



USAID
FROM THE AMERICAN PEOPLE

FEED THE FUTURE INNOVATION LAB FOR
COLLABORATIVE RESEARCH ON HORTICULTURE

UC DAVIS
UNIVERSITY OF CALIFORNIA

Horticulture Innovation Lab

We build international partnerships for fruit and vegetable research to improve livelihoods in developing countries.

Poverty and Hunger

- ▶ 1 out of every 7 people worldwide go to bed hungry every night
- ▶ 3 out of every 7 people live on less than \$2.50/day (half of these on < \$1 /day)
- ▶ World currently produces enough calories for the population
 - Poor lack money to buy food
 - Food distribution
 - Food wastage

Worldwide Food Security

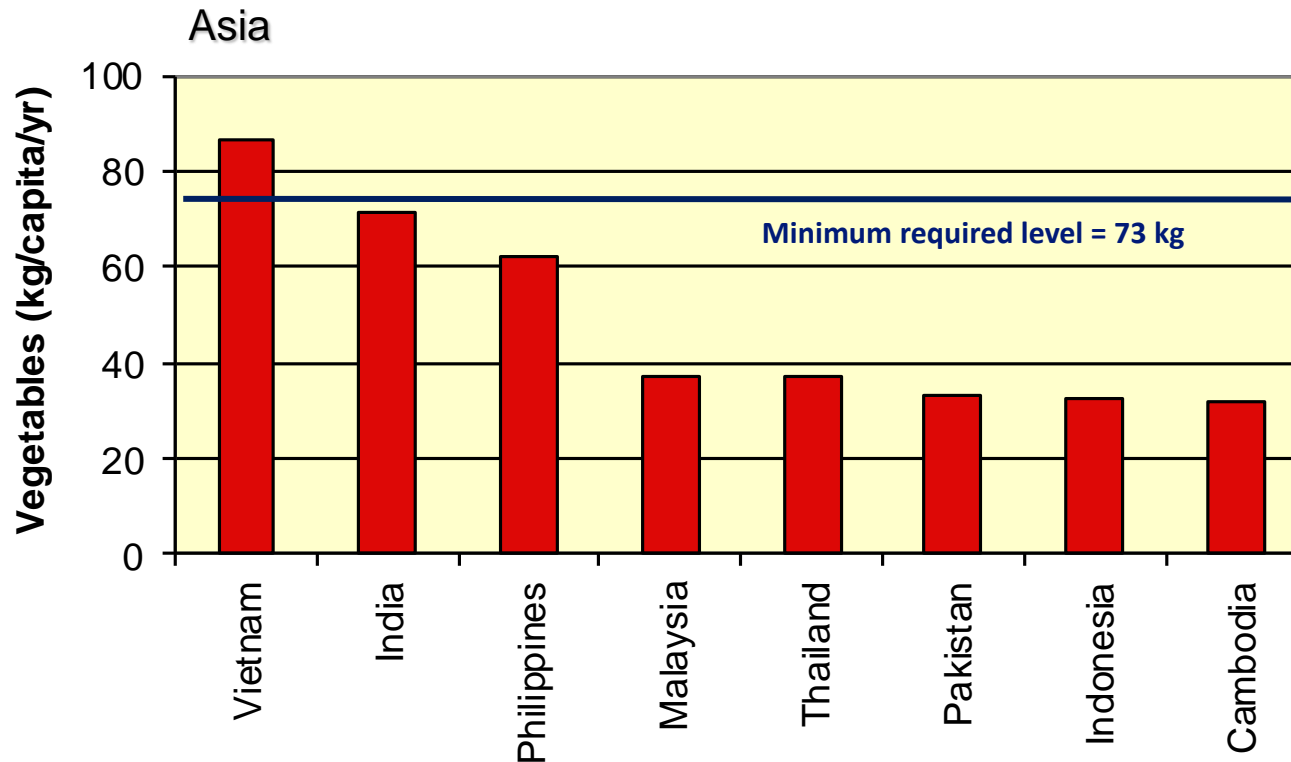
- ▶ Access to sufficient, safe, nutritious food
- ▶ Meets dietary needs for an active and healthy life
- ▶ Hidden Hunger – Malnutrition
 - 2–3.5 billion lack vitamins and minerals (28–50%)
 - Stunts the mental and physical capacity of individuals
 - Robs the poor of a healthy, productive life
- ▶ Essential to unlock potential and for human development and economic growth over time

Why Horticulture?

