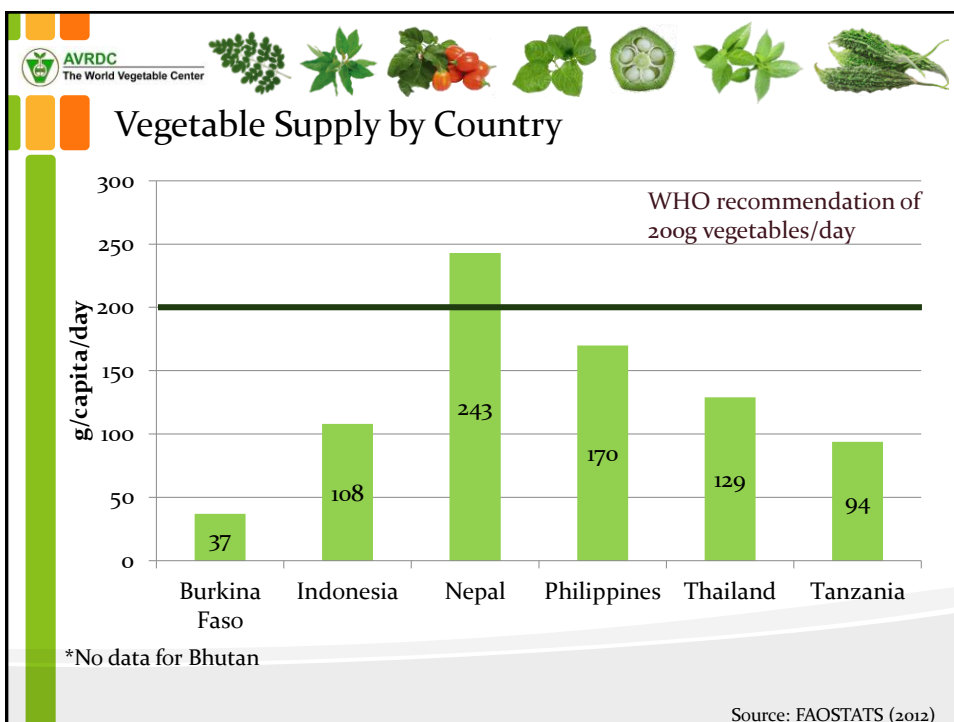


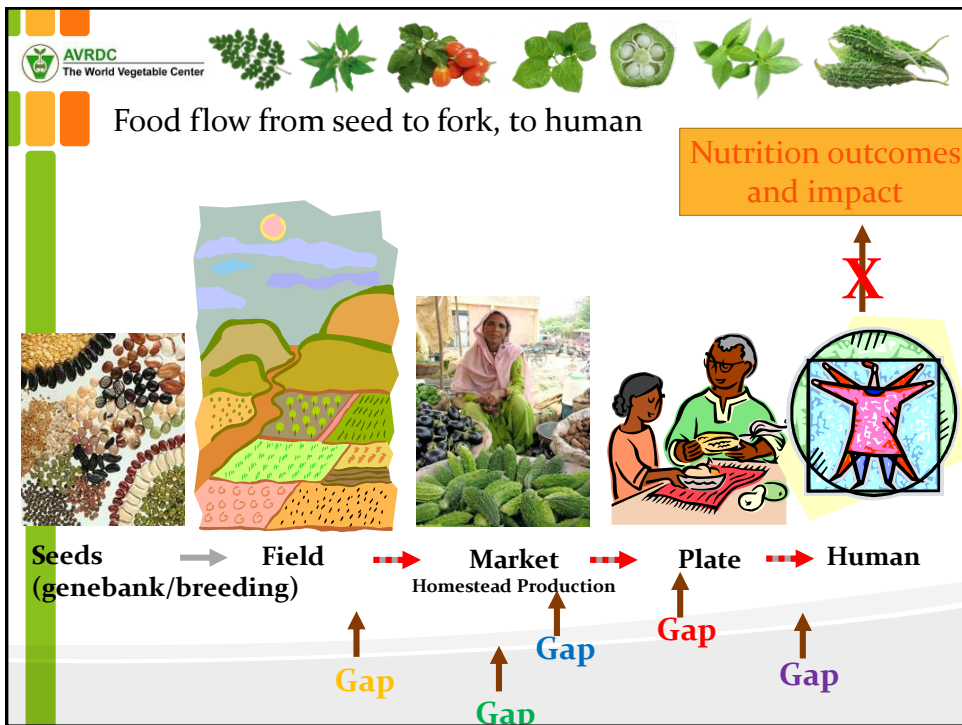
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## Comparison Among Countries

	Burkina Faso	Indonesia	Nepal	Philippines	Thailand	Tanzania
Cereals	627	512	473	422	421	287
Starchy Roots	27	159	189	84	57	443
Animal Foods	109	151	161	253	234	155
Pulses and Nuts	35	5	25	9	9	55
<b>Vegetables</b>	<b>37</b>	<b>108</b>	<b>243</b>	<b>170</b>	<b>129</b>	<b>94</b>
Oilcrops	52	103	23	27	63	50
Fruits	16	186	109	334	293	211
Others	14	48	113	77	114	27
<b>Total</b>	<b>917</b>	<b>1272</b>	<b>1336</b>	<b>1376</b>	<b>1320</b>	<b>1322</b>

Source: FAOSTATS (2012)





