UNDERUSED VEGETABLES - World Vegetable Center

Successes, constraints, lessons learned and key research issues

Roland Schafleitner, World Vegetable Center, Taiwan

Underused
Indigenous
Traditional
Unconventional

Vegetables

- Locally important, but not broadly used
- Potential to improve nutrition and income

Development opportunity crops

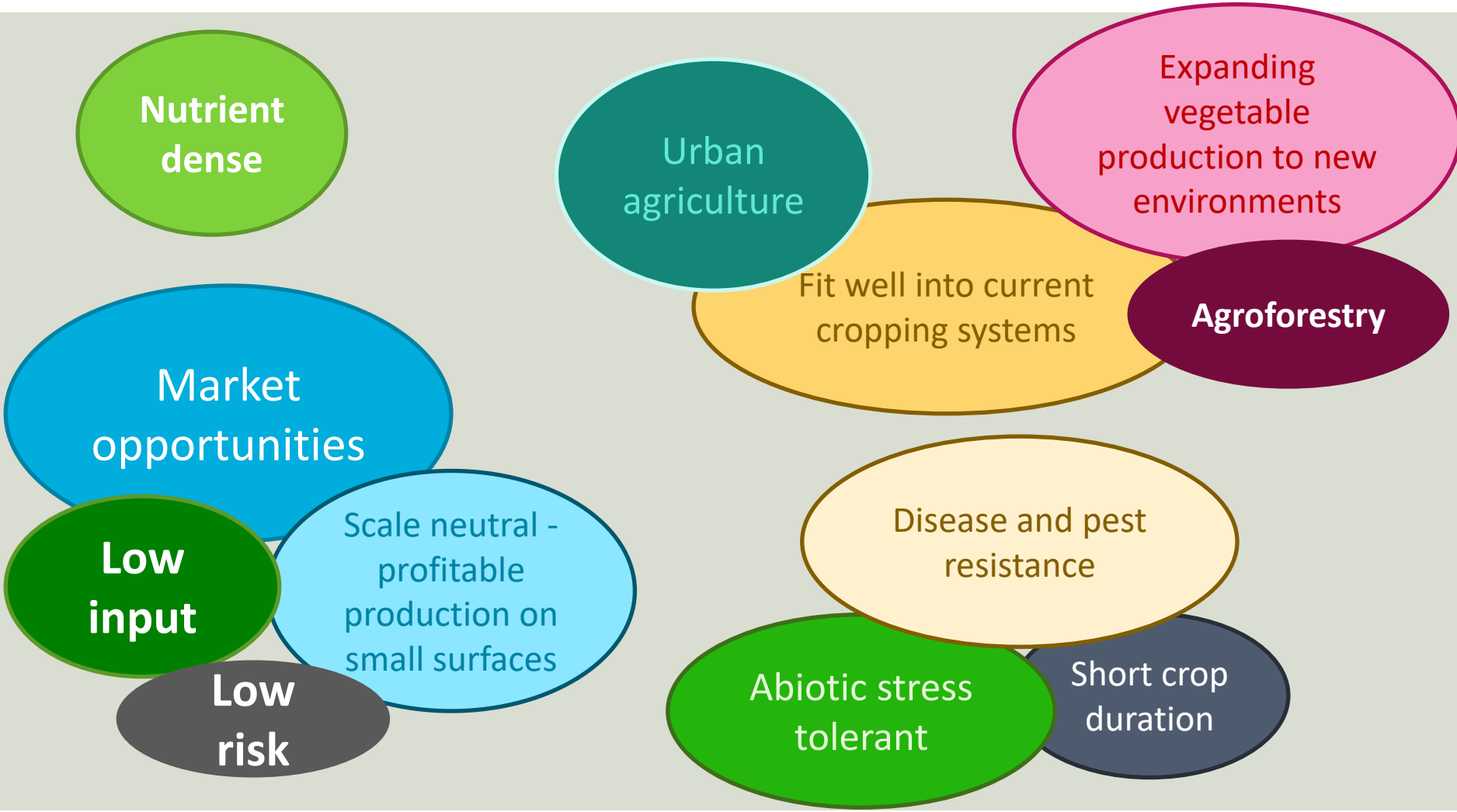



Development opportunity crops:

From low-input vegetables
for home consumption
to high value market-oriented crops?




