Identifying, Preserving, & Promoting Neglected & Underutilized Species

Cambodia Seed Saving Workshop

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ECHO Asia Impact Center

OVERVIEW

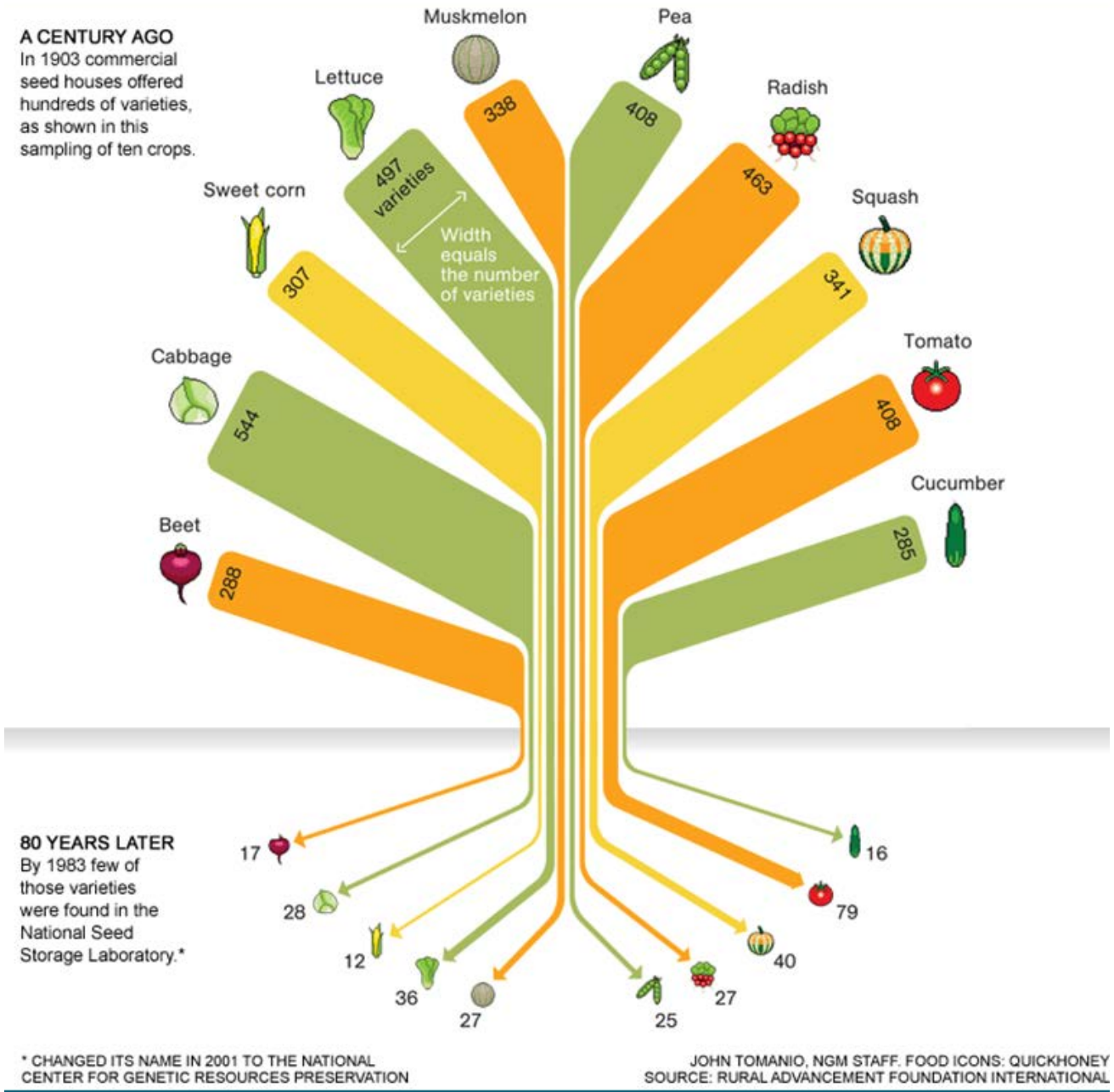
- Plant Biodiversity
- Local Seed Systems
- Introduction to Neglected & Underutilized Species (NUS)
- Identifying NUS In Your Area
- Field Work
- NUS Plant Profiles
- NUS Resources
- Opportunities & Challenges


DIMINISHING PLANT BIODIVERSITY

Diminishing Plant Species Biodiversity

- 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 Plant 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.

