Introduction to World Vegetable Center (WorldVeg)

Fenton D. Beed
Regional Director, World Vegetable Center

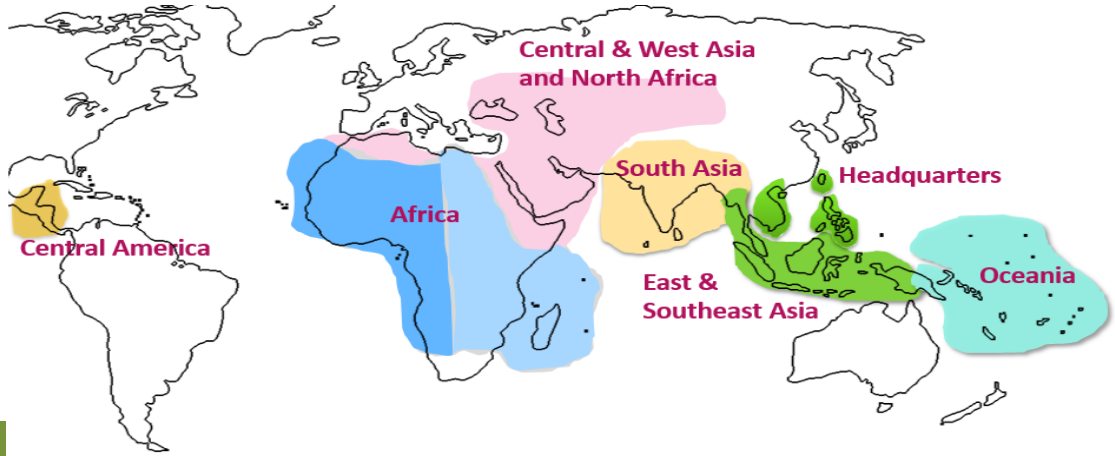
Module 3 , International Vegetable Training Course
Vegetables: from Harvest to Table
31st October -25th November
World Vegetable Center and Kasetsart University

World Vegetable Center

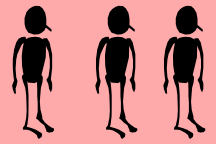
Vegetables for health and prosperity!

- Founded in 1971 as **AVRDC**
- Research to promote development - **nonprofit**
- Research outputs - **global public goods**
- Profitable value webs – **affordable year round**

Alleviate poverty and malnutrition through increased **production** *and* **consumption** *of health-promoting* **vegetables**



Food and nutritional security through vegetables

deficiency in calories and proteins		= HUNGER		800 million underweight
deficiency in vitamins and minerals		= MICRONUTRIENT DEFICIENCY		2 billion malnourished
excess calories		= IMBALANCED CONSUMPTION		2 billion overweight 0.6 billion obese

FAO; IFAD; WFP, 2012; Bereuter and Glickman, 2015: Healthy Food for a Healthy World

Food and nutritional security through vegetables

deficiency in calories and proteins	• Every year > 3M children die due to mal-nutrition • Every day 400 mothers die in childbirth due to iron deficiency
deficiency in vitamins and minerals	• Every day 1400 children go blind due to Vitamin A deficiency • First 1000 days affects physical and mental development
excess calories	• Asia and Africa lose 11% of GNP each year due to poor nutrition • Rates of diabetes increasing fastest in developing countries

FAO; IFAD; WFP, 2012; Bereuter and Glickman, 2015: Healthy Food for a Healthy World

(bio)fortification….

iron and zinc biofortification ?

Iodization ?

vitamin supplements ?

… or more diverse diets?

Vegetables WIN (women, income, nutrition)

1. empowerment of women to manage small rural and urban plots
2. high value inputs and outputs (fresh and processed)
3. short cultivation cycle and huge diversity
4. increased nutrition provided to family and consumers (micronutrients, vitamins, dietary fiber, phytochemicals and protein)