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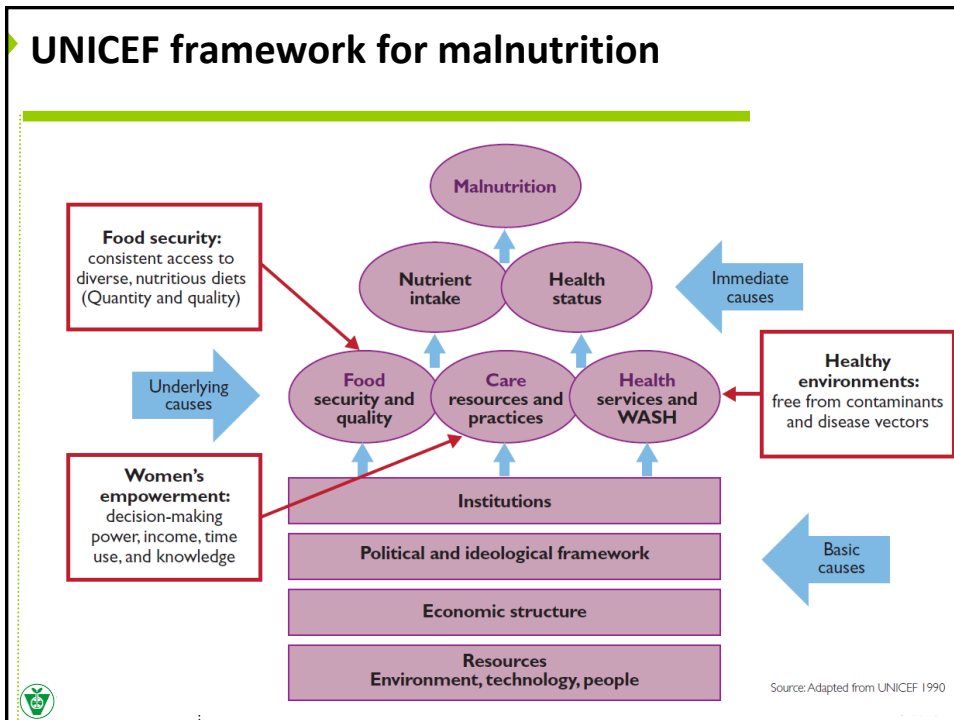
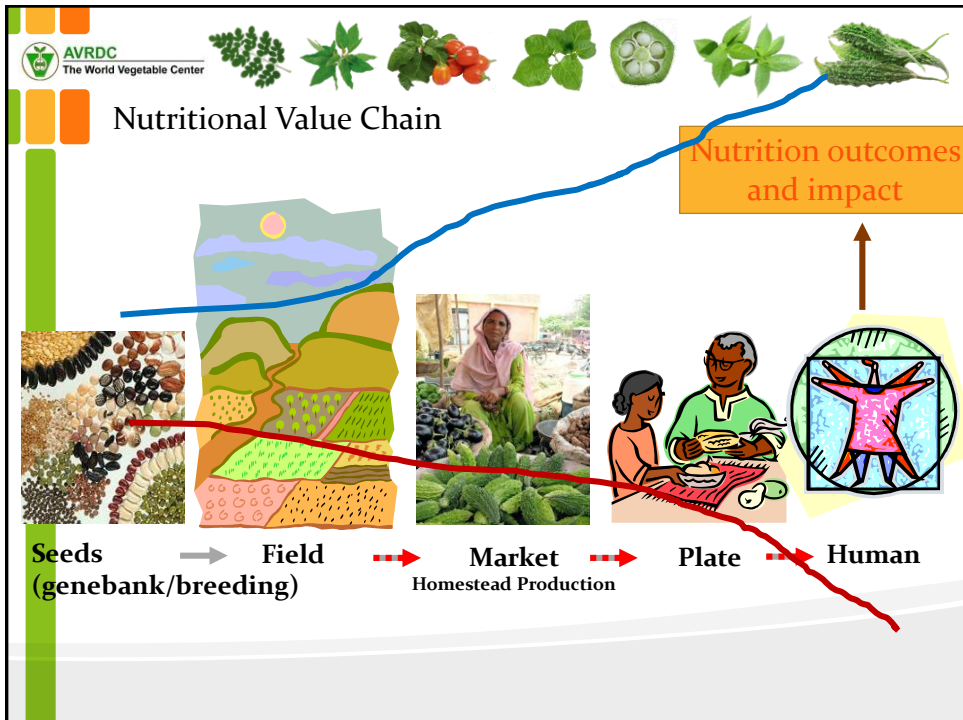
Nutritional value chain

What are the types and amounts of food and nutrients

- Produced by farmers
- Made available for dietary requirements
- Distributed
- Accessible and affordable by consumers
- Selected, purchased, used by consumers
- Consumed

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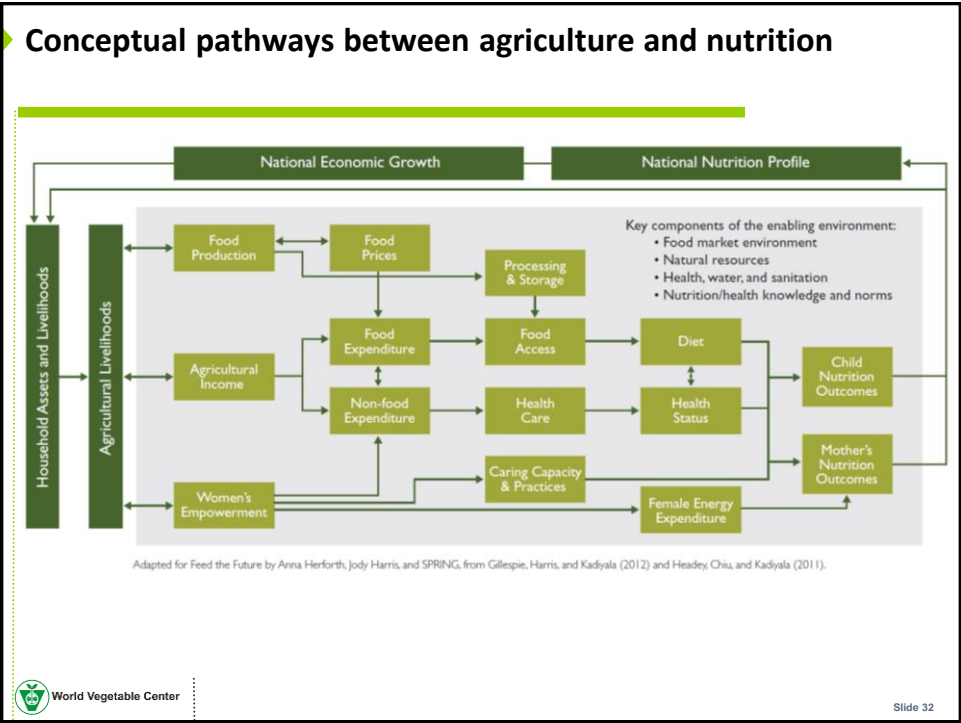
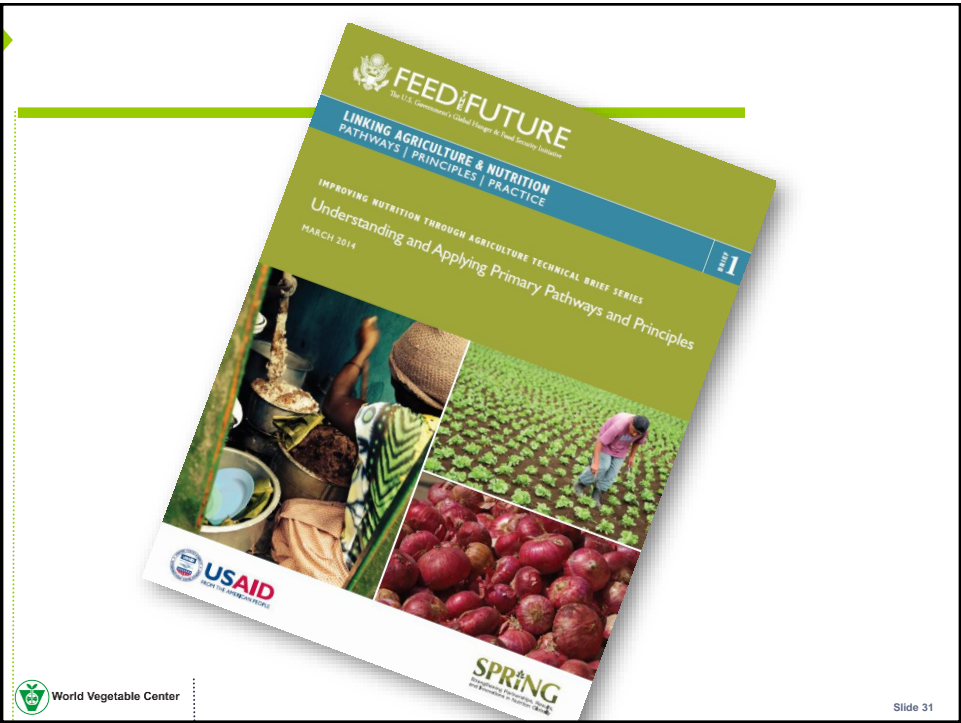
## ▶ Linking agriculture and nutrition