Why promoting underused vegetables ?



Conserving Biodiversity

Collection activities at the World Vegetable Center

ProNIVA, USAID, Gates Foundation, Global Crop Diversity Trust (2003 – 2011)

- African eggplant
- Nightshade
- Spider plant
- Ethiopian mustard
- Amaranth
- Jute mallow
- Cowpea
- Okra
- Roselle
- Hyacinth bean

World Vegetable Center, Arusha, Tanzania

Africa's largest Vegetable Genebank

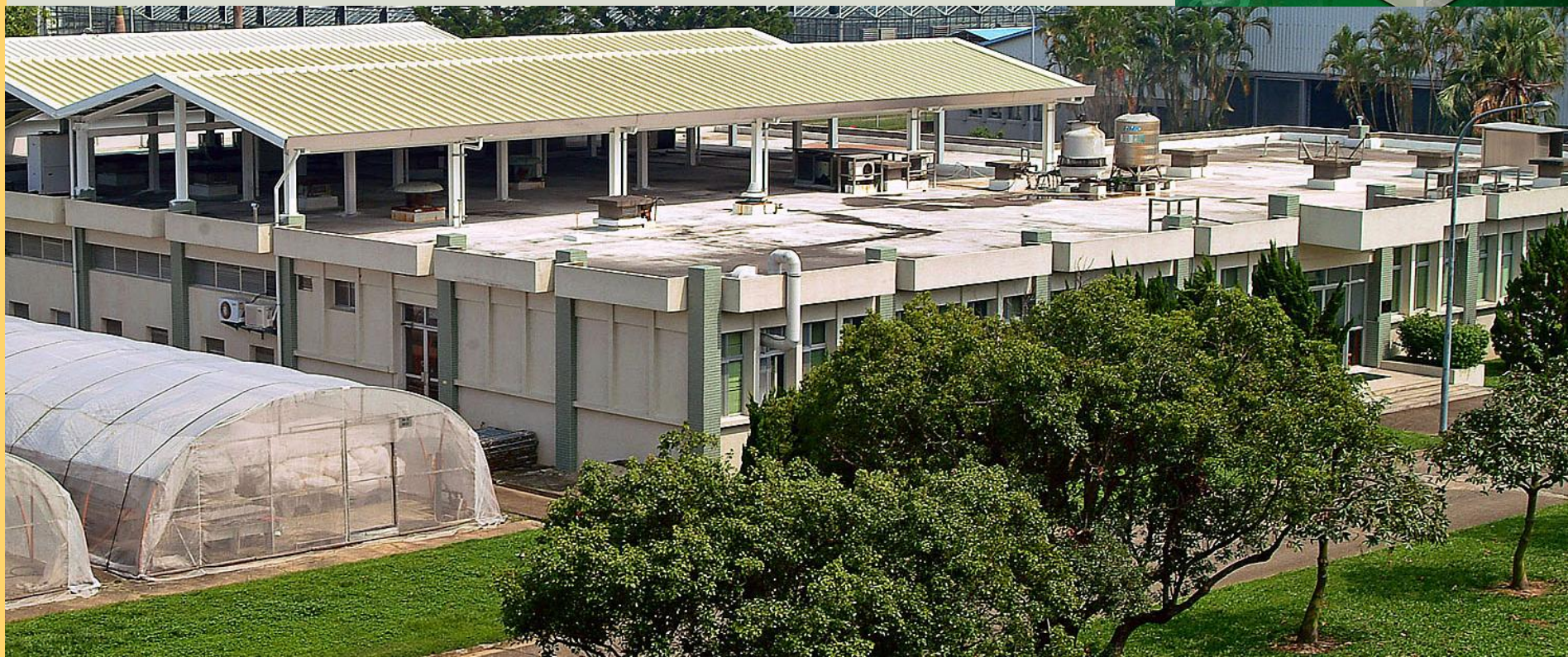
- >2,600 accessions
- 200 kg seed distributed in 2015