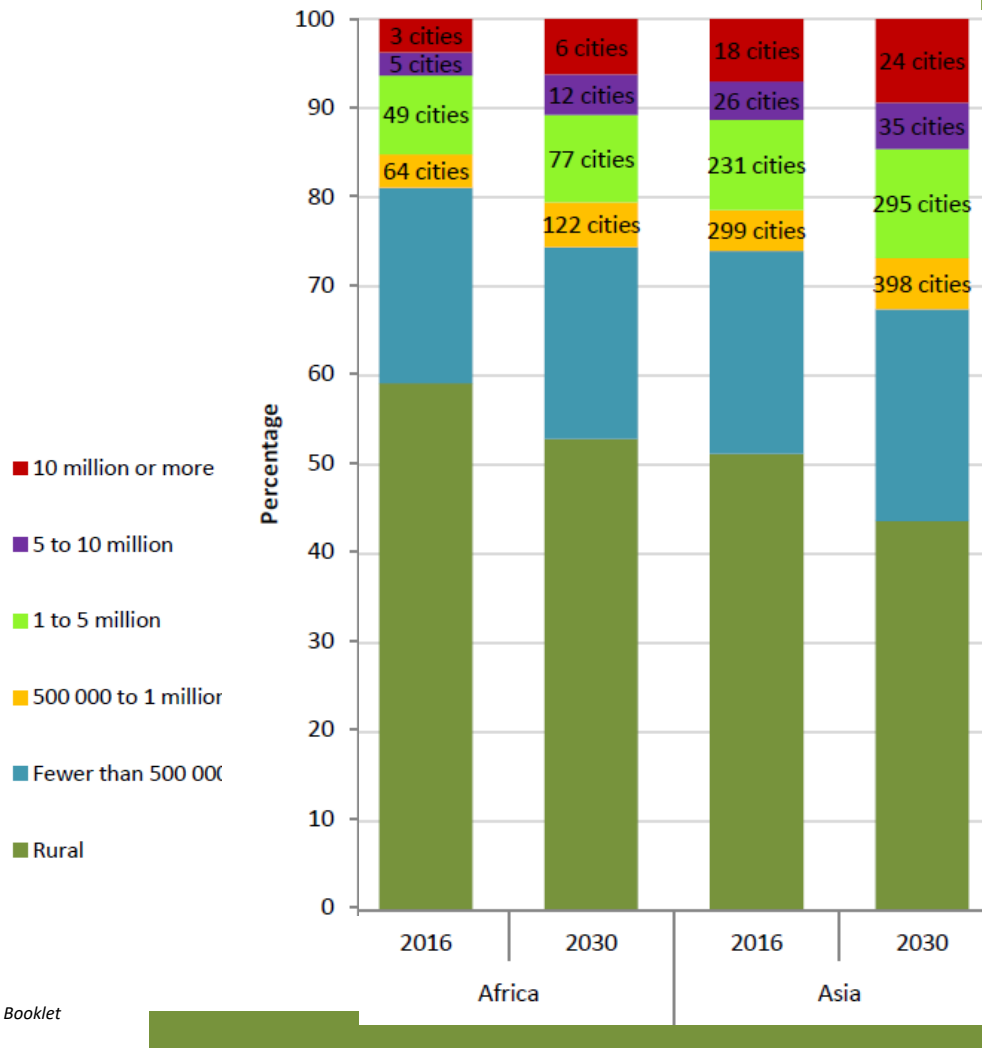

Global growth and urbanization

- 2015 – 7.3 billion people (60% in Asia – 16% in Africa)
- 2030 – 8.5 billion people (58% in Asia – 20% in Africa)
- 2050 – 9.7 billion people (54% in Asia – 25% in Africa)
- 2100 – 11.2 billion people (44% in Asia - 39% in Africa)

United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP.241.*

Global urbanization

- 2016 - 55 % of world's population in cities
- 2030 - 60 % of world's population in cities
- World's fastest growing cities in Asia and Africa



United Nations, Department of Economic and Social Affairs, Population Division (2016). *The World's Cities in 2016 – Data Booklet (ST/ESA/ SER.A/392).*

Urban supply of nutritious food

Germplasm: to prepare for the storm

- Collect remaining diversity from the wild and field
- Conserve it – securely and permanently
- Characterize novel traits
- Develop improved and adapted varieties
- Public Private Partnerships for seed supply

Copying with climate and market uncertainties

No. of accessions	62,000
No. of species	442
No. of countries of origin	156
No. of new varieties	520

