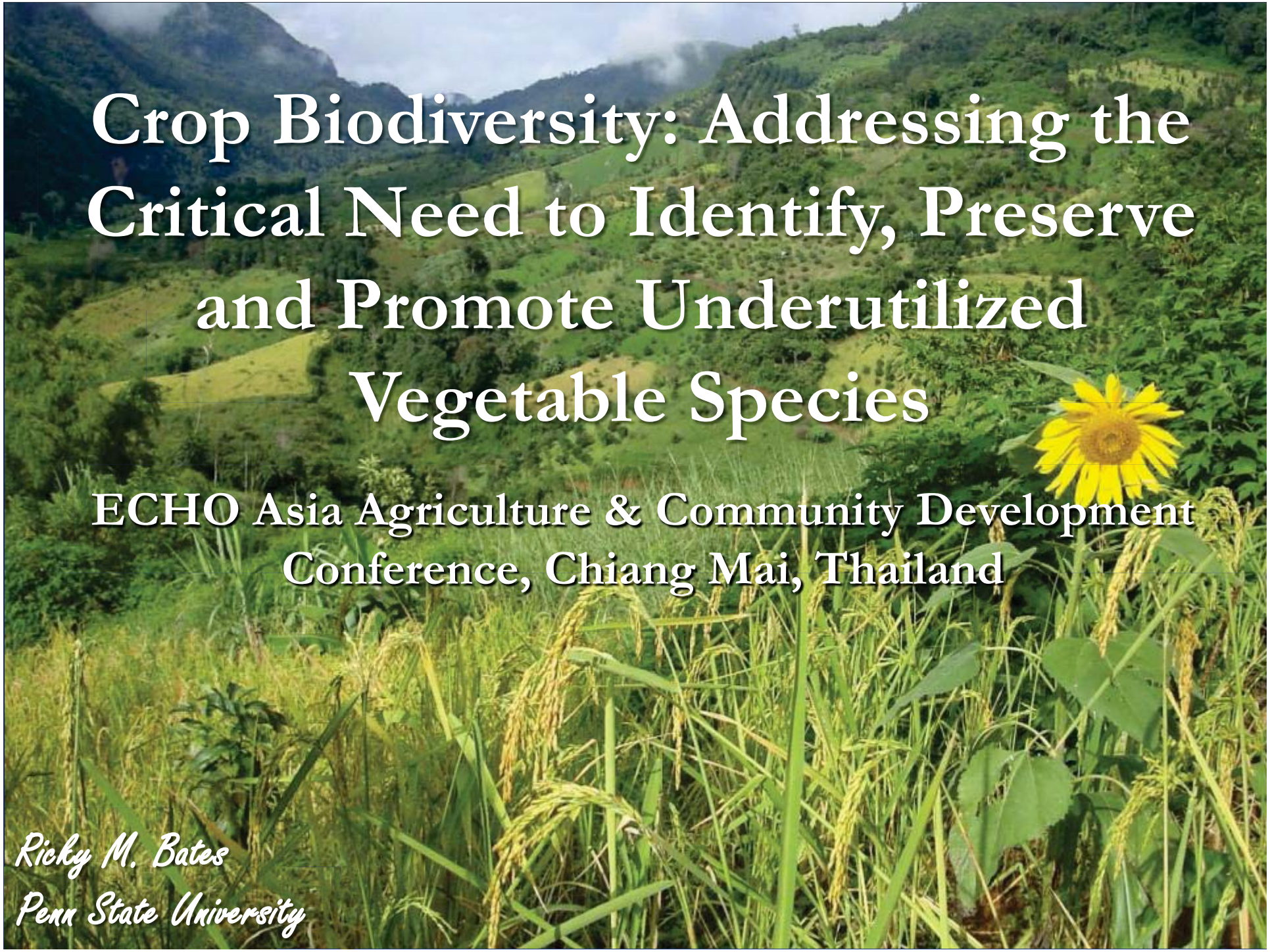


Crop Biodiversity: Addressing the Critical Need to Identify, Preserve and Promote Underutilized Vegetable Species