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 and 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, 2011

A Narrowing Pool of Global Food Crops

- Only 30 species provide 95 percent of our food energy needs.
- Of these, three crops – wheat, maize, and rice, provide over half of the world's food energy needs.
- Is it realistic to expect to feed a population of more than 6 billion people, which is expected to rise to more than 9 billion within 40 years, from a base of only 30 crop species?

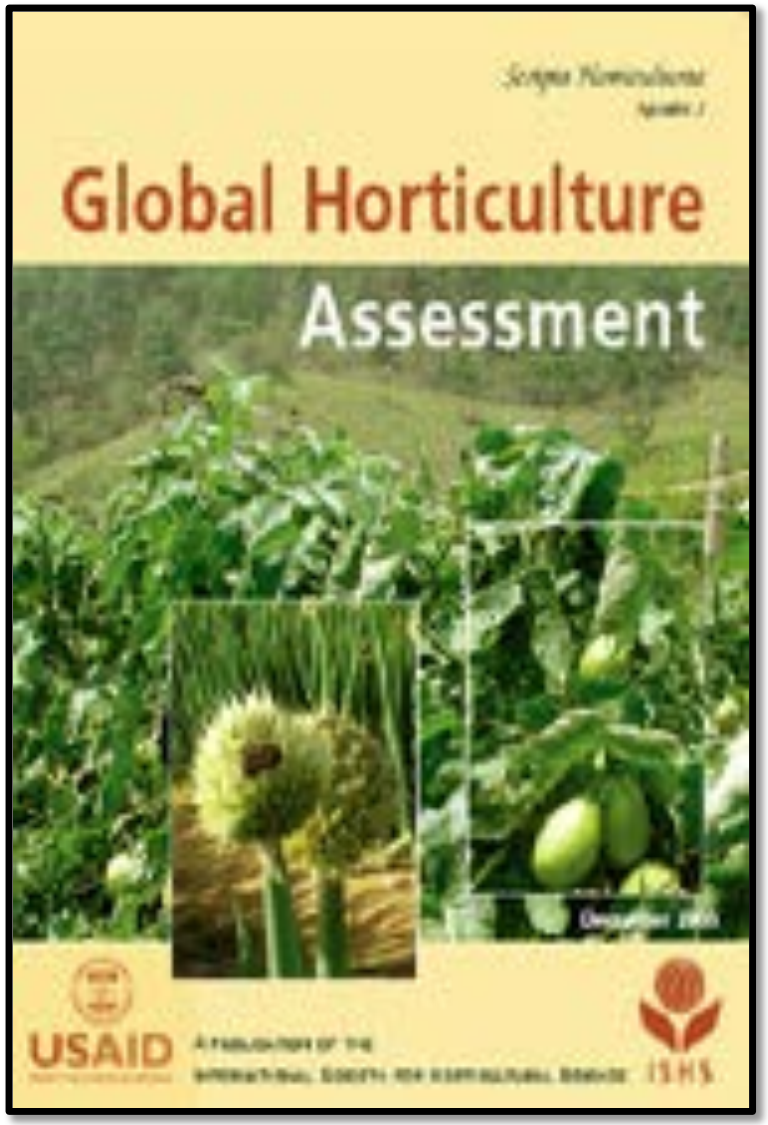
(Hart, 2007)


What Can Be Done?

LOCAL SEED SYSTEMS

Global Horticulture Assessment (2005)