The world's largest public sector collection of vegetable germplasm

Global vegetables

Traditional vegetables

Wild relatives, diverse and unique traits

Hibiscus sabdariffa: Source of vitamin C

our crop portfolio

Solanaceae
(tomato, pepper, eggplant,…)

bulb alliums
(onion, garlic, shallot,…)

legumes
(mungbean, vegetable soybean,…)

crucifers (pak choi, broccoli,…)

cucurbits (cucumber, pumpkin,…)

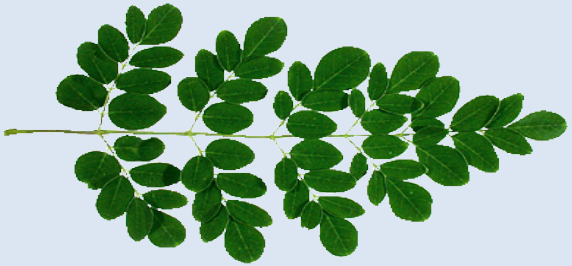
traditional vegetables

more nutritious

more ‘sturdy’

easier and faster to grow

growing demand



the revolution

tomato: Tengeru 97, Tanya, Kiboko, Meru

African eggplant: DB 3

impact in Tanzania:

production:
50% of tomato
98% of eggplant

investments:
USD 6.9 million in research, extension, and promotion

economic gains:
USD 254 million for tomato
USD 5 million for eggplant

High quality, nutritious: ‘Golden’ tomatoes

- **“Golden tomatoes”**
  - High quality
  - Nutritious
  - Good marketability
  - Resistance to multiple diseases

- **One single improved tomato can provide a person’s full daily vitamin A requirements**

Cucurbit breeding at the World Vegetable Center

OP and hybrids
resistant to powdery mildew / viruses
adapted to local markets
improved nutritional content