Conserving Biodiversity

World Vegetable Center Headquarter Genebank

>60,000 accessions

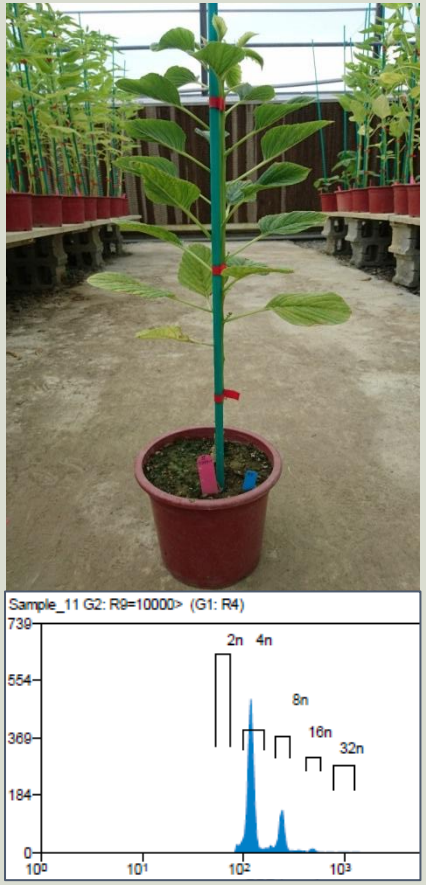
>10,000 accessions underused vegetables

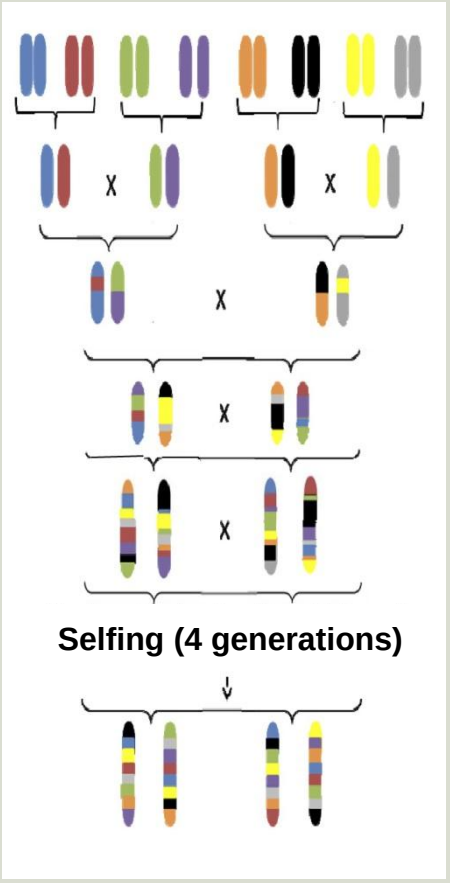


Mobilizing Biodiversity for Variety Development

Characterization/ population development

Amaranthus sp.