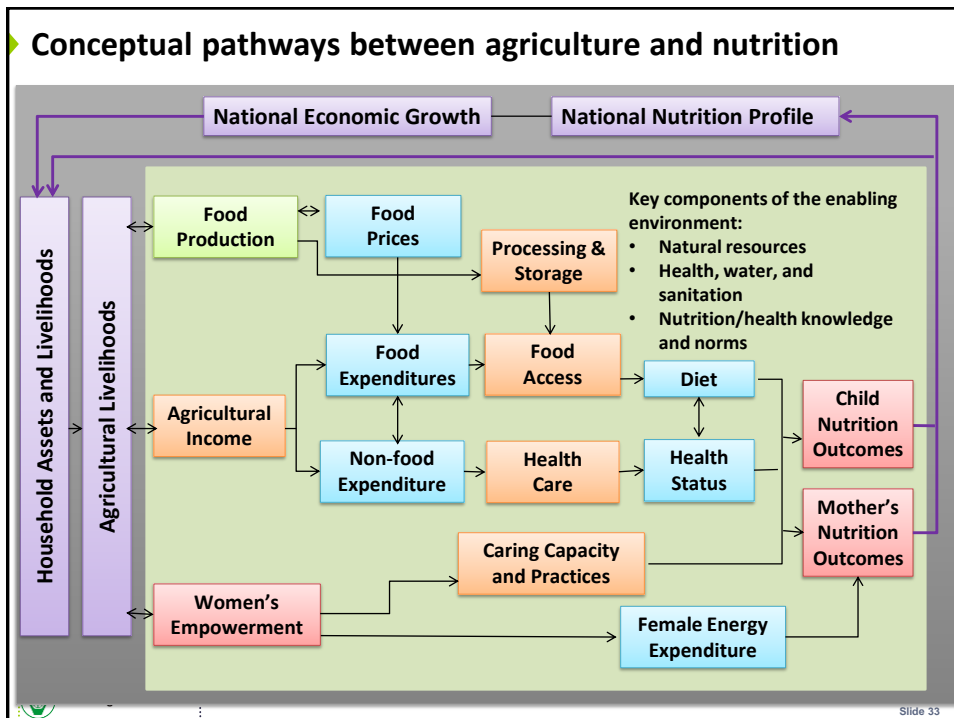
- Agriculture and food system affect nutrition
- Needs for multisectoral approaches
- The strong evidence base that link the use of maternal, infant, and young child feeding and care practices to reductions in chronic malnutrition
- Integrating nutrition and social behavior change (SBC) into agriculture development activities

## ▶ Linking agriculture and nutrition

- The food and agriculture sector is essential to human nutrition, but food and agriculture interventions do not always contribute to positive nutritional outcomes.
- Specific attention is required to make agriculture “nutrition-sensitive”.
- What does this mean in practice?







- ### Pathway through food production
- **Household food production** for consumption
  - **Growing nutritious and variety** of food (crops and livestock)
  - **Nutrition knowledge and SBC** (social and behavior change): essential to informing the range of decisions that farmers make about what they grow to consume, what they grow to sell, and what they decide to purchase with their income.
  - **Processing and storage** can affect the shelf life, safety, and nutrient content of foods in positive or negative ways for nutrition and health.

## ▶ Pathway through agriculture income

- The effect of income on nutrition is not direct or easily predictable; it is always modified by what is available, affordable, and convenient to purchase; who decides what is purchased; and the myriad factors that drive that decision
- Establishing **successful small farming businesses** that ensure livelihoods: Keys to reducing poverty in rural areas
- Ensure that **nutritious, diverse foods are available and affordable in local markets**
- **Market and transportation systems** must enable year-round and/or seasonal supplies based on **consumer preferences** and **purchasing power**.
- **Nutrition SBC**: Household investments in health and nutritious food

## ▶ Pathway through women's empowerment

- Women's decision-making affects what is produced on the farm
- Women's control of income and assets can affect productivity based on their spending decisions and on the social networks and cultural norms that influence those decisions
- Training female and male farmers in farm management and business skills can optimize the income earned with the available time, labor, assets, and capital

## ▶ Pathway through women's empowerment

- Activities that influence the amount of time or labor women spend on agriculture-related tasks can affect their own health and energy expenditure, and in turn their capacity to feed and care for infants, young children, and themselves.
- A vital step in improving nutrition in a household with an agricultural livelihood requires that farming business decisions give attention to how women are involved in agriculture activities.

## ▶ The enabling environments

- Food market environment
- Natural resources environment
- Health, water and sanitation environment
- Nutrition/ health knowledge and norms

► **Nutrition-sensitive agriculture -  
Programing principles**

1. Incorporate explicit nutrition objectives and indicators into design.
2. Assess the local context.
3. Target the vulnerable and improve equity.
4. Collaborate and coordinate with other sectors.
5. Maintain or improve the natural resource base, particularly water resources.


► **Nutrition-sensitive agriculture -  
Programing principles**

6. Empower women.
7. Facilitate production diversification, and increase production of nutrient-dense crops and livestock.
8. Improve processing, storage, and preservation of food.
9. Expand market access for vulnerable groups, and expand markets for nutritious foods.
10. Incorporate nutrition promotion and education that builds on local knowledge.