Traditional treasures: diet diversity

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Spider plant

Blue pea

Moringa

Nightshade

African eggplant

Aibika

Amaranth

Cowpea

Water mimosa

Jute mallow

Watercress

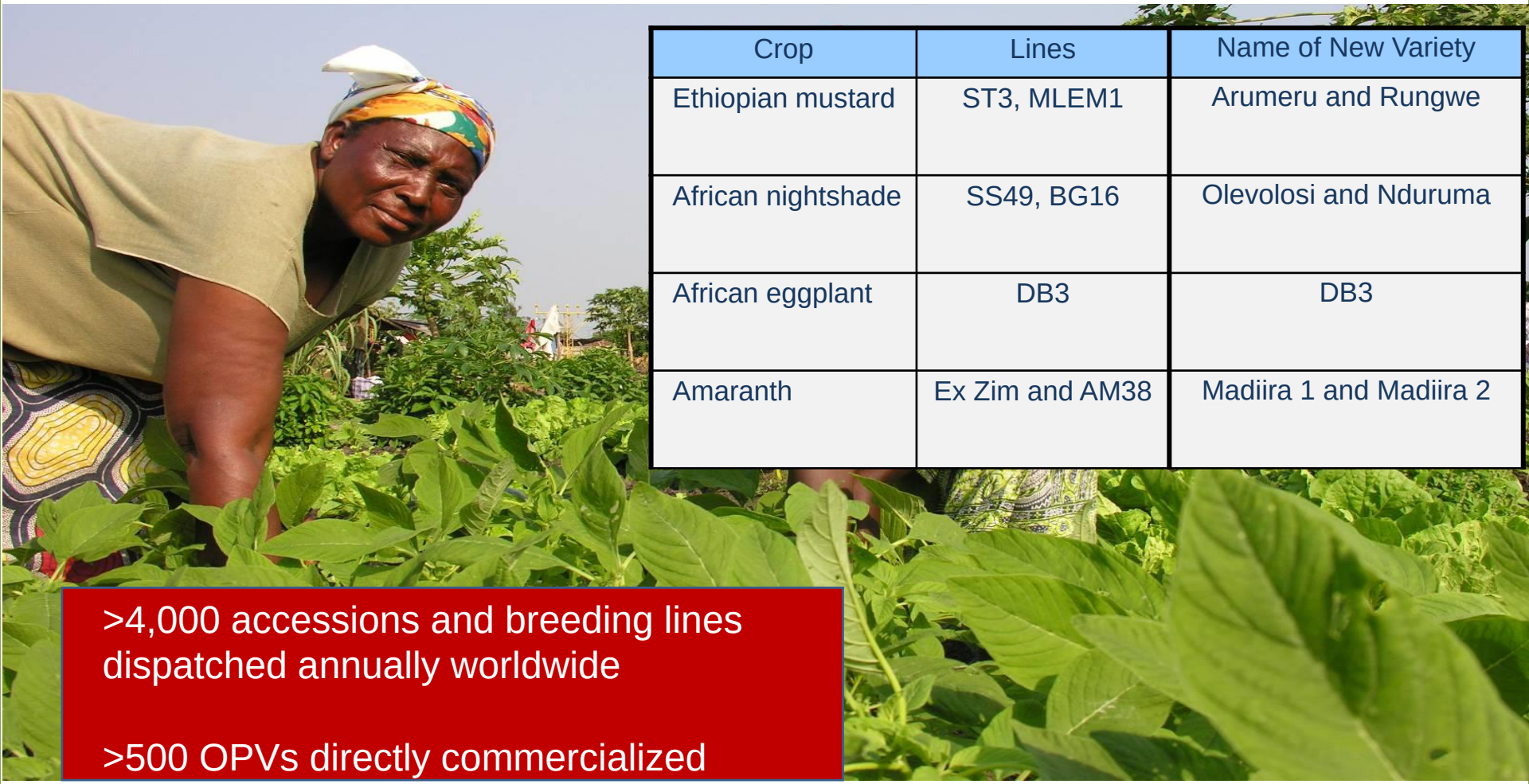
Ethiopian kale

Recommended nutrient intakes and % per 100 g of:

	Protein	Vitamin A	Iron	Folate	Zinc	Calcium	Vitamin E
RNI for pregnant women (1st trimester)	g 60	µg RE 800	mg 30	µg 600	mg 11	mg 1000	mg α-TE 7.5
percentage of RNI	- % -						
rice	0	0	1	2	4	0	0
cassava (root)	2	0	1	5	3	2	0
millet	6	0	2	14	8	0	0
meat (chicken)	**37**	0	3	1	**14**	1	3
mungbean	**40**	**2**	**22**	**104**	**24**	**13**	**7**
vegetable soybean	**18**	2	**13**	**28**	**13**	4	**78**
cabbage	3	1	1	10	2	4	2
tomato	2	18	1	3	2	1	7
slippery cabbage	**6**	**106**	**5**	**30-177**	11	**18**	**58**
moringa leaves	7	**146**	**11**	**49**	5	10	**65**
amaranth	9	**160**	6	**31**	6	**32**	17
jute mallow	10	**198**	**12**	**21**	0	**36**	36
nightshade	**8**	**101**	**13**	**10**	**9**	**21**	**28**
vegetable cowpea leaves`	8	**193**	6	**27**	3	**54**	**101**

RNI source: FAO/WHO 2004; RNI for iron with low bioavailability; RNI for zinc with medium bioavailability
Nutrient data source: USDA nutrient database, AVRDC IV nutrient data, and literature

Improved lines – released varieties in Tanzania



Crop	Lines	Name of New Variety
Ethiopian mustard	ST3, MLEM1	Arumeru and Rungwe
African nightshade	SS49, BG16	Olevolosi and Nduruma
African eggplant	DB3	DB3
Amaranth	Ex Zim and AM38	Madiira 1 and Madiira 2