ECHO Asia Agriculture & Community Development Conference, Chiang Mai, Thailand

Ricky M. Bates
Penn State University

Outline

- Introduction
  - Crop biodiversity
  - Neglected/underutilized species; Informal seed systems
- Project Background
  - USAID & Hort CRSP
  - 'Strengthening indigenous informal seed systems in SE Asia'
- Preliminary/Potential Outcomes and Impacts
  - Seed system inventories
  - Seed exchange & education
  - Capacity building
  - Species improvement; Value chain development
- Observations and Conclusions
  - Key linkages; Constraints, bottlenecks & opportunities

Introduction

Diminishing Plant Species Biodiversity

Fill in the blanks with (your best guess of) the correct numbers:

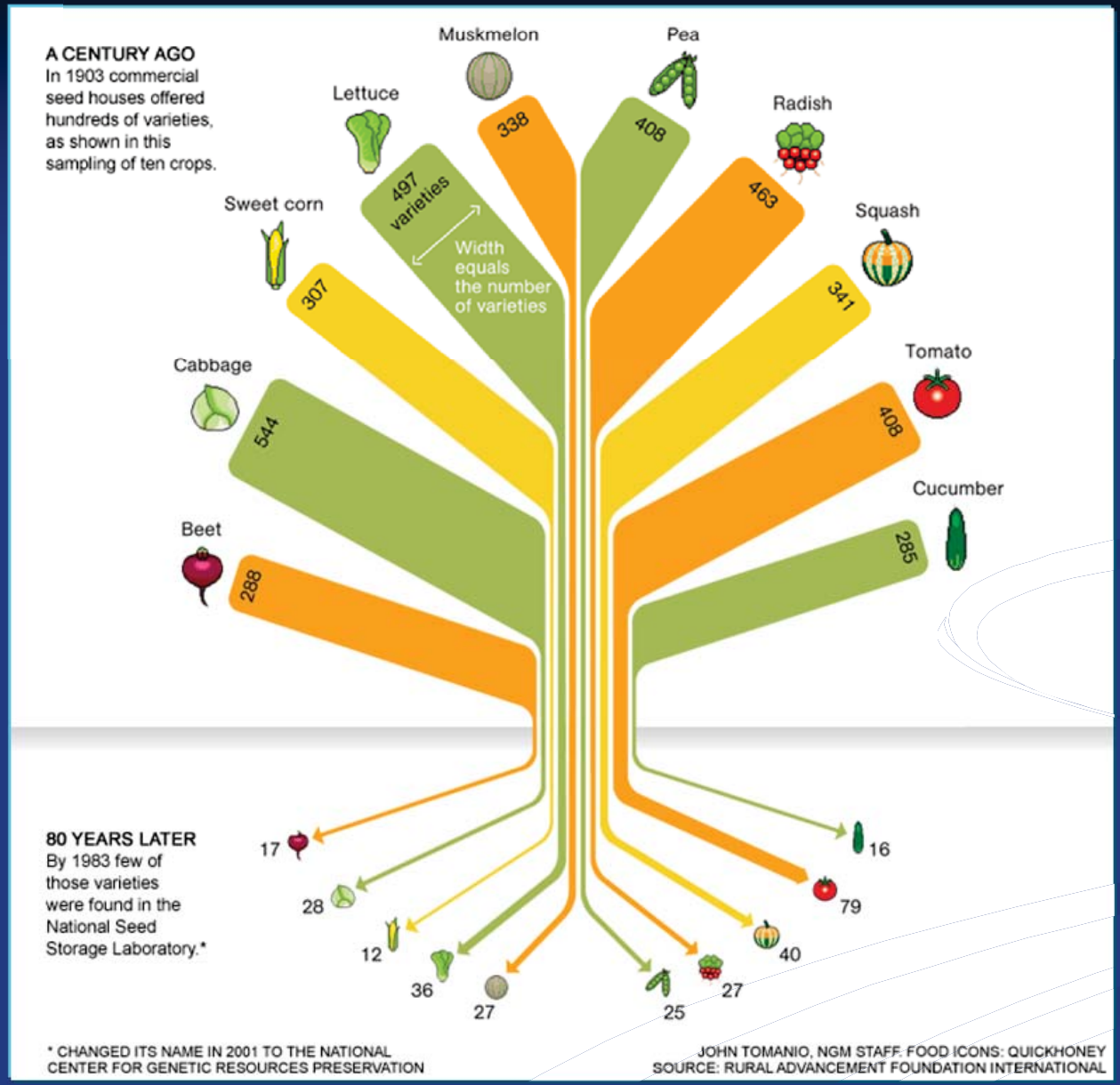
- During their history, human beings have used over _____ plant species for food, fiber, forage, fuel, industrial, cultural and medicinal purposes.
- Approximately _____ cultivated species are still in use today around the world.
- Less than _____ plant species are currently commercialized and in use on a global scale.
- Just _____ of these provide over 75% of the world's food, with the majority of the calories coming from just three: corn, rice & wheat.