## ► Making agriculture work for nutrition – Synthesis of guiding principles (FAO)

### Planning for nutrition

1. **Incorporate explicit nutrition objectives** in agricultural policy and programme design.
2. **Assess the context** and causes of malnutrition at the local level, to maximize effectiveness and reduce negative side effects.
3. **Do no harm.** Identify potential harms, develop a mitigation plan, and set in place a well-functioning monitoring system.
4. **Measure nutritional impact through programme monitoring and evaluation.**
5. Maximize opportunities through **multisectoral coordination.**
6. **Maximize impact of household income** on nutrition, such as through increasing women's discretionary income.
7. **Increase equitable access to productive resources** (e.g. land, water, credit).
8. **Target** the most vulnerable groups, including smallholder farmers, women, and poor/food insecure households


Source: FAO,  
 [www.fao.org/fileadmin/user\\_upload/wa\\_workshop/docs/Synthesis\\_of\\_Ag-Nutr\\_Guidance\\_FAO\\_IssuePaper\\_Draft.pdf](http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/Synthesis_of_Ag-Nutr_Guidance_FAO_IssuePaper_Draft.pdf)  
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## ► Making agriculture work for nutrition – Synthesis of guiding principles (FAO)

### Taking Actions: All approaches should:

9. **Empower women**, the primary caretakers in households, through: income; access to extension services and information; avoiding harm to their ability to care for children; labor and time-saving technologies; and support for rights to land, education, and employment.
10. **Incorporate nutrition education** to improve consumption and nutrition effects of interventions. Employ agricultural extension agents to communicate on nutrition as feasible.
11. **Manage natural resources** for improved productivity, resilience to shocks, adaptation to climate change, increased equitable access to resources through soil, water, and biodiversity conservation.

Source: FAO,  
 [www.fao.org/fileadmin/user\\_upload/wa\\_workshop/docs/Synthesis\\_of\\_Ag-Nutr\\_Guidance\\_FAO\\_IssuePaper\\_Draft.pdf](http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/Synthesis_of_Ag-Nutr_Guidance_FAO_IssuePaper_Draft.pdf)  
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## ► Making agriculture work for nutrition – Synthesis of guiding principles (FAO)

These can be combined with approaches to:

12. **Diversify production and livelihoods** for improved food access and dietary diversification, natural resource management, risk reduction, and improved income.
13. **Increase production of nutrient-dense foods**, particularly locally-adapted varieties rich in micronutrients and protein, chosen based on local nutrition issues and available solutions.
  - **Horticultural crops** are highly recommended, to improve year-round micronutrient intakes and healthy diet patterns, and to increase income (especially women's).
  - Produce **animal-source foods on a small scale**, including fish and livestock, to improve intakes of micronutrients, protein, and fat; keep production small-scale to avoid harms to the natural resource base.
  - Harness the potential of nutritious **underutilized foods** (e.g. indigenous crops), which often have high nutrient content, low input requirements, and can generate income.
  - Increase **legume** production for their nutritional value and their attribute of nitrogen fixation, which can improve soil fertility and yields and reduce inputs.
  - Invest in **biofortification** as a complement to other approaches.
  - Staple crop production may be necessary but insufficient for addressing undernutrition.
  - Cash crops are unlikely to improve nutrition on their own.



Source: FAO  
World Vegetable Center

[www.fao.org/fileadmin/user\\_upload/wa\\_workshop/docs/Synthesis\\_of\\_Ag-Nutr\\_Guidance\\_FAO\\_IssuePaper\\_Draft.pdf](http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/Synthesis_of_Ag-Nutr_Guidance_FAO_IssuePaper_Draft.pdf)

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## ► Making agriculture work for nutrition – Synthesis of guiding principles (FAO)

These can be combined with approaches to:

14. **Reduce post-harvest losses and improve processing**
15. **Increase market access and opportunities**, especially for nutritious foods that smallholders may have a comparative advantage in producing
16. **Reduce seasonality of food insecurity through diversification throughout the year, improved storage and preservation, and other approaches**



Source: FAO,

[www.fao.org/fileadmin/user\\_upload/wa\\_workshop/docs/Synthesis\\_of\\_Ag-Nutr\\_Guidance\\_FAO\\_IssuePaper\\_Draft.pdf](http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/Synthesis_of_Ag-Nutr_Guidance_FAO_IssuePaper_Draft.pdf)

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## AVRDC Approaches to Improved Nutrition Achievements, challenges and perspectives

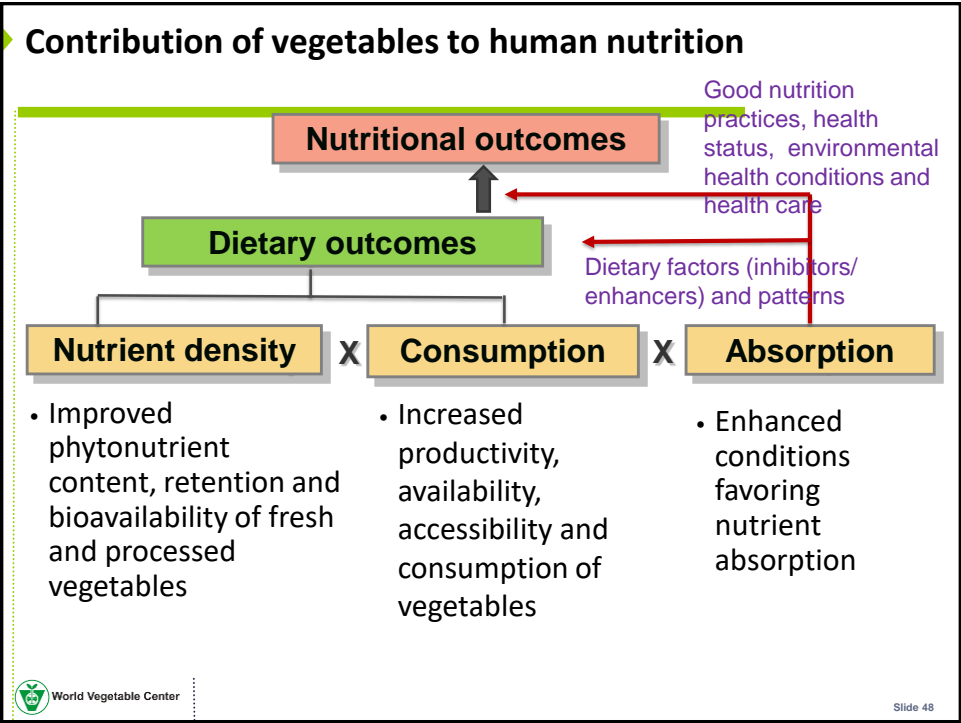
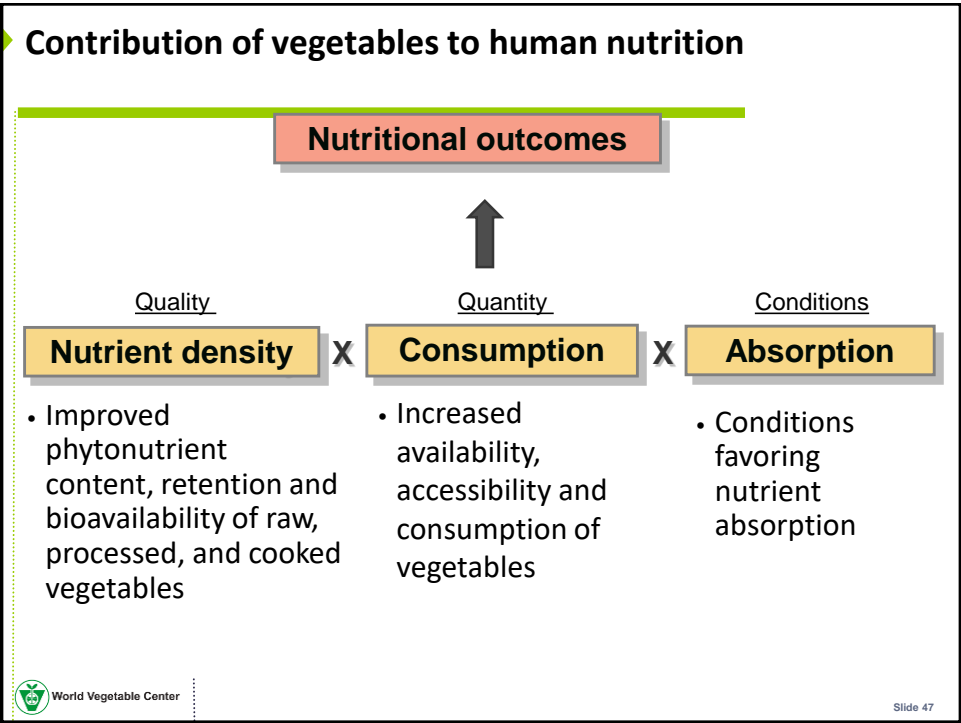
**Ray-Yu Yang**