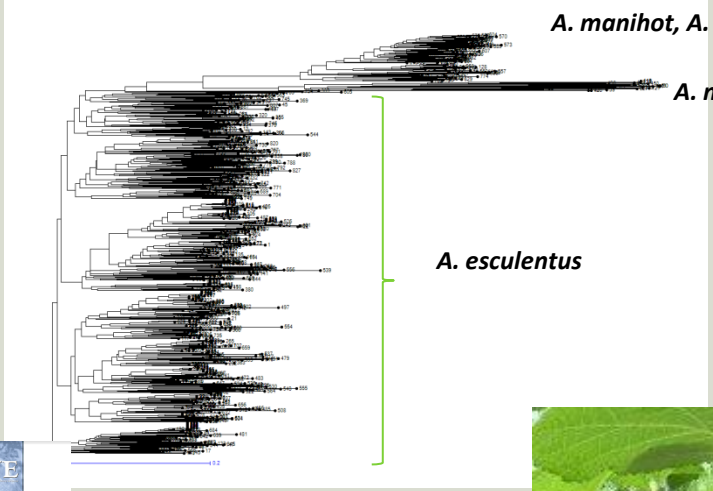


Mobilizing Biodiversity for Variety Development

Characterization/population development

Okra

Molecular marker, core collection



Contents lists available at SciVerse ScienceDirect

Gene

journal homepage: www.elsevier.com/locate/gene

The okra (*Abelmoschus esculentus*) transcriptome as a source for gene sequence information and molecular markers for diversity analysis

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ARTICLE INFO

Article history:
Accepted 19 December 2012
Available online 5 January 2013

Keywords:
Abelmoschus esculentus
Next-generation sequencing
Transcriptome
Microsatellite marker

ABSTRACT

A combined leaf and pod transcriptome of okra (*Abelmoschus esculentus* (L.) Moench) has been produced by RNA sequencing and short read assembly. More than 150,000 unigenes were obtained, comprising some 46 million base pairs of sequence information. More than 55% of the unigenes were annotated through sequence comparison with databases. The okra transcriptome sequences were mined for simple sequence repeat (SSR) markers. From 935 non-redundant SSR motifs identified in the unigene set, 199 were chosen for testing in a germplasm set, resulting in 161 polymorphic SSR markers. From this set, 19 markers were selected for a diversity analysis on 65 okra accessions comprising three different species, revealing 58 different genotypes and resulted in clustering of the accessions according to species and geographic origin. The okra gene sequence information and the marker resource are made available to the research community for functional genomics and breeding research.

Mobilizing Biodiversity for Variety Development

Molecular Characterization

Genotyping by sequencing
>1,000s of markers at low costs
Diversity – mapping - breeding












Nutrient Analysis

Amaranth leaves:

• Protein	3.2 - 3.9 g	
• Pro-vitamin A	1.7 - 3.1 mg	(0 – 0.4 mg)*
• Vitamin C	36 - 78 mg	(19 - 22 mg)*
• Calcium	270 - 582 mg	
• Iron	2.4 - 3.8 mg	(0.3 - 0.6 mg)*
• Zinc	0.7 - 1.5 mg	

* Ranges found in tomato or cabbage

The diversity of African leafy vegetables: agromorphological characterization of subsets of AVRDC's germplasm collection

T. Stoilova[1,a], F.F. Dinssa[1], A.W. Ebert[2] and A. Tenkouano[3]

[1]AVRDC – The World Vegetable Center, Eastern and Southern Africa, Arusha, Tanzania; [2]AVRDC – The World Vegetable Center, Shanhua, Tainan, Taiwan; [3]AVRDC – The World Vegetable Center, West and Central Africa, Bamako, Mali.

ISHS

Success stories

Mungbean

1997 – 2004 SAVERNET:
Transformation from a marginal to a major crop in Asia

- Production increase: 35%
- Economic benefit (Pakistan): US$ 20 M p/a
- Adoption: near 100%