Diminishing Plant Species Biodiversity

Fill in the blanks with (your best guess of) the correct numbers:

- During their history, human beings have used over **40,000** plant species for food, fiber, forage, fuel, industrial, cultural and medicinal purposes.
- Approximately **7,000** cultivated species are still in use today around the world.
- Less than **150** plant species are currently commercialized and in use on a global scale.
- Just **12** of these provide over 75% of the world's food, with the majority of the calories coming from just three: corn, rice & wheat.

Diminishing Crop Species Biodiversity



Comparison of seed varieties sold by commercial U.S. seed houses in 1903 with those in the U.S. National Seed Storage Laboratory in 1983. The survey found that about 93 percent of the varieties had gone extinct.

National Geographic, July, 2011

Food Ark

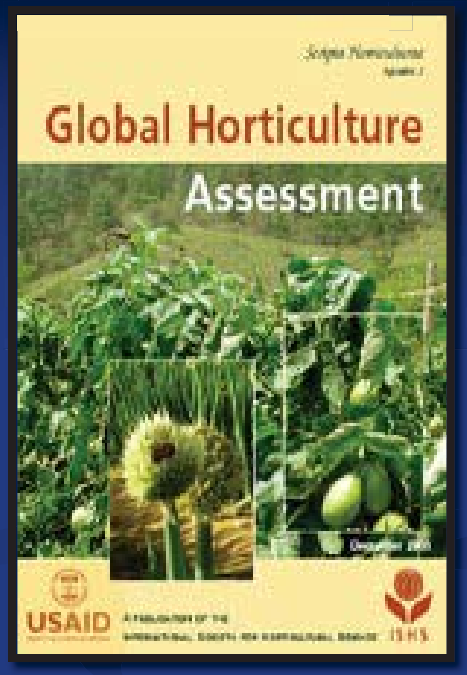
- "A crisis is looming. To feed our growing population, we'll need to double food production. Yet crop yields aren't increasing fast enough, and climate change and new diseases threaten the limited varieties we've come to depend on for food. Luckily we still have the seeds and breeds to ensure our future food supply-but we must take steps to save them."

Food Ark, National Geographic, July 2011

http://www.nationalgeographic.com/

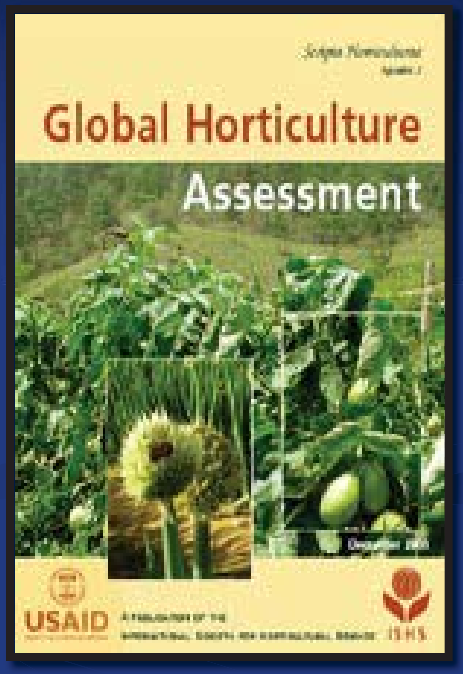
Global Horticulture Assessment (2005)

- Analysis of opportunities & challenges for global horticulture development
- Result: priority listing for a hort. research & capacity building agenda; basis for USAID's portfolio in global hort. development
- Identified constraints to the growth of horticultural development worldwide, within 8 broad themes



Global Horticulture Assessment (2005)