>4,000 accessions and breeding lines dispatched annually worldwide

>500 OPVs directly commercialized

Nutritious foods through community gardens

Vegetable seed packs

Impact assessment

Education & training

Impact in more than 20 countries across Africa, Asia and Oceania

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Nutrition at WorldVeg

analysis of diet and nutrition

seeds → field → market → plate → human

homestead Production

home garden and nutrition education

nutrition message delivery system and promotion

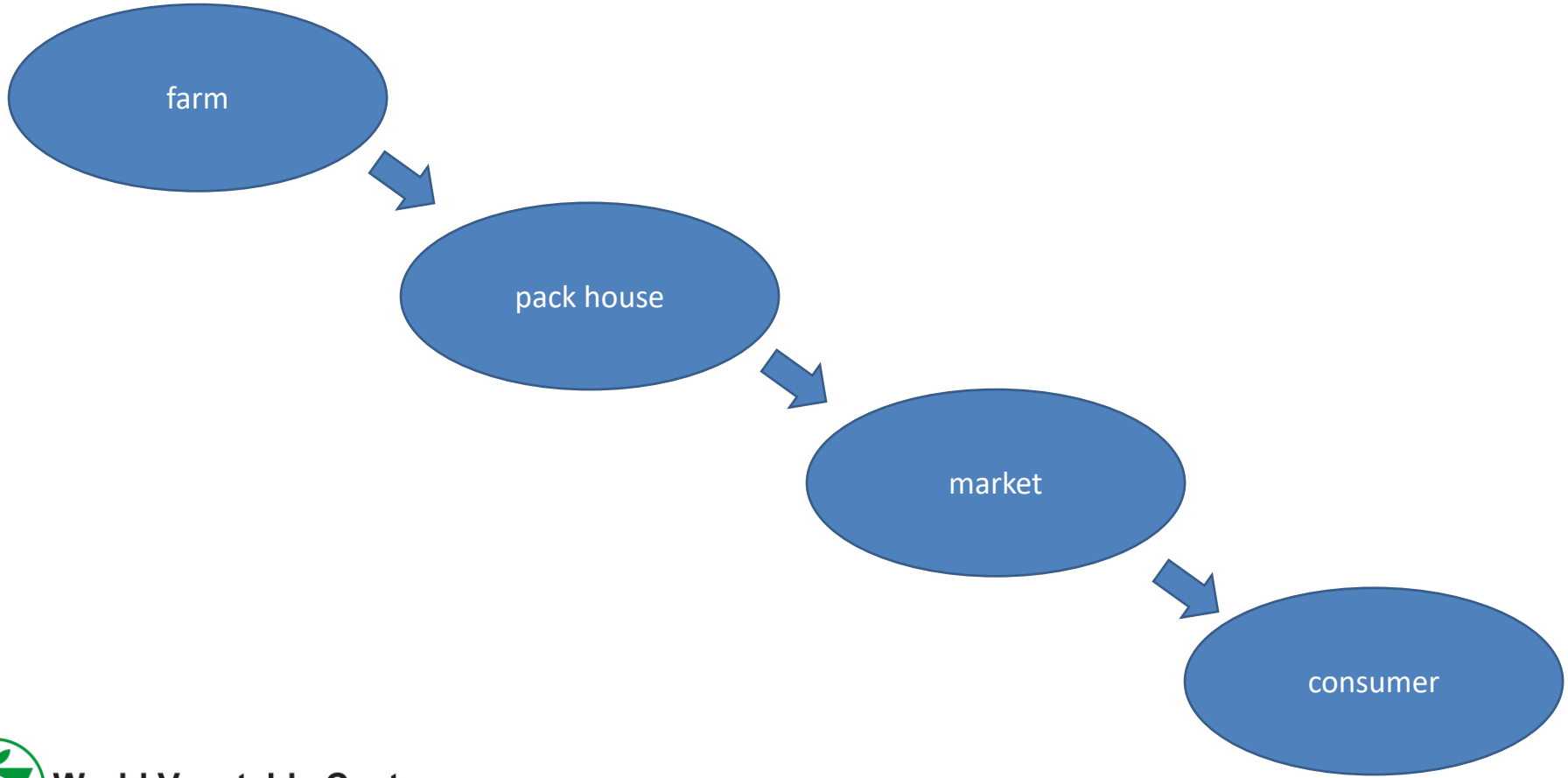
nutrient database and nutritional and quality evaluation for Breeding and Germplasm program

linking school garden with education, feeding and WASH

Post Harvest

Value chain analysis → Technology generation → Build capacity

Post harvest technologies



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Postharvest Program

Value chain analysis → Technology generation → Building capacities

Good transport and market handling practices

Value addition (solar dryers, fermentation, sauces)