- ▶ High value crops – income generation and diversification
- ▶ Intensive farming on small plots possible
- ▶ Nutritional benefits of diet diversification
- ▶ Women are heavily engaged in horticulture crop production and marketing

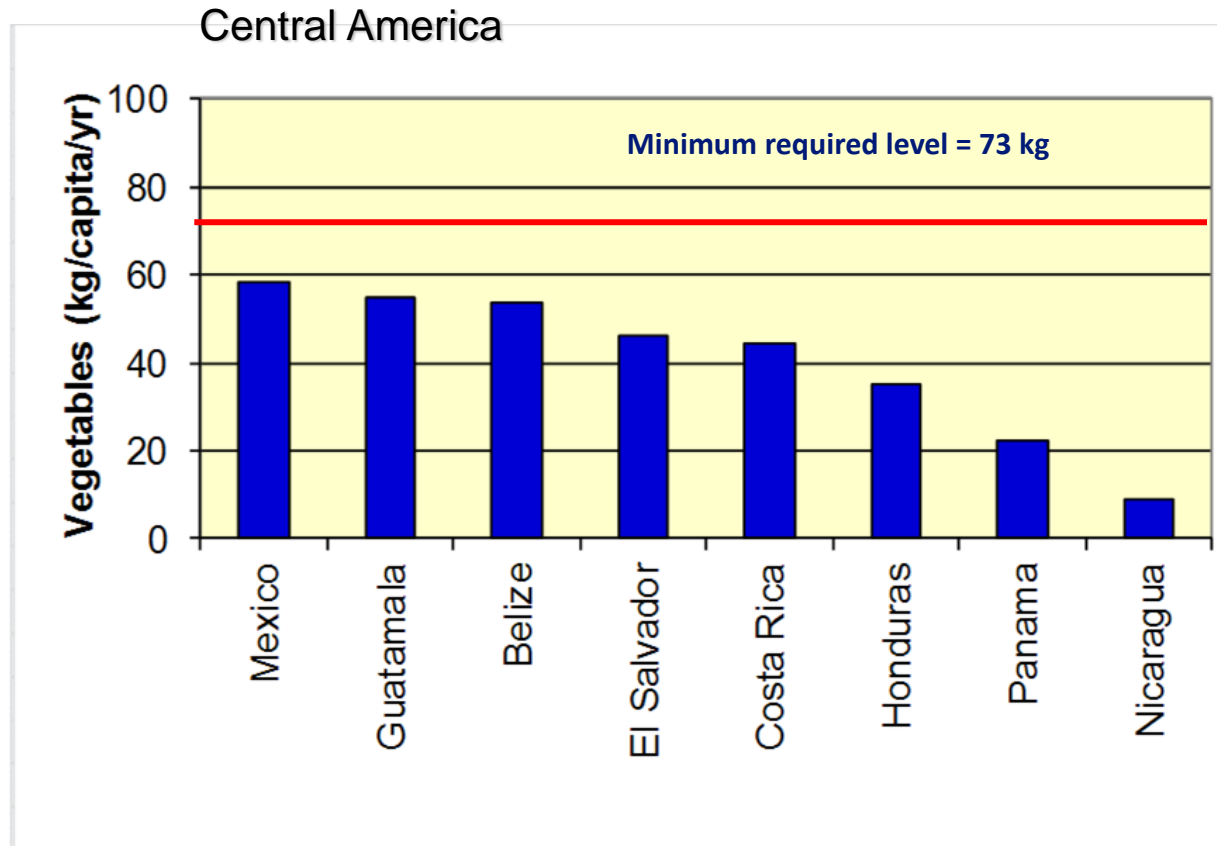


Consumption of Horticultural Products Remains Very Low in Much of the Developing World



Source: FAOSTAT, 2004. Data for 2001.