- Theme: Genetic Resource Conservation and Development



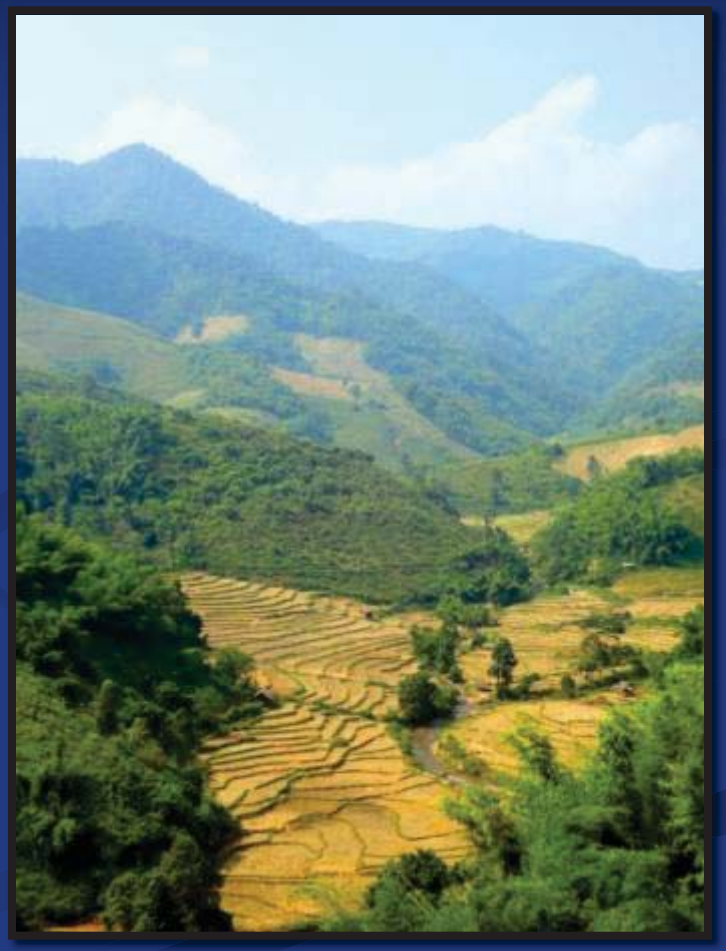
- "Development of seed and planting stock programs, *focused on locally adapted and market-demanded varieties*, will lead to greater yields and higher market values. … *traditional knowledge and native horticultural varieties* must be identified, characterized and conserved." (Global Horticulture Assessment, pg.2)

Informal Seed Systems

- Farmer self-saved seed, farmer-to-farmer exchange, etc.
- Important sources of seed for smallholder farmers
- Critical component of resource-poor farming systems
- Often responsible for over 75% of food crop seed planted (Almekinders et al., 1994)

Value of Local, Informal Seed Systems

- Facilitates maintenance of crop bio-diversity by preserving *in situ* locally adapted varieties
- Broadens genetic base of production w/ multiple varieties adapted to specific production systems and microclimates
- Provides seed/food security during instability, natural disaster, climate change



Neglected & Underutilized Species (NUS)

- Central to local, informal seed systems
- Important role in smallholder farmer livelihoods
- Untapped potential for commercialization (market-driven, science-based)

Wise Use of Underutilized Species Can:

- Contribute substantially to food security
- Increase incomes among the poor
- Improve nutrition and health
- Sustain healthy ecosystems