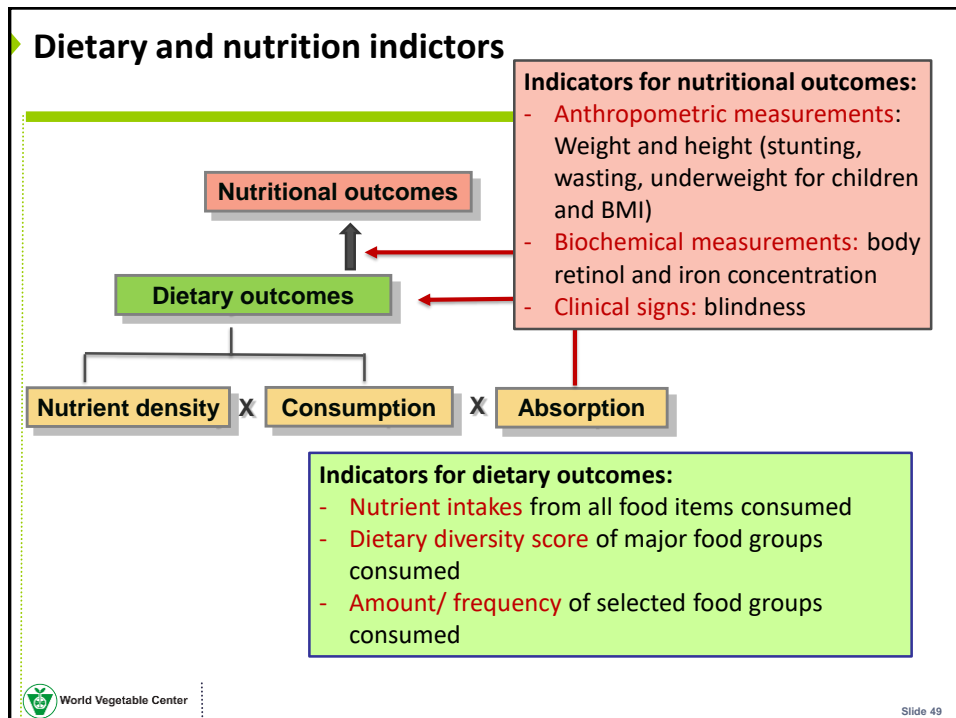
AVRDC – The World Vegetable Center, Taiwan