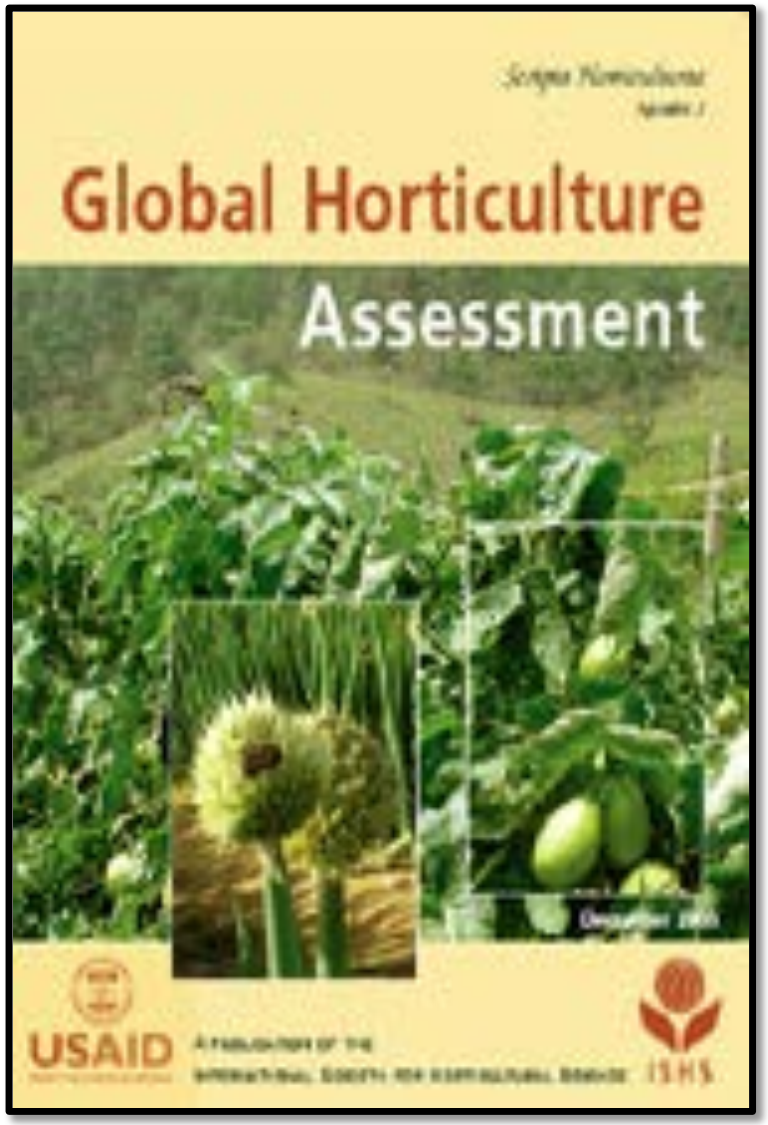
- Analysis of opportunities & challenges for global horticulture development.
- 750 participants in 60 countries.
- Result: priority listing for a horticulture and capacity building agenda; basis for USAID's portfolio in global horticulture development.
- Identified constraints to the growth of horticulture development worldwide, within 8 broad themes.



Global Horticulture Assessment (2005)

- Theme #3: “Genetic Resource Conservation and Development.”
- “Development of high-quality 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 (Alemkinders 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 with multiple varieties adapted to specific production systems and microclimates.
- Provides seed/food security during instability, natural disaster, climate change.

INTRODUCTION TO NEGLECTED & UNDERUTILIZED SPECIES (NUS)

Neglected & Underutilized Species (NUS)

Neglected & Underutilized Species (NUS)

- Definition of underutilized crops – “Species with underexploited potential for contributing to food security, nutrition, health, income generation, and environmental services” (FAO-2007).

- Also known as: neglected, minor, lost, promising, alternative, and traditional (Hart, 2007)

- But regarded as underutilized by whom?

Neglected & Underutilized Species (NUS)

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

Why Might a Crop by NUS?

- Limited range of growth (e.g. particular growth requirements)
- Limited recognition
- Products not as able to be transported or processed as wheat, corn, or rice for distribution
- Edible portions inconvenient to access (e.g. edible hearts of rattan shoots are cloaked in thorny stems)

Why Might a Crop by NUS?

- Nutritional issues and toxins require special processing
  - High oxalates (taro leaves and stems)
  - Cyanide compounds (Chaya, cassava leaves and tubers)
- Not widely considered as palatable (bitter, astringent)

Wise Use of NUS Can:

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

Write some examples of NUS from your area?

IDENTIFYING NUS IN YOUR AREA

Should You Consider Promoting NUS in Your Focus Area?

- Is food security an issue for any specific communities within particular locations/ecosystems in your focus area?
- Are the constraints in accessing food or food-producing crops?
- Are there any environmental factors negatively affecting local food production?
- Are there many alternative crop options available, especially for family food security?

Are there NUS of Interest Already in Your Focus Area?