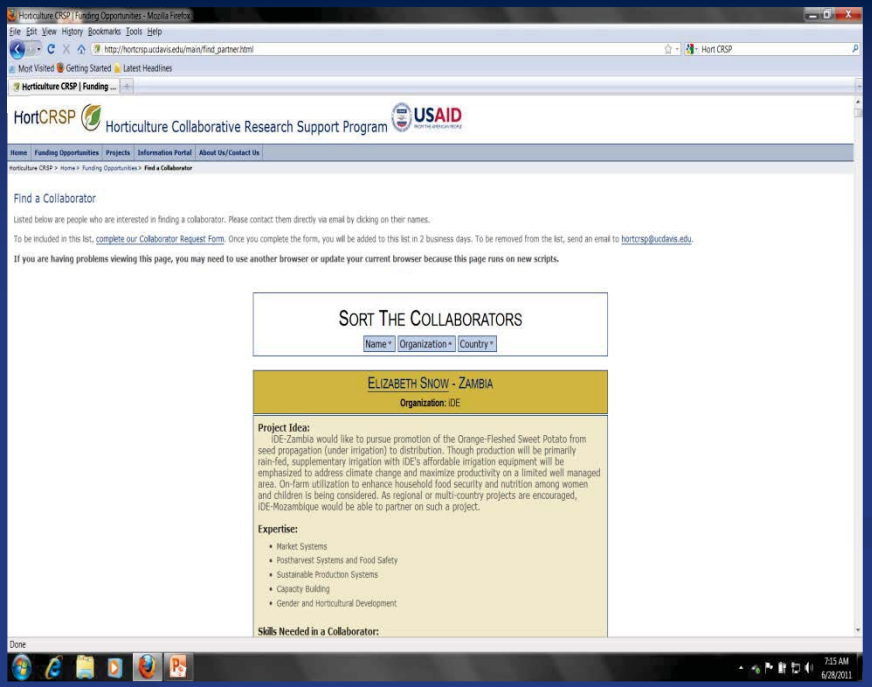
Project Background

USAID CRSP's (Collaborative Research Support Program)

- Sponsorship: USAID / Hort CRSP / UC Davis
- The U.S. Agency for International Development selected UC Davis to lead a new $15 million, five-year global Horticulture Collaborative Research Support Program (CRSP) in October 2009
- Overall Goal: Help the world's poorest people break out of a persistent cycle of poverty by producing and marketing high-value horticulture crops
- USAID Feed-the-Future focus countries: 12 African, 4 Asia, 4 Latin American

USAID CRSP's & NUS

- Improving Market Access for Emerging South African Rooibos Farmers
- Indigenous African Leafy Vegetables (ALV) for Enhancing Livelihood Security of Smallholder Farmers in Kenya
- Concentrated Nutritional and Economic Enhancement of Ghanaian Diets Using Orange-Fleshed Sweetpotato Products



New Global Nutrition CRSP: http://nutritioncrsp.org/

Project Background

- Title: Strengthening Indigenous Informal Seed Systems in Southeast Asia
- Team: NGO-University Partnership
  - ECHO Asia Impact Center (Chiang Mai, Thailand)
  - Wholistic Development Organization (Phnom Penh, Cambodia)
  - Upland Holistic Development Project (Mai Ai, Thailand)
  - Maejo University (San Sai, Thailand)
  - Penn State University (University Park, USA)
- 1-Year Exploratory Project: Oct. 2011-Sept. 2012

Strengthening Indigenous Informal Seed Systems in Southeast Asia

- Indo-Burma region (including Northern Thailand) identified as one of the world's "Biodiversity Hotspots" in need of conservation (Myers, et. al., 2000, Nature 403: 853-858.)