## AVRDC Approaches to Improved Nutrition Achievements, challenges and perspectives





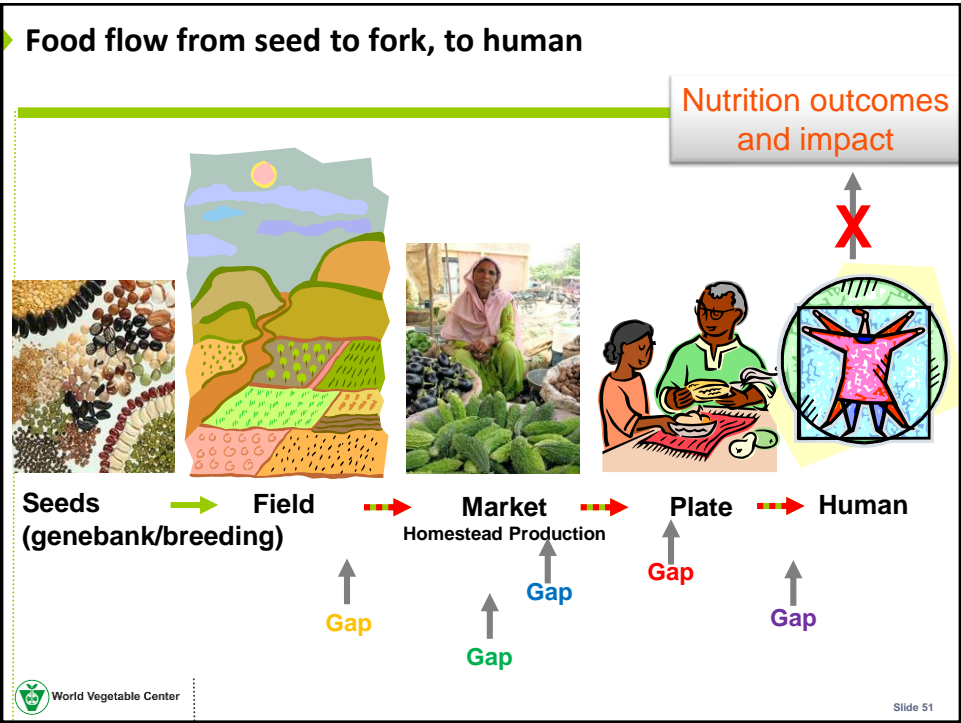


### Dietary diversity scores

Household dietary diversity score (0-12)		Women dietary diversity score (0-9)	
Numbers	Food groups	Number s	Food groups
1	Cereals	1	Starchy staples
2	White tubers and roots	2	Dark green leafy vegetables
3	<b>Vegetables</b> (1.vitamin A rich veg and tubers; 2. dark green leafy; 3. other veg)	3	Other <b>vitamin A rich</b> fruits and <b>vegetables</b>
4	Fruits (1. vit A rich; 2. others)	4	<b>Other</b> fruit and <b>vegetables</b>
5	Meat (1. organ; 2. flesh)	5	Organ meat
6	Eggs	6	Meat and fish
7	Fish and other seafood	7	Eggs
8	Legumes, nuts and seeds	8	Legumes, nuts and seeds
9	Milk and milk products	9	Milk and milk products
10	Oils and fats		
11	Sweets		
12	Spices, condiments and beverages		

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Set targets toward dietary and nutritional outcomes

Enabling factors: Environment, Income, Nutrition

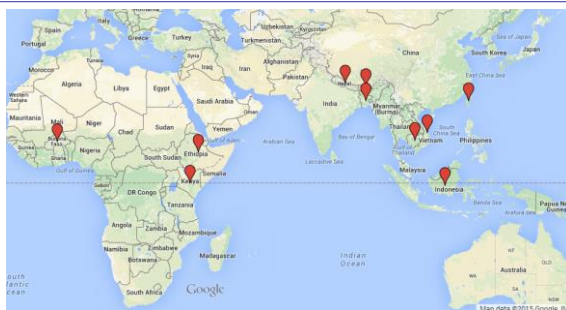
	Germplasm	Breeding	Production	Consumption		
				Postharvest /processing	Market	Nutrition
Nutrition targets	Nutrient content	Nutrient yield	Nutrient supply	Nutrient retention	Cost of diet ?	Dietary intakes
Data						
Content	X	X	X	X		
Yield		X	X			
Area			X			
Loss (?)				X		
Market reach/price (?)					X	
Consumption						X

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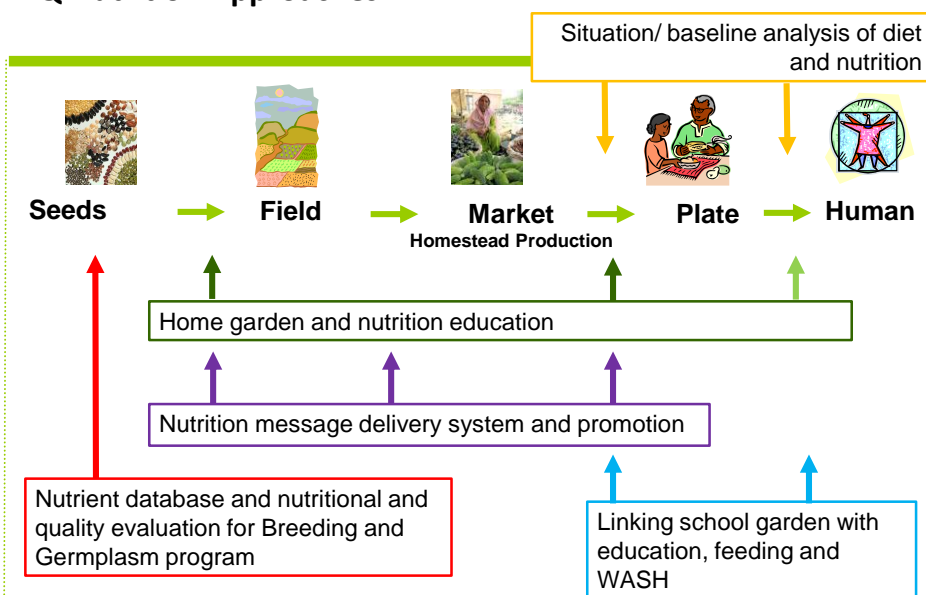
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## ▶ AVRDC HQ Nutrition- Involved Projects

Project	Target country/ study site
1. USAID-Horticulture project	Bangladesh
2. SDC-Vegetables Go to Schools	Nepal, Bhutan, Indonesia, Burkina Faso
3. CRP-Humidtropics: Crosscutting nutrition	Vietnam, Kenya
4. SDC-CHAIN Project	Cambodia
5. A4NH Seed Grant	Bangladesh
6. Others: postharvest, CoA, ..	Taiwan....



## ▶ HQ Nutrition Approaches




HQ Nutrition Activities			
Project	Target countries	Intervention/ study	Expected diet/nutrition outcomes
USAID-Horticulture Project (2011-2015)	Bangladesh (S)	<ul style="list-style-type: none"> <li>Home garden (HG+N)</li> </ul>	<ul style="list-style-type: none"> <li>Increased access to and consumption of vegetables</li> </ul>
		<ul style="list-style-type: none"> <li>Promotion through school garden</li> </ul>	<ul style="list-style-type: none"> <li>Increased awareness of vegetables and healthy diets</li> </ul>
		<ul style="list-style-type: none"> <li>Nutrition education through Community Nutrition Scholars</li> </ul>	<ul style="list-style-type: none"> <li>Improved nutrition KAP (knowledge, attitude and practice) and maternal, infant and young child nutrition</li> </ul>
		<ul style="list-style-type: none"> <li>Training in food processing, product registration and linking processors to markets</li> </ul>	<ul style="list-style-type: none"> <li>Increased vegetable utilization and preservation</li> </ul>
SDC-Vegetables Go to	Indonesia, Nepal, Bhutan	<ul style="list-style-type: none"> <li>Linking school gardens with education promotion</li> </ul>	<ul style="list-style-type: none"> <li>Increased nutrition KAP related to vegetable and healthy diets</li> </ul>

HQ Nutrition Activities (cont)			
Project	Target countries	Interventions/ study	Expected diet/nutrition outcomes
CRP-Humidtropics: Crosscutting-Nutrition (2014-2016)	Vietnam (NW)	<ul style="list-style-type: none"> <li>Food and nutrition survey</li> <li>Home gardens</li> <li>Nutrition impact pathways</li> <li>Nutrition innovation platform</li> </ul>	<ul style="list-style-type: none"> <li>Increased production, consumption of vegetables</li> <li>Enhanced nutrition KAP</li> <li>Improved diets</li> </ul>
	Kenya (W)	<ul style="list-style-type: none"> <li>Nutrition impact pathway</li> <li>Nutrition innovation platform</li> </ul>	<ul style="list-style-type: none"> <li>Improved diets (quantity and quality)</li> </ul>
SDC- CHAIN Project (2015-2018)	Cambodia (N)	<ul style="list-style-type: none"> <li>Home garden and nutrition (HG+N) joint training materials</li> <li>Capacity building of government trainers in HG+N</li> </ul>	<ul style="list-style-type: none"> <li>Enhanced training delivery mechanisms and sustainable HG seed</li> <li>Enhanced nutrition practices and utilization of vegetables</li> </ul>