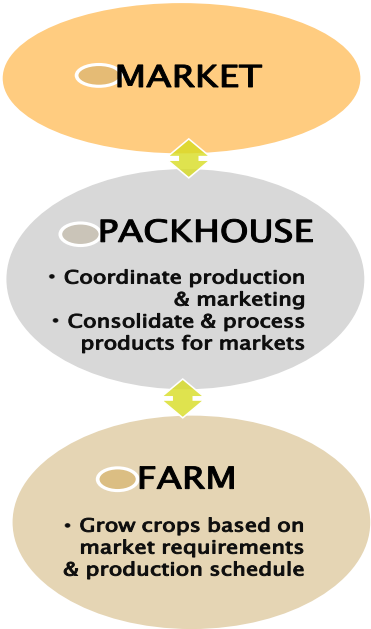
Storage (Coolbot storage; evaporative cooler)

Packaging (MAP, best practices)

Sorting/grading and pretreatment techniques (sanitizer/antimicrobials, precooling)

Good harvesting and field handling practices

Improved varieties (long shelf life, processing)



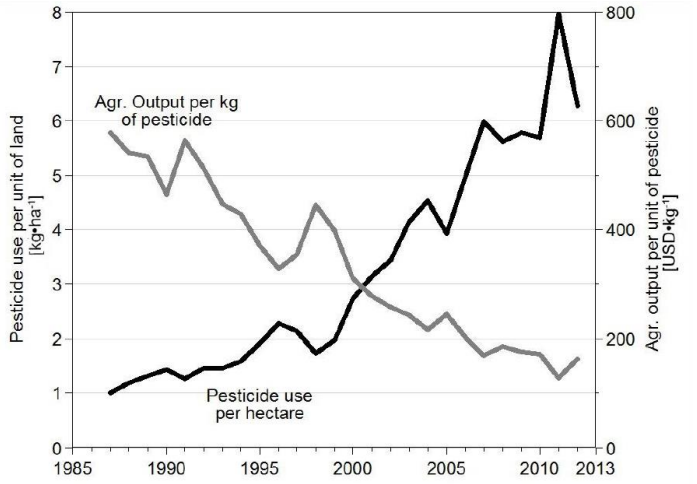
The Association of Southeast Asian Nations

"UNIDO Regional Trade Standards Compliance Report, 2013"

"ASEAN potential to gain from macro trends of increasing population and purchasing powers not met in all countries by increased vegetable production"

- Food safety and quality issues cause import rejections:
  - MRLs exceeded of pesticides (approved and prohibited) and mycotoxins
  - presence of quarantine plant pathogens and pests
  - inadequate hygiene standards

Inappropriate pesticide use accepted practice



Agricultural pesticide use (Office of Agricultural Regulation, 2011) and pesticide productivity (FAO, 2011; The World Bank, 2011) in Thailand, 1987-2012 (Praneetvatakul et. al., *2016)*

- Loss of producer profit
- Loss of trade and value chains
- Loss of country and retailer credibility
- Loss of biodiversity
- Loss of yield
- Increased pest resistance
- Health hazard to growers
- Health hazard to consumers

Solutions to inappropriate pesticide use

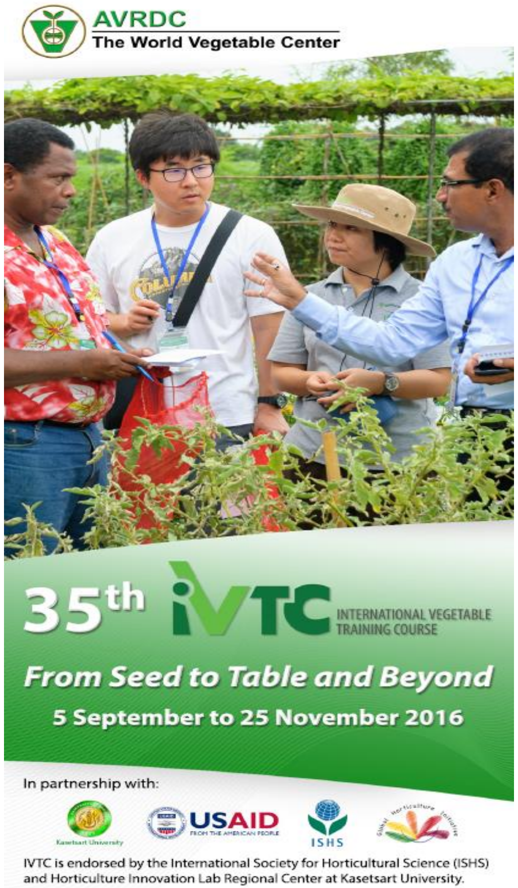
- Precise pest and disease diagnostics
- Host resistance
- Agronomic practices
- Judicious pesticide use
- Biological control

Judicious Pesticide Use

Enforce GAP

Increase awareness:

MRLs and health impacts
Appropriate use of approved products at correct dose for specific crops
Appropriate timings of applications (respecting Pre-Harvest Interval)
Use of correct safety and application equipment
Store and dispose responsibly



Capacity building and networking


Dr. Somsiri Sangchote leading the participants in the seed health sessions.