Map source: http://www.freeworldmaps.net/asia/thailand/

Strengthening Indigenous Informal Seed Systems in Southeast Asia

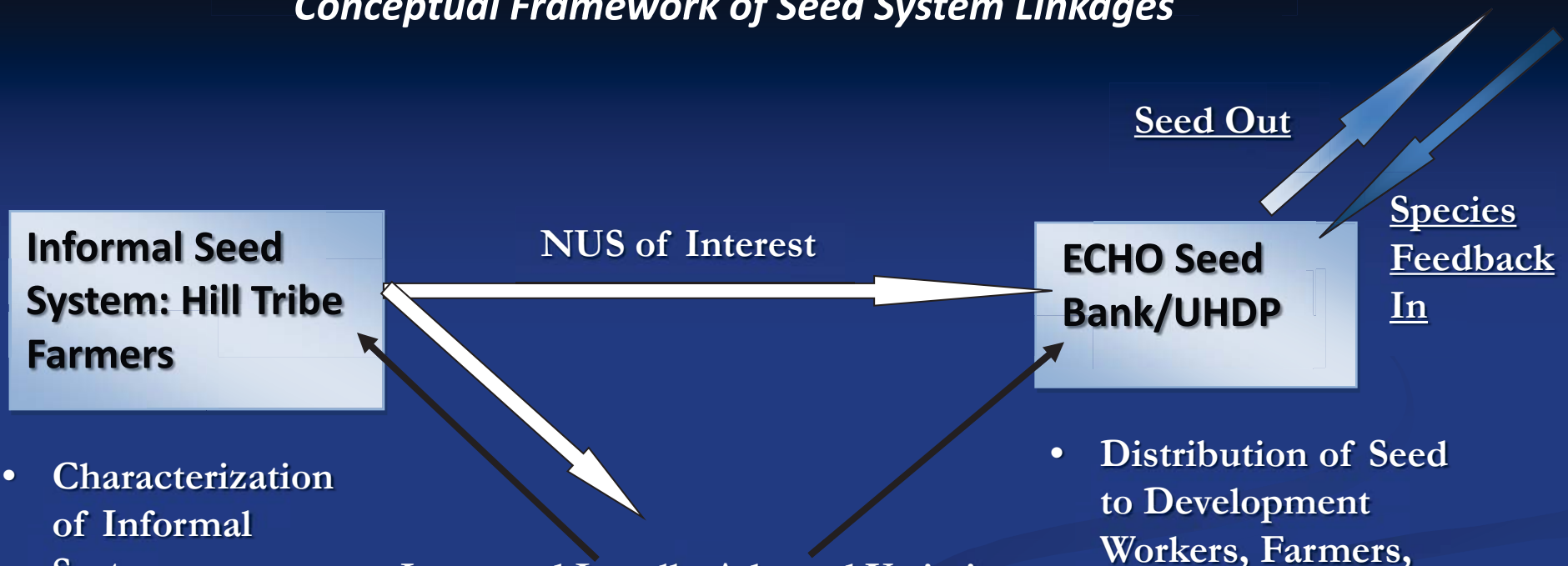
- Project Goal: Increase the impact and reach of informal seed systems locally and regionally
- Objectives and Methods:
  - Develop team/strategy focused on strengthening the informal seed system, including the conservation of knowledge surrounding that system (System vs. component-focused)
  - Survey key underutilized crops and collect local crop knowledge
  - Activities promoting emergence of effective regional seed bank, including training of key personnel, and seed storage trials
  - Develop seed-focused training meetings and seed exchanges
  - Improve human and institutional capacity, strategically focused on entrepreneurial women

Project Background: Strengthening Informal Seed Systems in Southeast Asia

- Specific Project Approach:
  - Methodologies for Strengthening Informal Indigenous Vegetable Seed Systems in Northern Thailand and Cambodia
  - 1st International ISHS Symposium on "Sustainable Vegetable Production in South East Asia", Indonesia, 13-17 March 2011; Acta Horticulturae (Abram Bicksler et al.)
- General Strategy:
  - Linking an innovative, NGO-based seed bank to the local, informal seed system, & supporting this relationship via an NGO-University partnership
  - 1-month in each of three village clusters

Strengthening Informal Seed Systems

Conceptual Framework of Seed System Linkages



- Characterization of Informal System
- Analysis of Harvest, Storage & Distribution
- Identification of Bottlenecks & Constraints to Value-Chain Development

- Crop Improvement Activities
- Applied Research Focused on Farmer-Identified Seed Topics

- Distribution of Seed to Development Workers, Farmers, Agencies
- Collection of Feedback on Species Performance
- Seed Stock Increase
- Training and Development

Preliminary/Potential Outcomes and Impacts

Seed System Inventories & Research

- Identification & compilation of key underutilized annual/perennial vegetables
- Thus far, 95 accessions from (3) village clusters for seed germ. experiments & evaluation
- Capitalizing on genetic variability (Ex. Lablab purpureus)
- Value of perennial species used as vegetables

Seed System Inventories & Research

Table 1. Partial list of underutilized but regionally important annual and perennial species often consumed as vegetables in hill tribe communities of northern Thailand. These species are rarely used as vegetables outside the research focus area.