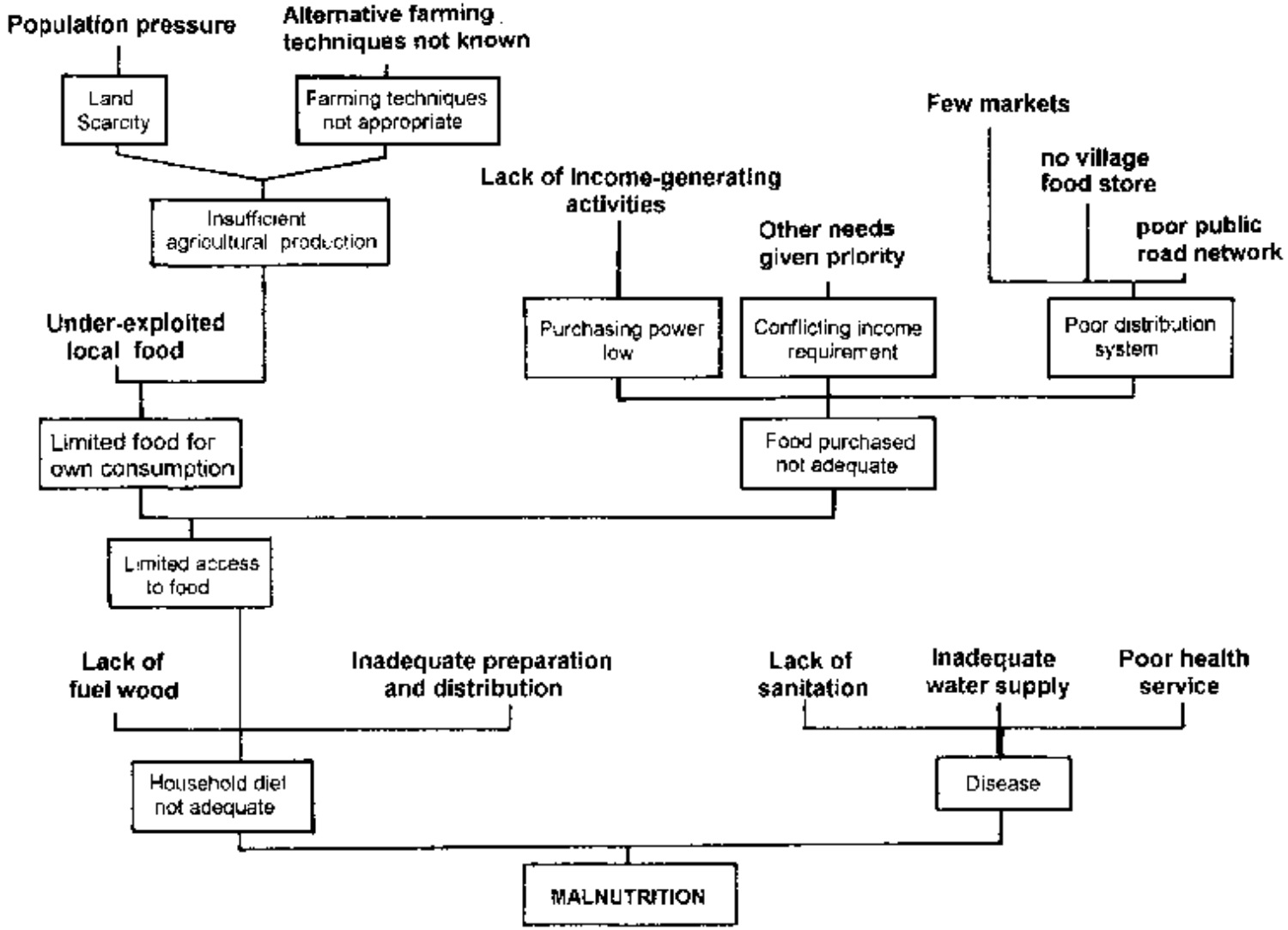
- How might you locate them?
- How might you understand their role in local nutrition and in the economy?
- Are they very common among a small population or region but unknown beyond?
- Are they widespread but still considered minor?
- Where can you locate scientific information about these crops?

Are There Possible Non-Local NUS That Might Be Useful and Appropriate for Your Focus Area?

- Are there any particular non-local underutilized crops that might grow well under local environmental conditions?
- Would such crops be adopted by local growers and consumers?
- How might these crops be located, imported, and evaluated?

*Introducing plant species

Understanding Local Food Security: Getting to the Root of the Problem



Problem and Solution Trees (PRA Technique)


FIELD WORK

Market Surveys

With knowledgeable persons, survey local markets to determine the availability of different types of major crops as well as underutilized crops.

mountain date palm - *Phoenix loureiroi*

Surveying Local Foods and Ingredients

- Talk with families, especially the cooks, to determine what is being consumed locally.
- Food preferences are difficult, if not impossible, to change. For example, in parts of SE Asia, dairy foods are non traditional and not likely to be widely consumed or particularly welcomed. But new types of leafy greens may gain acceptance fairly readily (although diets are already quite rich in leafy greens).