Evaluating lettuce plants at the Agri-Technology Complex.


Learning how to graft vegetable seedlings.


Accomplished grafters show their handiwork.

East and Southeast Asia															South Asia						Africa										Others																	
Brunei	Cambodia	China (PR)	Hongkong	Indonesia	Korea	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Taiwan	Timor Leste	Thailand	Vietnam	Bangladesh	Bhutan	India	Nepal	Pakistan	Sri Lanka	Burkina Faso	Cameroon	Gambia	Kenya	Malawi	Zambia	SouthAfrica	Nigeria	Sudan	Swaziland	Afghanistan	Kazakhstan	Jordan	Lebanon	Iraq	Egypt	Papua NG	Tuvalu	Nauru	Palau	Rep of Kiribati	Sao Tome	Solomon Islands	Netherlands	UK	Venezuela	Male	Female
	1		2	6	1					1			4		1		2		4	5	1				1			1		1			2	1		2				1	1	1	1				31	9
2	75	139	7	59	18	60	11	71	23	7	4	3	59	102	47	18	10	9	8	34	3	1	1	1	1	1	1	2	1	3	24	20	4	1	2	2	4	1	1	1	1	1	1	1	1	1	585	269
640															126						15										66																69%	31%

Scaling: system approaches

demo plots

WorldVeg and partners

baby trials

ToT farmers
149 plots

grandbaby trials

farmers
517 plots

Scaling: value chains

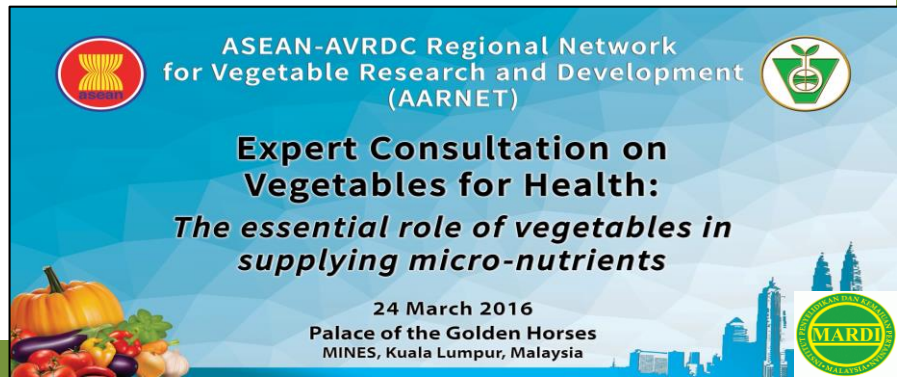
best practice hubs

WorldVeg and partners

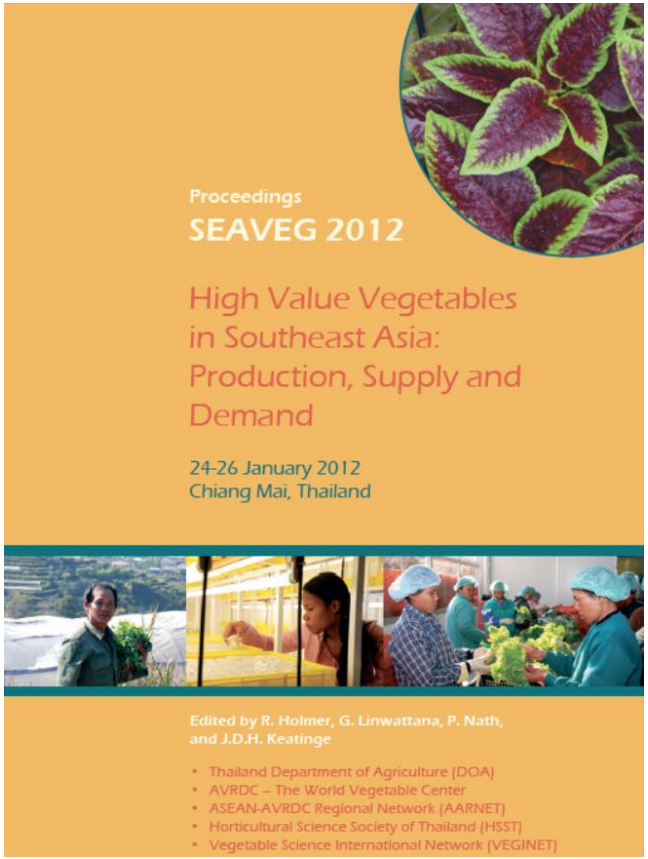

avrdc.org/aarnet/
A platform for vegetable R&D and information exchange in ASEAN
AARNET
ASEAN-AVRDC Regional Network on Vegetable Research and Development