Consumption of Horticultural Products Remains Very Low in Much of the Developing World



Source: FAOSTAT, 2004. Data for 2001.

What is the Horticulture Innovation Lab?

- ▶ One of 10 USAID funded Innovation Labs for Collaborative Research
- ▶ University of California, Davis (lead), North Carolina State University, University of Florida, University of Hawaii, Manoa
- ▶ 5 year initial award + 5 year extension
- ▶ Focused on the entire value chain
 - Seed systems
 - Variety Evaluation
 - Production
 - Postharvest and Marketing



Objectives of the Horticulture Innovation Lab

- ▶ To apply research findings and technical knowledge to increase smallholders' participation in markets
- ▶ To build local scientific and technical capacity
- ▶ To facilitate the development of policies that improve local horticultural trade



Highlights from First Five Years

Partners

- ▶ Universities, NGOs, NARS, Companies, International Organizations
- ▶ 15 U.S. Universities
- ▶ 43 African Partners
- ▶ 36 Latin American Partners
- ▶ 19 Asian Partners
- ▶ 2 European Partners
- ▶ Plus, international research or development organizations



Over 35 Research Projects

- ▶ \$75,000 to \$1 mil
- ▶ Africa: Benin, Democratic Republic of the Congo, Gabon, Ghana, Kenya, Malawi, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe
- ▶ Latin America: Bolivia, Chile, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, and Peru
- ▶ South and Southeast Asia: Bangladesh, Cambodia, India, Laos, Nepal, Sri Lanka, Thailand, and Vietnam

Some Successes

- ▶ Kent Bradford (UC Davis) and collaborators tested seed drying zeolite beads and found that most vegetable seeds dried with the beads germinated better than those dried in the sun.



Some Successes

- ▶ Jim Nienhuis (UW–Madison) and partners identified tomato lines from AVRDC in Taiwan that were resistant to Central American viruses.



Some Successes

- ▶ Jim Simon (Rutgers) and partners created over \$675,000 in income and 350 jobs for farmers and agribusiness in Ghana.

Jim Simon was awarded the 2012 Research Award from BIFAD for his work with the Horticulture Innovation Lab



Some Successes

- ▶ Sally Miller (Ohio State) and colleagues developed a research-based GAP manual for tomato in Nigeria – the first of its kind and a model for future manuals.



Some Successes

- ▶ Rick Bates (Penn State) and partners characterized and stored indigenous crops while increasing indigenous seed exchanges between rural Southeast Asian villages.



Some Successes

- ▶ Stephen Weller (Purdue), Jim Simon (Rutgers) and partners evaluated African leafy vegetables and learned that these nutritious vegetables have vast market potential in western Kenya.



Regional Centers of Innovation

- ▶ Establish in recognized regional institutions
- ▶ Will become regional foci for Horticulture Innovation Lab activities
 - Training
 - Research
 - Outreach
 - Information



Regional Centers of Innovation

- ▶ Latin America and Caribbean Center
 - Zamorano University, Honduras
- ▶ Southeast Asia Center
 - Kasetsart University, Thailand
- ▶ East Africa Center
 - KARI–Thika, Kenya



Capacity Building

- ▶ Training of trainers
- ▶ Farmer trainings
- ▶ Graduate education

Trellis Fund

- ▶ Goal: link U.S. graduate students to agricultural NGOs and national research institutes in developing countries, and enable those organizations to extend new ideas to rural populations



Information Dissemination

- ▶ Horticulture Knowledge Bank
- ▶ Website: <http://horticulture.ucdavis.edu>
- ▶ Study how farmers best learn about horticultural practices

Postharvest Losses

- ▶ Only 5% of research funding has been spent to address issues of postharvest losses
- ▶ Postharvest topics are often left to the end of development projects and the project ends before they are fully addressed