Farm and Garden Surveys

Local farmers and gardeners will be your most valuable resources in determining which underutilized crops are being grown; and whether any new crops might be useful or welcome.

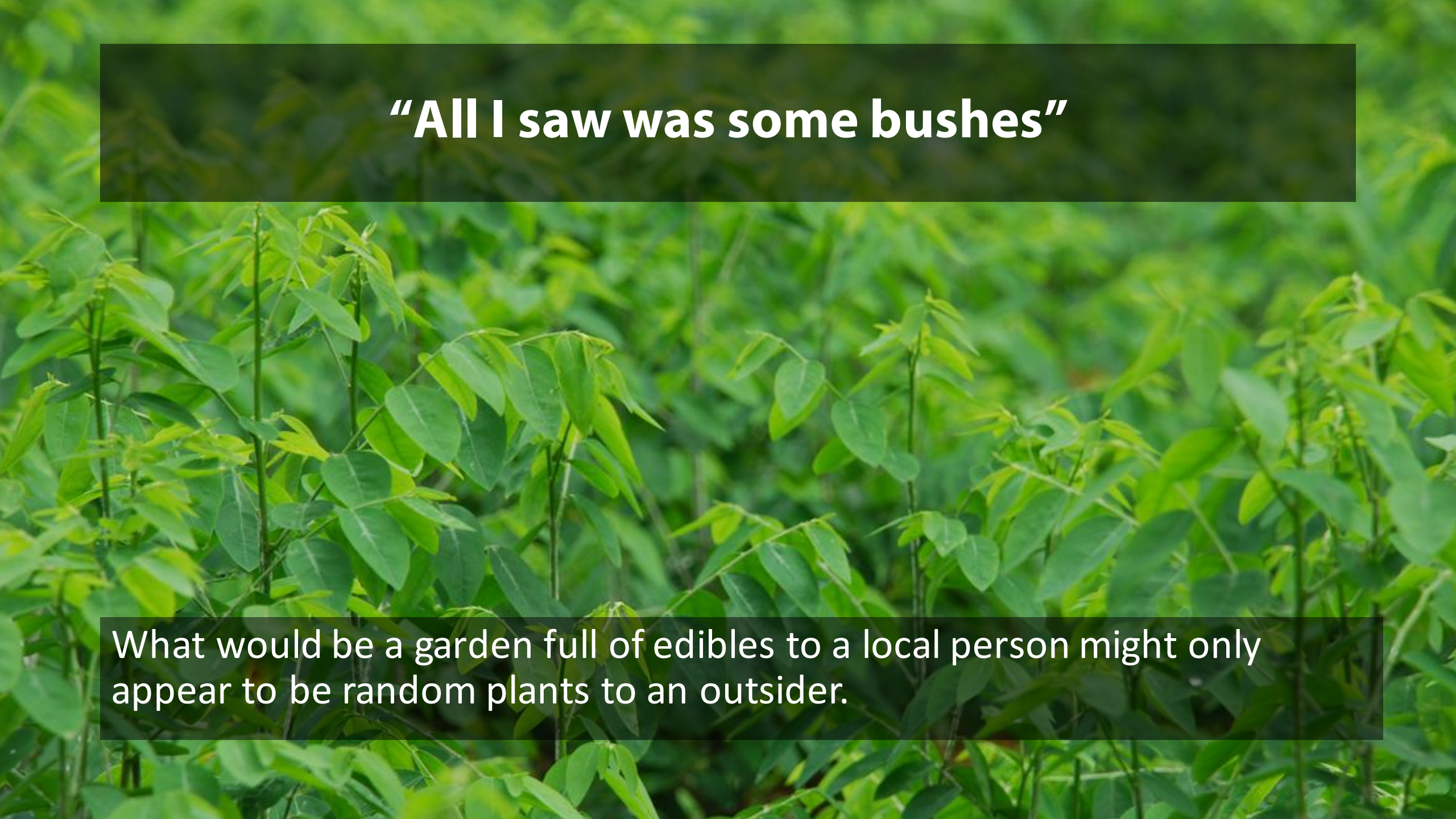
Swapping Seeds

Informal seed sharing or organized seed fairs are great ways to both inventory seeds of possible underutilized crops and to access such plant material for promotion among other farmers.