Shanmugasundaram et al., 2009

Success stories

African eggplant

Foundation seed

Multilocation trials

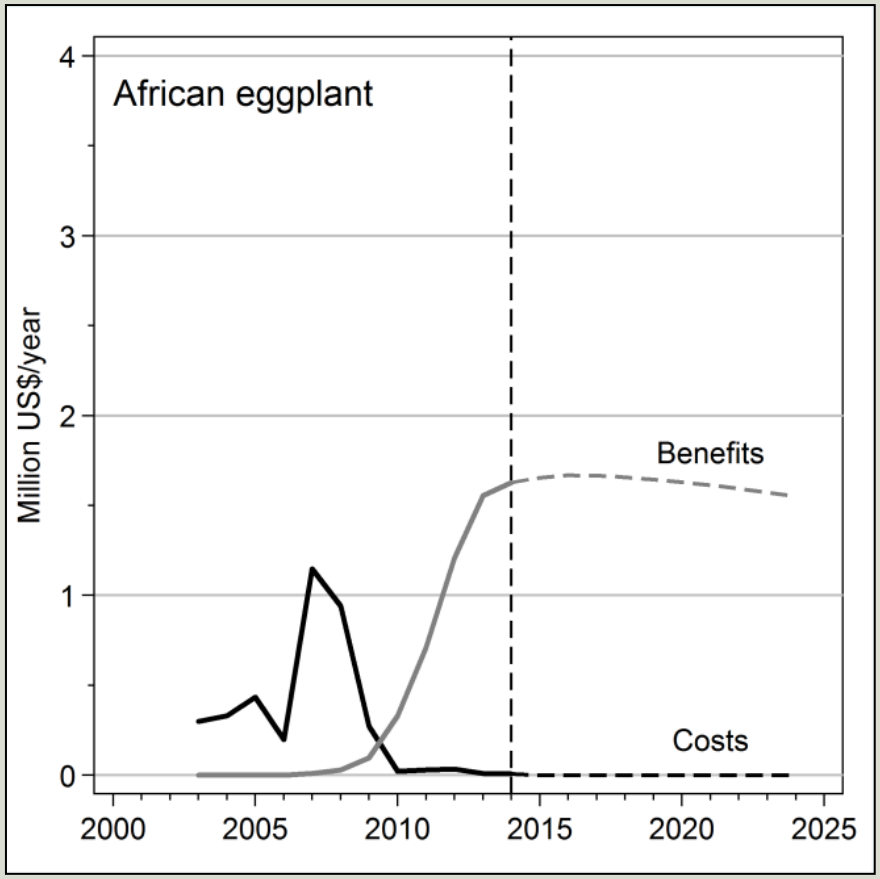
Purified lines

Germplasm collection & characterization

- Pests and disease resistant
- Long fruit production season
- Reduced bitterness

Horti Tengeru (Tz) & World Vegetable Center

Success stories



Schreinemachers et al., submitted

Horti Tengeru (Tz) & World Vegetable Center

Success stories

Economic outcomes *Gross margin*

IV: US$5,274/acre

Convent. Vegetables: US$1,213/acre

Net gain with IV: *US$4,060/acre*

Social outcomes

- No major gender conflicts observed
- Change in farmers' perceptions towards farming as a business
- Access to markets

Environmental outcomes

- No negative impacts
- Fewer or no chemicals used
- Little space requirement –intercropped/rotated with other crops

Success stories

Food Sec. (2015) 7:97–107
DOI 10.1007/s12571-014-0408-7

ORIGINAL PAPER

The effect of women's home gardens on vegetable production and consumption in Bangladesh

Pepijn Schreinemachers · Marie Antoinette Patalagsa · Md. Rafiqul Islam · Md. Nasir Uddin · Shahabuddin Ahmad · Sitesh Chandra Biswas · Md. Tanvir Ahmed · Ray-Yu Yang · Peter Hanson · Shawkat Begum · Chifumi Takagi

Improved vegetable gardens increase nutrient supply

- Proteins 171 %
- Iron 284%
- Vitamin A 189%
- Vitamin C 290%

Ipomoea aquatica
Ipomoea batatas
Basella alba
Amaranthus spp.
Abelmoschus esculentus
Vigna unguiculata subsp. *sesquipedalis*
Cucumis spp.
Momordica charantia

Lessons learned

Positive association between agricultural and dietary diversity

Food Sec. (2015) 7:535–554
DOI 10.1007/s12571-015-0466-5

ORIGINAL PAPER

Improving diets with wild and cultivated biodiversity from across the landscape

Bronwen Powell[1] · Shakuntala Haraksingh Thilsted[2] · Amy Ickowitz[1] · Celine Termote[3] · Terry Sunderland[1] · Anna Herforth[4]