Family	Scientific Name	Common Name	Thai Name (ภาษาไทย)	Edible Portion
Perennials				
Araceae	*Lasia spinosa*	spiny vegetable	phak naam/ผักหนาม	stems
Araliaceae	*Trevesia palmata*	snowflake tree	tang luang/ต้างหลวง	shoots/flowers
Arecacea	*Caryota mitis*	fish tail palm	tao rang daeng/เต่าร้างแดง	inner core (heart)
Asclepiadaceae	*Gymnema inodorum*	chiang daa	chiang daa/เชียงดา	shoots
Bignoniaceae	*Oroxylum indicum*	indian trumpet	pheka/เพกา	flowers/pods
Fabaceae	*Acacia concinna*	shikakai	sompoi/ส้มป่อย	shoots/flowers/pods
Moraceae	*Broussonetia kurzii*	mulberry leaf	salae/สะแล	fruit/young leaves
Moraceae	*Ficus racemosa*	cluster fig	madeua kliang/มะเดื่อเกลี้ยง	leaf shoots
Moraceae	*Ficus virens*	red shoot fig	phak hued/ผักเฮือด	leaf shoots
Verbenaceae	*Clerodendrum glandulosum*	clerodendrum	nang yaem pa/นางแย้มป่า	leaf shoots
Annuals				
Amaranthaceae	*Celosia argentea*	celosia/cockscomb	dawk ngawn kai/ดอกหงอนไก่	shoots/flowers

Underutilized perennial species and ecosystem sustainability

Seed System Inventories & Research

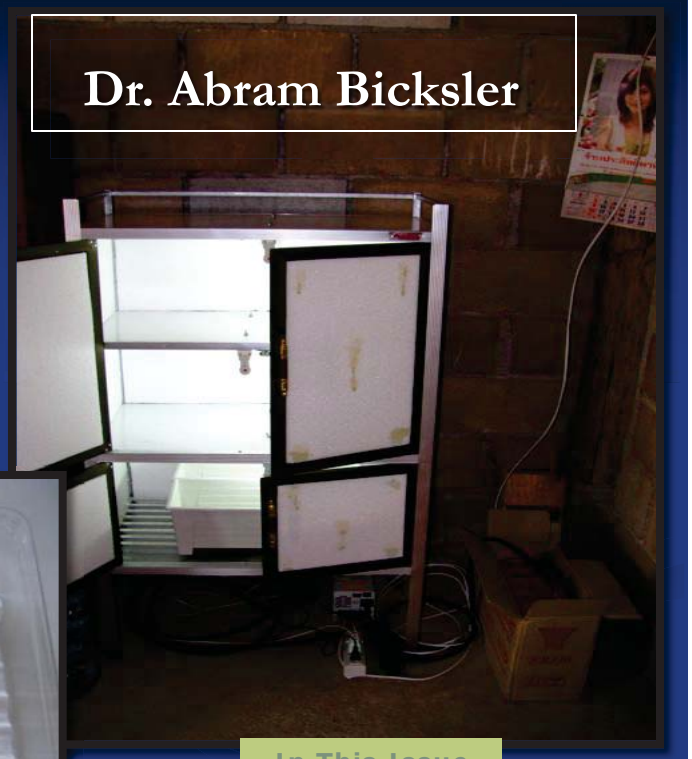
- Development of germplasm maps, identification of key "gatekeepers" in village clusters, seed distribution information
  - Importance of gender
  - Limited geographic distribution

Seed System Inventories & Research

- Inventory of seed harvest and storage practices

Seed System Inventories & Research

- Development of low cost seed germination cabinet for viability testing
- Seed germination and vigor trials