Avoiding Misinterpretation in the Field

Possible flawed assumptions by outside development workers and experts:

- There are no really viable local crops (otherwise, why is the local population so poor, underfed, etc.?)
- Local food sources are generally inferior and must be replaced.
- Locals do not garden ("We saw no vegetables growing around their homes.")



“All I saw was some bushes”

What would be a garden full of edibles to a local person might only appear to be random plants to an outsider.

Community-Based Surveys

Rely on persons with local knowledge to help interpret the information.

Is it a Wild Food, a Crop, or Both?

- An estimated 1.6 billion people rely on forests for their livelihoods (FAO).
- Wild foods, from forests, swamps, lakes, and streams are a key component of diets throughout the developing world.
- Some of these foods are also semi-domesticated, being grown in farms, gardens, and waterways.
- Surveys may need to determine if such foods are only found in the wild or perhaps cultivated.
- Development projects might explore the possibility of promoting certain wild foods for cultivation.


NUS PLANT PROFILES

The leaves

Acacia pennata, known locally as *cha-om* or *pak lat*, is another common source of leafy vegetables. Tender leaf shoots are produced over much of the year, also providing greens during the dry months.

The leaves

Acacia pennata leaf shoots are commonly produced in home gardens and easily located in markets. They are usually eaten as raw dipping vegetables, fried with eggs or cooked in curries.

The leaves

Known elsewhere as katuk, *Sauropus androgynus* is called *pak wan* (sweet vegetable) in Thailand where it is indigenous. The shoots of katuk are produced throughout much of the year, particularly with the availability of moisture. One productive bush can offer several edible shoots at a time.

The leaves

Katuk leaves are sometimes eaten raw but generally cooked in various ways, such as stir fries and curries. Katuk is considered a nourishing food, often consumed by women following childbirth.

The leaves

Another northern Thai native, the multi-purpose kassod tree (*Senna siamea*) has edible leaf tips.

Valued for firewood as well as its edible leaves, kassod tree is commonly planted along roadsides.

The leaves

Mainly a key ingredient in certain curries, kassod leaves can be found in local markets both fresh…

…and boiled.

The leaves

Another indigenous forest species found throughout northern Thailand, the bushy *Clerodendrum glandulosum (pagoda flower),* is sometimes included in home gardens.

Its tender young leaves are available most of the year and are blanched for dipping.

The leaves

Bauhinia purpurea (butterfly tree)
is a naturalized species valued both as an ornamental and a source of greens.

Sold here in with a mix of mushrooms, *Bauhinia* leaf tips are steamed or blanched for dipping or curried.

The leaves

Tamarind (*Tamarind indica*) grows throughout the tropics and is valued in northern Thailand, as elsewhere, for its pulpy pods.

Additionally, the tender leaf shoots and flowers are added to soups as well as curries for a sour flavor.

The leaves

Mango (*Mangifera indica*) is one of the most common fruit trees of northern Thailand. New, tender, raw leaves produced during the mid-late dry season are used to dip pepper sauces, larb (a dry curry) or added to salads.

The Leaves

A non-woody perennial, *pak nam* (*Lasia spinosa*) grows in moist places such as creek banks.

Harvested year round in the wild or semi-nurtured on farm wetlands, the leaves and stems of *pak nam* (Thai for “spiny vegetable”) are blanched for dipping and included in curries. It is sometimes found in local markets.

The leaves

A clump of fiddlehead fern in a home garden.

Fiddlehead fern (*Athyrium esculentum*) is an another herbaceous perennial native to northern Thailand. Commonly found in the wild along stream banks, this fern is also cultivated as a minor crop.

The tender shoots and fronds are stir fried, curried and blanched or eaten raw as a dipping vegetable.

Edible fiddlehead fern shoots and fronds.

The leaves

Leaf pepper (*piper sarmentosum*), also a non-woody perennial indigenous to the forests of Thailand, is valued as both a food source and an ornamental ground cover.

Fresh leaves in the market

The tender new leaves of this non-climbing pepper are eaten raw as a dipping vegetable or used as an edible wrapper for a local treat called *miang kham.* They're also added to curries.

miang kham

The flowers

Snowflake tree foliage

The indigenous snowflake tree (*Trevesia palmata*) grows naturally in moist forest, but also thrives in home gardens.