Lessons learned

Women

Dominate traditional vegetable production and marketing

Increased opportunities for traditional vegetables

= **Improved livelihood of resource-poor women**

= **Improved nutritional status of their family members**

Lessons learned

Focus on farmers

- Participatory evaluation
- Local management practices
- Successful technologies spread rapidly through farmer to farmer learning

Lessons learned

There are no miracle crops

Nutrient dense African leafy vegetables were unable to
improve serum retinol, ferritin or hemoglobin in children with mild deficiencies

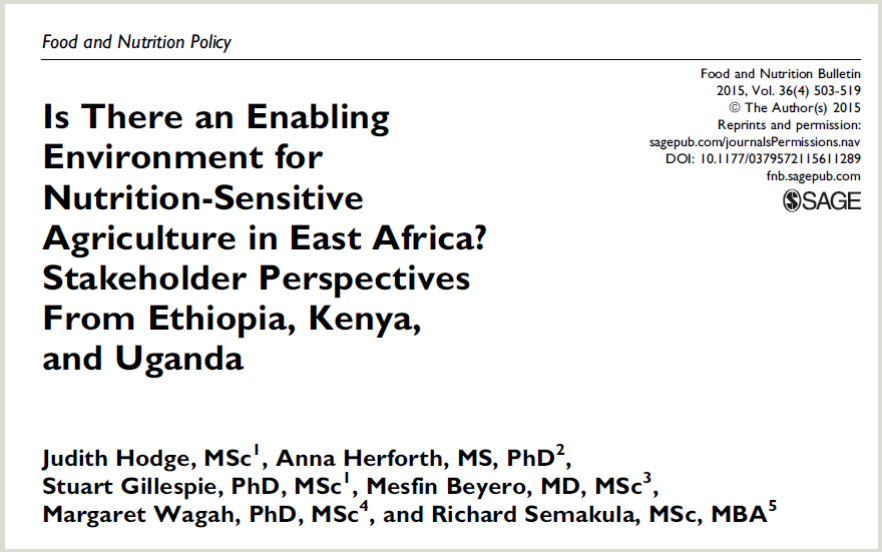
Public Health Nutrition: 19(5), 935–945 doi:10.1017/S1368980015002037

Effect of African leafy vegetables on the micronutrient status of mildly deficient farm-school children in South Africa: a randomized controlled study

Marinka van der Hoeven[1,2], Mieke Faber[3], Jennifer Osei[2], Annamarie Kruger[1] and Cornelius M Smuts[2,*]

[1]Africa Unit for Transdisciplinary Health Research, Faculty of Health Sciences, North-West University, Potchefstroom, South Africa: [2]Centre of Excellence for Nutrition Faculty of Health Sciences, North-West University, Private Bag X6001, Potchefstroom 2520, South Africa: [3]Non-Communicable Diseases Research Unit, South African Medical Research Council, Cape Town, South Africa