► **HQ Nutrition Activities (cont)**

Project	Target countries	Interventions/ study	Expected diet/nutrition outcomes
A4NH Seed Grant (2014-2015)	Bangladesh (S)	<ul style="list-style-type: none"> <li>Nutrition messages integrated with agricultural extension through seed company</li> </ul>	<ul style="list-style-type: none"> <li>Enhanced nutrition message delivery system</li> <li>Increased awareness of healthy diets and nutrition among farmers</li> </ul>
Proposal: GIZ-small grant Nutrition Sensitive Promotion	Kenya (W)	<ul style="list-style-type: none"> <li>Test for effective nutrition messages</li> </ul>	<ul style="list-style-type: none"> <li>Enhanced nutrition message delivery system</li> </ul>

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► **HQ Nutrition Activities (cont)**

Project	Study site	Interventions/ study	Expected diet/nutrition outcomes
COA and others	Taiwan	<ul style="list-style-type: none"> <li>Nutrient database</li> <li>Interactive and user-friendly web page design</li> <li>Nutritional evaluation of cowpea leaves and pods, Malabar spinach, tomato, chili, amaranth seeds, moringa, .....</li> </ul>	Nutrition information <ul style="list-style-type: none"> <li>Promotion messages</li> <li>Nutrient contents</li> </ul>
USAID-postharvest		<ul style="list-style-type: none"> <li>Lectures in Cambodia and Thailand</li> <li>Support training of food processing in Bangladesh in collaboration with USAID-Horticulture Project</li> </ul>	


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## Achievements 2015

**USAID-Horticulture Project:** Shahabuddin, Peter, Razu, Ray-Yu et al. and partners

Number of beneficiaries in Bangladesh who received nutrition related interventions

	Y1		Y2		Y3		Y4 (2015)		Total	
	M	F	M	F	M	F	M	F	M	F
Home Gardeners		301	-	3595	-	6000	-	3000	-	12,896
School children	-	-	2932	2780	4,090	3,879	3,874	4,149	10,896	10,808
Food Processors	-	-	-	-	-	-	67	83	67	83
Total									10,963 (32%)	23,787 (68%)
Grand Total									34,750	



## Achievements 2015

**SDC-Vegetables Go to School:** Ray-Yu, Pepijn, Maureen, Greg, Caroline, Jean-Baptiste

- **Project outcome assessment**
- **Technical support** to country teams: provide trainings, reference materials and consultation to country teams to implement the following programs:
  - **School gardens**
  - **Education**
  - **Promotion**
  - **Linking with other feeding and WASH initiatives**
- **Rapid assessment** of project operations at schools



## Achievements 2015

### SDC-Vegetables Go to School: Ray-Yu, Pepijn, Maureen, Greg, Caroline, Jean-Baptiste

- Rapid assessments of project interventions at schools and operations in four countries were accomplished

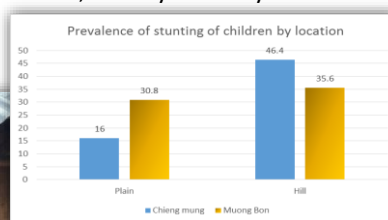
Country	Interventions at schools			
	Garden	Education	Promotion	Linking feeding and WASH
Bhutan	<ul style="list-style-type: none"> <li>Linked with national agriculture, nutrition and health programs</li> </ul>	<ul style="list-style-type: none"> <li>Weekly lesson</li> <li>Revising curricula</li> </ul>	<ul style="list-style-type: none"> <li>Active</li> </ul>	<ul style="list-style-type: none"> <li>Vegetables for school meals</li> <li>Moringa and bean sprout supplements</li> </ul>
Nepal	<ul style="list-style-type: none"> <li>Actively linked with home garden</li> </ul>	<ul style="list-style-type: none"> <li>Weekly lesson</li> </ul>	<ul style="list-style-type: none"> <li>Less active</li> </ul>	<ul style="list-style-type: none"> <li>No school feeding/ health programs</li> <li>Suggested to link with home garden and community nutrition</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>Linked with women's groups and vegetable nurseries</li> </ul>	<ul style="list-style-type: none"> <li>Weekly lesson</li> </ul>	<ul style="list-style-type: none"> <li>Less active</li> </ul>	<ul style="list-style-type: none"> <li>Weekly feeding program to demonstrate healthy diet planned</li> </ul>
Burkina Faso				

## Achievements 2015

### Humidtropics-Crosscutting nutrition: Ray-Yu, Ha, Pepijn, Victor et al.

Food and nutrition assessments in target areas of Vietnam and Ethiopia

- Nutrition KAP (knowledge, attitude and practice)
- Consumption: food frequency, 24 hour recall, dietary diversity score
- Food security related parameters

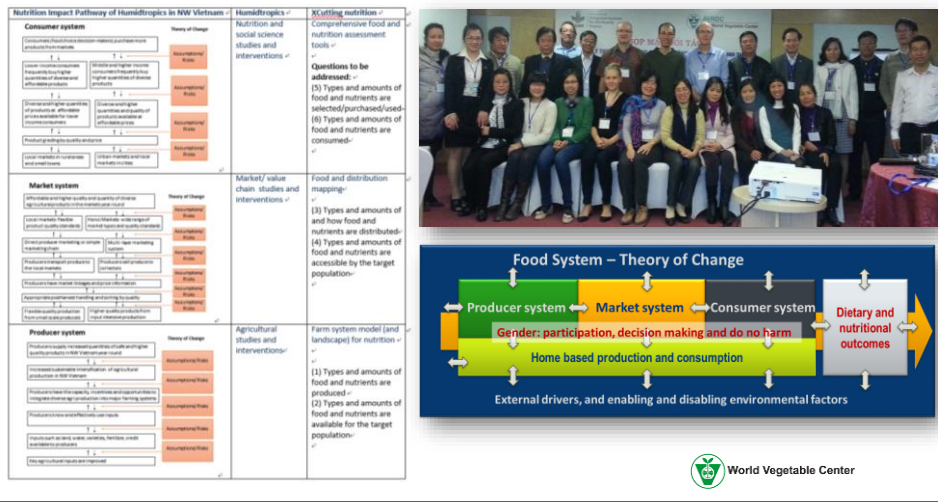


Foods	Chieng Mung (n=100)		Muong Bon (n=100)	
	% HH	N of m <sup>2</sup>	% HH	N of m <sup>2</sup>
vegetable garden	81	243.6	87	410.3
fish pond	39	612.0	59	387.3
agriculture land	84	2609.3	90	24053.3
non-agri-land	73	9671.3	59	7342.9