Edible snowflake tree flowers.

Although the small tree produces edible young leaves, which are produced year round, the snowflake tree is best known for edible flowers that emerge during the cold season. These are included in curries.

The flowers

Sesbania (*sesbanis grandiflora*) is not native, but has been long adopted by people in this region for its edible flowers. The white-flower variety is generally preferred over the more bitter red flower type.

Sesbania flowers are most abundant during the end of the rainy season as well as the hot season. The flowers can be steamed or blanched for dipping or included in curries.

The flowers

Certain types of banana blossoms are edible, including the Thai cooking banana (*Musa acuminata x balbisiana*) and forest banana. The blossoms are eaten raw in salads, stir fried and curried.

The flowers

Kapok tree during the dry season.

The tree cotton or kapok tree (*Bombax ceiba*) is commonly encountered along northern Thai roadsides. During the dry season the deciduous trees produce bright orange flowers.

The flowers

The fallen flowers are collected and dried, many of which are marketed.

The dried flowers go into curries and a popular noodle dish.

The flowers

During the cold season this indigenous *Bauhinia* (*Bauhinia variegata*) produces edible, white flowers which are consumed by some ethnic groups.

The flowers

Multi-purpose neem (*Azadirachta indica*) hails from nearby India and Burma. Apart from timber and natural insecticidal value, steamed and blanched flowers and leaf shoots are enjoyed as a dipping vegetable.

The pods

Indigenous Indian trumpet (*Oroxylum indica*) has edible pods and flowers. Its tender young pods are harvested in the late rainy and early cold seasons and are roasted over a flame to remove the tough outer layer. The inner portion of the pod can be used to dip pepper sauce and larb. Otherwise, it is added to salads, fried with pork or curried.

The pods

Both tender, young pods and shoots of various naturalized *Leucaena* spp. are eaten raw as a dipping vegetable.

Hedges of *Leucaena* commonly surround home gardens in northern Thailand.

The pods

Moringa (*M. oleifera*), or drumstick tree, is another naturalized perennial vegetable. Both the tender, young pods and leaf shoots are edible with pods being available during the dry season and leaves harvestable during the rainy season.

Pods and leaf shoots are added to curries whereas leaves are steamed for dipping and also added to soups.

The shoots

Shoot of *Dendrocalamus giganteus.*

Dozens of bamboo species, most of which indigenous, are found in northern Thailand. Besides offering important construction materials, the shoots of many types of bamboo, such as giant bamboo (*Dendrocalamus giganteus*), play a major role in the local diet.

Bamboo shoots, available mainly during the rainy season, may be boiled for dipping, curried or stir fried.

Bamboo shoots for sale in the market.

The shoots

Chopping a mature shoot from a rattan clump.

Although numerous rattan species are indigenous to northern Thailand, they are increasingly rare in the wild. Most famous as canes used for weaving baskets and wicker furniture, these thorny palms also have shoots with an edible core.

The rattan shoot with the thorny bark trimmed off.

The thorny outer bark of large shoots can be trimmed off to access the core. The bitter cores are sometimes eaten raw as a dipping vegetable, roasted and added to dipping sauces or cooked in curries.

The hearts

The multi-trunk red fishtail palm (*Caryota mitis*).

Fishtail palms (*Caryota spp.*) are also native to Thailand. Though increasingly rare in the wild, the species has gained popularity as an ornamental plant.

The edible heart of red fishtail palm.

Unlike rattan palms, the fishtail palm lacks thorns. The outer bark is removed to access the sweet, edible heart that's cooked in curries.


NUS RESOURCES

Where to Start: Using What is Already Available

- The Food and Agriculture Organization (FAO) of the United Nations offers a tremendous wealth of technical resources covering a wide range of food production topics, particularly for the developing world.
- Use the search engine of the FAO homepage to locate possible resources for underutilized crops in particular regions of the world.

Where to Start: Using What is Already Available

CGAIR (Consultative Groups on International Agriculture Research) in an international organization which funds and co-ordinates research into agricultural crop breeding with the goal of "reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources."