Home Achievements Projects Steering committee Links Photos Publications
AARNET: Origins, Vision & Mission
VISION: To be the premier platform for spearheading vegetable research and development and information exchange in ASEAN
MISSION: To coordinate and facilitate development and implementation of R&D projects on vegetables in ASEAN member countries, in collaboration with AVRDC – The World Vegetable Center and its regional office in East and Southeast Asia, and other organizations, as well as facilitate information exchange, technology transfer and training on vegetable production related fields.
NEWS

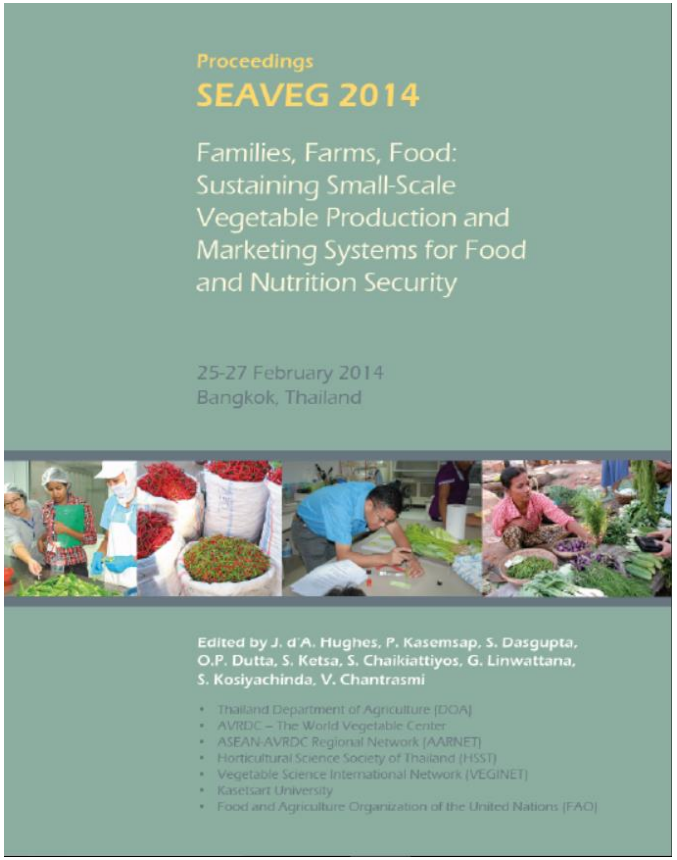
Networking


ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET)
Expert Consultation on
Climate Change Mitigation and Adaptation Strategies for Vegetables in Southeast Asia
26 March 2015
Champasak, Lao PDR
NAFRI


ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET)
Expert Consultation on Vegetables for Health:
The essential role of vegetables in supplying micro-nutrients
24 March 2016
Palace of the Golden Horses
MINES, Kuala Lumpur, Malaysia
MARDI

Vegetables for improved nutrition and livelihoods





http://avrdc.org/aarnet/publications/seaveg-conference-proceedings/

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Vegetables are essential for **HEALTH**

Research builds on **GENETIC DIVERSITY**

Vegetable sector is an engine for **ECONOMIC GROWTH** and **PROFIT**