ECHO Asia Note 8.0

January 2011 Issue 8

In This Issue

ECHO Asia Notes

A Regional Supplement to ECHO Development Notes

Seed Exchange & Education

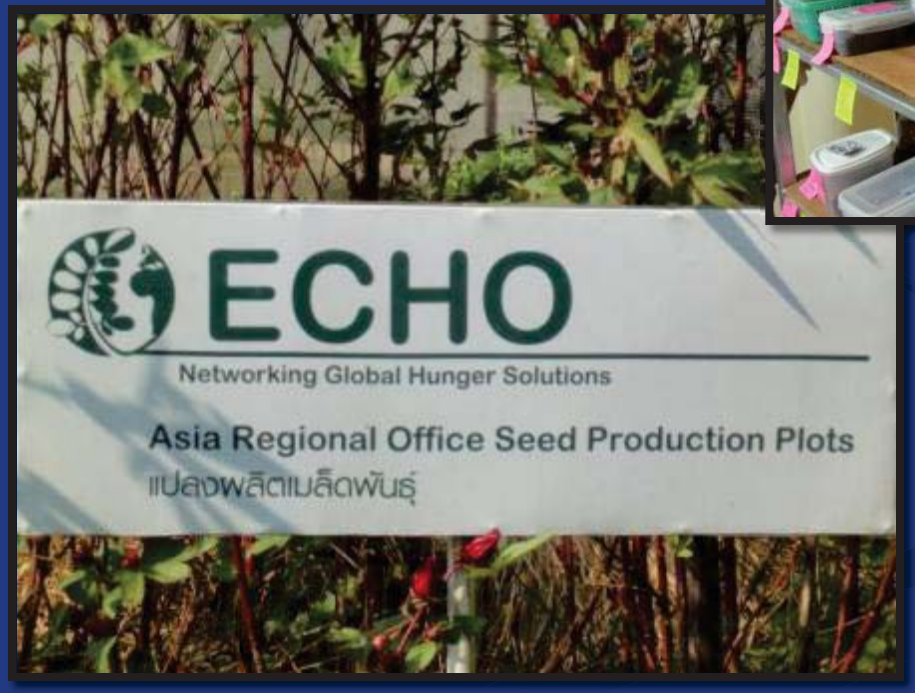
- Regional seed fairs & training
  - Empowering tool: catalyst to self-organize; demonstrated "control" of local seed system
  - Improved seed exchange of locally-adapted and "new" species
  - New interactions between villages, socio-economic groups
  - Knowledge and linkages improved

Capacity Building

- Human capital

Capacity Building

- Institutional capacity



Species Improvement & Value Chain Development

- Vegetable Fern (*Diplazium esculentum*)
  - Market-driven, science-based

Observations & Conclusions

Observations & Conclusions

While the informal seed system is important to smallholder farmers in northern Thailand & Cambodia, certain constraints and bottlenecks exist within the system:

- Wide range of seed handling practices leads to sometimes variable seed quality
- Limited local and regional distribution of underutilized species
- Potential difficulty scaling up production of selected species; ex. land ownership issues
- Limited interaction with formal seed system; diminished access to improved varieties

Observations & Conclusions

Some studies indicate that Farmer Seed Enterprises (FSEs) positively impact certain problems associated with seed supply bottlenecks (David, 2004). However, FSEs may face several initial challenges:

- May lack capacity for education and training
- May not have infrastructure required to store larger seed stocks and maintain seed quality
- May not have institutional capacity for research, evaluation and/or value chain development
- May lack economic sustainability

Observations & Conclusions

The model presented here, linking the informal seed system with an NGO/seed bank, along with broader support of universities, is versatile and has certain advantages. It might also be seen as a temporary, or intermediate step, in the development of economically and institutionally sustainable Farmer Seed Enterprises.

Benefits of NGO-Seed Bank-Farmer Linkages:

- Provide opportunities for human and institutional capacity building
- Extend the distribution and impact of high quality, locally-adapted seed of underutilized species to local farmers and regional NGO and GO development workers
- Offer new economic opportunities for local farmers (esp. women entrepreneurs)
- May accelerate the pace by which local farmers mobilize and self-organize

Observations & Conclusions

- Lessons learned in northern Thailand & Cambodia
  - Spend adequate time in the communities, esp. for survey work
  - Talk to the farmers
  - Include women from the beginning and at all levels
  - Capitalize on partnerships and networks
  - Adopt a multidisciplinary approach, involving practitioners with diverse backgrounds (engineers, social scientists, evaluation specialists)
- More work needed….
  - Economic aspects of community-based seed enterprises
  - Evaluate appropriate technology to improve seed quality under challenging conditions

Seven Factors Affecting the Success of NGO-University Partnerships in Agric. Development

1) Science, technology & innovation
2) Timing & planning
3) Collaboration & cooperation
4) Private incentives
5) Community involvement
6) Experimentation & evolution
7) Leadership & dedication

Resources

Crops For the Future:
http://www.cropsforthefuture.org/

Global Horticulture Assessment:
http://pdf.usaid.gov/pdf_docs/PNADH769.pdf

Platform for Agrobiodiversity Research:
http://agrobiodiversityplatform.org/

Biodiversity International:
http://www.bioversityinternational.org/

Horticulture CRSP:
http://hortcrsp.ucdavis.edu/

Map source: http://www.freeworldmaps.net/asia/thailand/

Thank You

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