CGAIR has a network of 15 research centers, of which those most likely to have some focus on underutilized crops include:

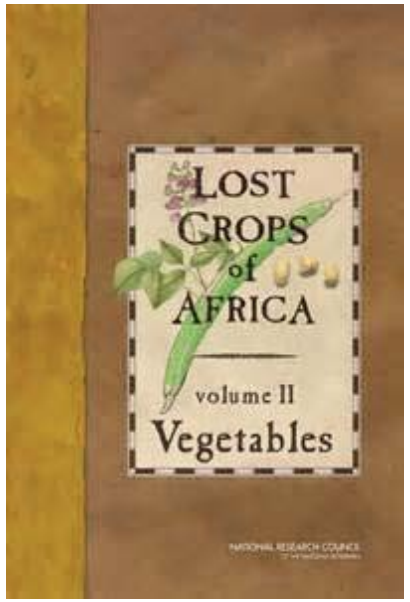
- Bioversity International
- International Center for Agricultural Research in the Dry Areas (ICARDA)
- International Center for Forestry Research (Bogor, Indonesia)
- International Crop Research Institute for the Semi-Arid Tropics
- International Center for Tropical Agirculture
- World Agroforestry Center (ICRAF)

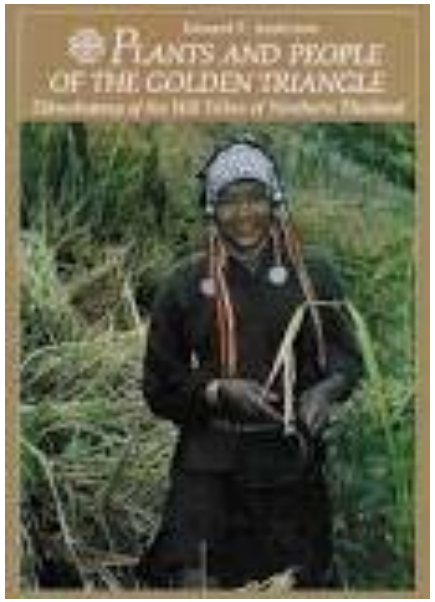
Where to Start: Using What is Already Available

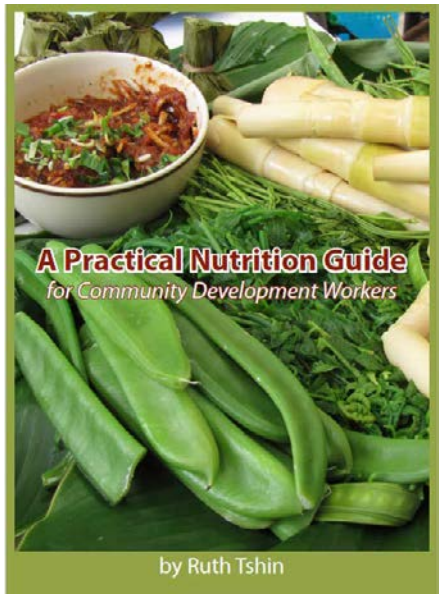
AVRDC
The World Vegetable Center

- The World Vegetable Center is committed to alleviating poverty and malnutrition in the developing world through the increased production and consumption of nutritious and health-promoting vegetables.
- Founded in 1971 with a mandate to work in tropical Asia with its headquarters campus in Taiwan open in October 1973.
- As the Center gained expertise and capacity, it expanded into sub-Saharan Africa, Central Asia, and South Asia. In 2008, the organization adopted a new name – AVRDC – The World Vegetable Center – to reflect its global scope.

Resources: Local/Regional Reference Books







Look for authoritative regional publications.

Do not forget to consult guides in local/regional languages.

Resources: Local Experts

- Regional, natural, and local contacts with underutilized crop expertise
- National or local universities
- Local governmental agencies
- Non-governmental organizations

Cambodia Department of Agriculture

ICC
INTERNATIONAL COOPERATION CAMBODIA

Royal University of Agriculture

OPPORTUNITIES & CHALLENGES

Opportunities for Identifying NUS

- Underutilized crop surveys offer a excellent chance to learn not only about local food systems but related development issues (e.g., health and nutrition, sociology, environmental status, seed saving, and sharing systems).
- Such efforts honor local farmer knowledge and contribute toward building helpful relationship.
- The learning arrangement can help law a foundation for future collaboration with regard to local agriculture development.

Challenges Related to Identifying NUS

- Surveys require significant preparation and cataloging skills as well as essential communication abilities.
- Positive identification of underutilized crops encountered in markets, kitchens, gardens, or field may be a challenge, especially with regard to language obstacles and lack of access to outside resources.
- Farmers may be suspicious of survey activities (perhaps concerned about motives related to biopiracy, religious proselytization, etc.)