Lessons learned



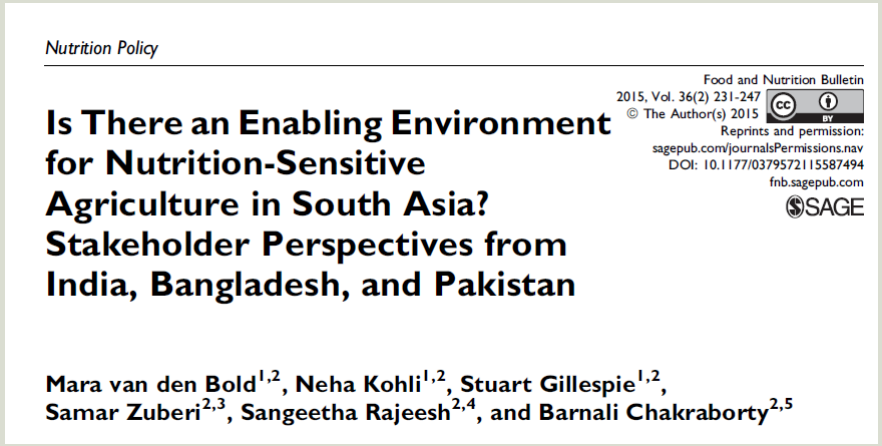
Food and Nutrition Policy

Food and Nutrition Bulletin
2015, Vol. 36(4) 503-519

DOI: 10.1177/0379572115611289
fnb.sagepub.com
SAGE

Is There an Enabling Environment for Nutrition-Sensitive Agriculture in East Africa? Stakeholder Perspectives From Ethiopia, Kenya, and Uganda

Judith Hodge, MSc[1], Anna Herforth, MS, PhD[2], Stuart Gillespie, PhD, MSc[1], Mesfin Beyero, MD, MSc[3], Margaret Wagah, PhD, MSc[4], and Richard Semakula, MSc, MBA[5]



Nutrition Policy

Food and Nutrition Bulletin
2015, Vol. 36(2) 231-247

DOI: 10.1177/0379572115587494
fnb.sagepub.com
SAGE

Is There an Enabling Environment for Nutrition-Sensitive Agriculture in South Asia? Stakeholder Perspectives from India, Bangladesh, and Pakistan

Mara van den Bold[1,2], Neha Kohli[1,2], Stuart Gillespie[1,2], Samar Zuberi[2,3], Sangeetha Rajeesh[2,4], and Barnali Chakraborty[2,5]

Contribution to nutrition-sensitive agriculture

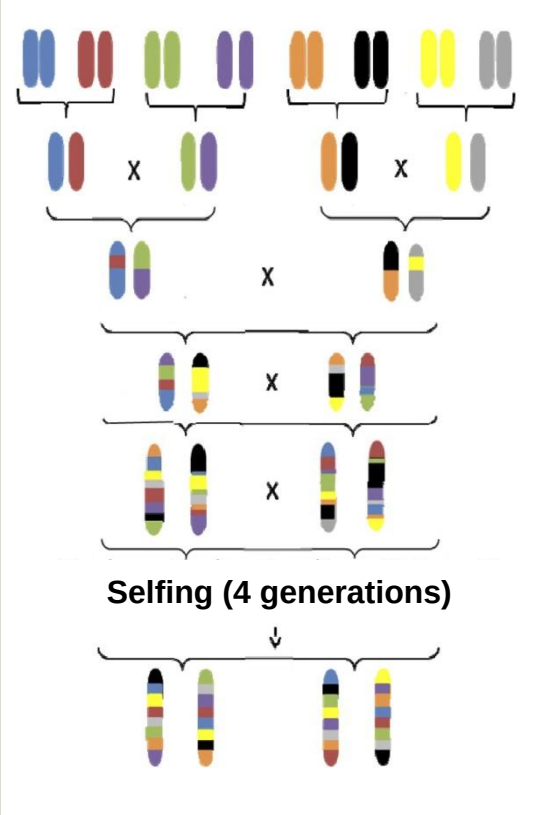
(mixed view among stakeholders of different countries)

- Crop diversification
- Value chain activities and improved market access
- Nutrition education
- Insight into relation between agriculture, nutrition, and health
- Better understand how agriculture–nutrition policies are shaped

Key research issues

Safeguard and use of biodiversity

- Genebank & in situ collections
- Germplasm characterization
- Core collections and specialized populations for breeding and trait capture



Key research issues

Provide improved varieties: Breeding – Seed Systems

- Assess breeding potential underutilized vegetable species
- Pre-breeding to combine favorable traits
- Demand-driven variety development
- Engage seed producers

Key research issues

Production, Marketing & Consumption

- Improved production systems (water-saving production, IPM, urban agriculture…
- Market access
- Post harvest technologies

Key research issues

Measure impact & adjust interventions

Improve methods for measuring health and livelihood outcomes