Achievements 2015

**Humidtropics-Crosscutting nutrition:** Ray-Yu, Ha, Peter, Greg, et al

- Potential impact pathways from production to market and consumption systems in NW Vietnam mapped in Hanoi Stakeholder Meeting



Achievements 2015

**SDC-CHAIN Project:** Ray-Yu, Peter, Sereyrih, Srin, et al.

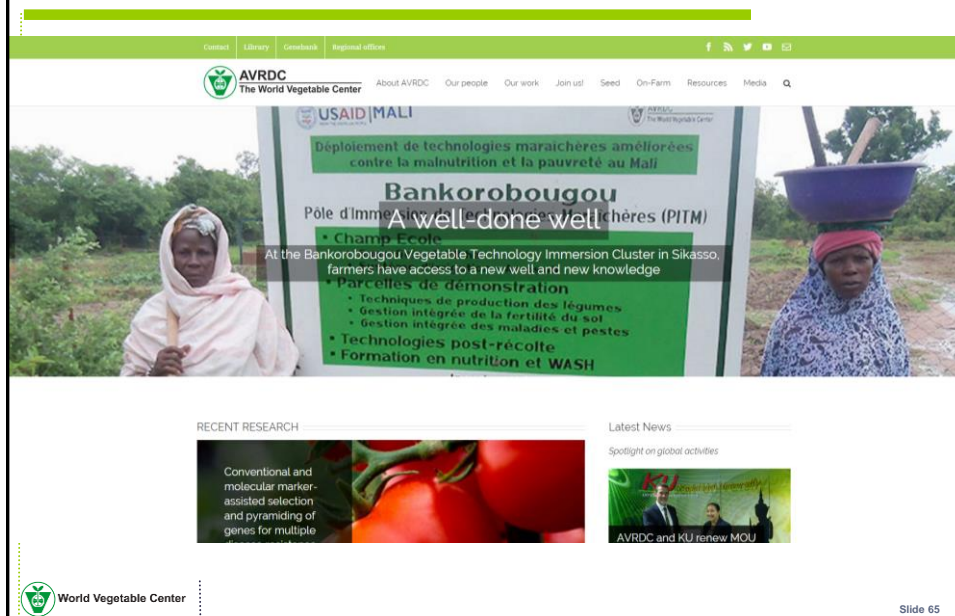
- Scoping study – home garden, nutrition and seeds in north Cambodia
- Training program development in progress
  - Master trainers from GDA (General Directorate of Agriculture) and MoH-NNP (Minister of Health-National Nutrition Program)
  - Trainers: agriculture extension staff from PDA (Provincial Department of Agriculture) and food/nutrition extension staff from PDOWA (Provincial Department of Women's Affairs)
- Training material development in progress
  - Collect existing materials in English and Khmer
  - Identify key topics and training schedules
  - Develop customized materials



- Problems:
- Too much water
  - Too little water

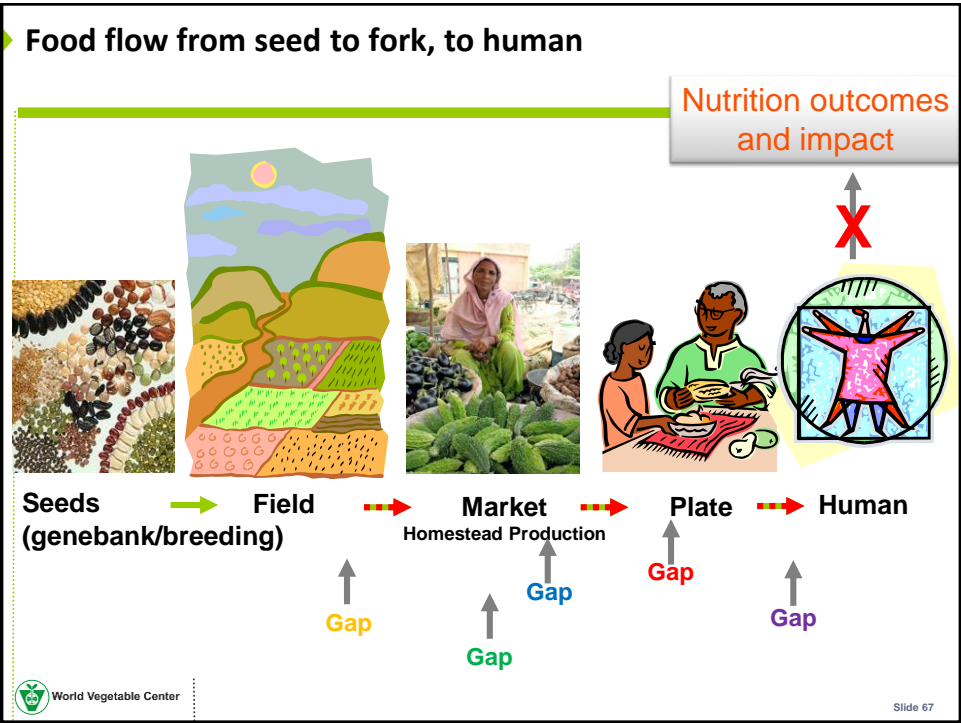


## ▶ AVRDC - The World Vegetable Center



## ▶ Part 1: Nutrition values from seed to table and beyond

- Essential nutrients and phytochemicals
- Daily requirement and health benefits
- Nutrient database
- Nutrient values along the food flow
  - Nutrient content
  - Nutrient supply
  - Nutrient cost
  - Nutrient retention
  - Nutrient bioavailability
  - Nutrient intake
  - Nutrient requirement



Nutritional values from seed to table, to outcomes

	Enabling factors			Nutrition status		
	Environment			Income		
	Nutrition					
	Germplasm	Breeding	Production	Consumption		
				Postharvest /processing	Market	Nutrition
Nutrition targets	Nutrient content	Nutrient yield	Nutrient supply	Nutrient retention	Cost of diet ?	Dietary intakes
Data						
Content	X	X	X	X		
Yield		X	X			
Area			X			
Loss (?)				X		
Market reach/price (?)					X	
Consumption						X

2017/11/21

World Vegetable Center

## ▶ Part 2: Nutrition interventions from seed to table and beyond

- Discussion:
  - Improve nutrition of consumers
    - Research topic, problems, objectives, approaches, partnerships, expected results