Reducing Losses is Key to Sustainability and Food Security

- Investments in land, energy, seed, fertilizer, water, and labor are wasted when produce degrades before it is consumed
- To increase food security for 9 million people, reducing produce losses after harvest must be emphasized along with enhanced productivity



Causes of Postharvest Losses from Biological and Environmental Factors

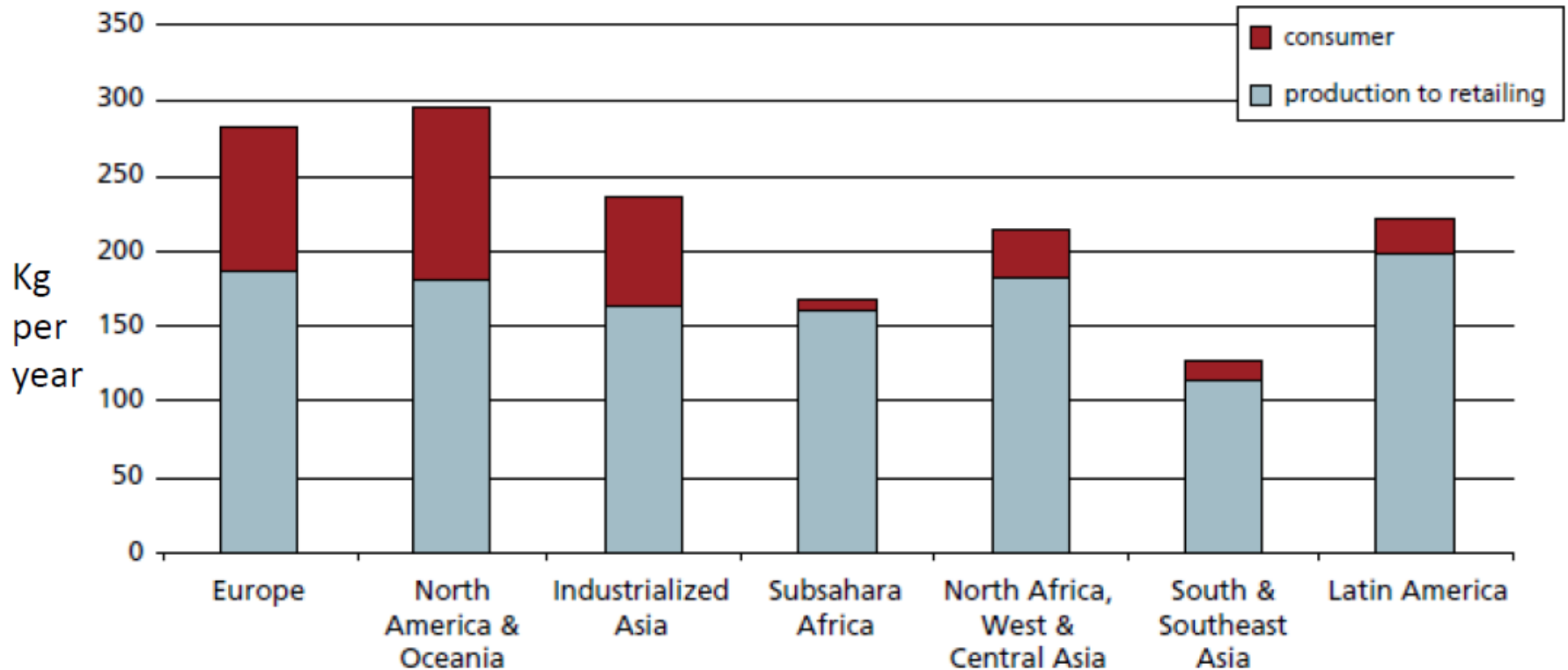
- Improper maturity/ripeness
- Poor initial quality
- Mechanical damage
- Inadequate sanitation
- Inadequate drying or dry storage
- Decay
- Improper product temperature
- Excessive water loss
- Delays between harvest & market





PHL Varies by Region (FAO; 2011)

Per capita food waste and food loss (Kg/year)



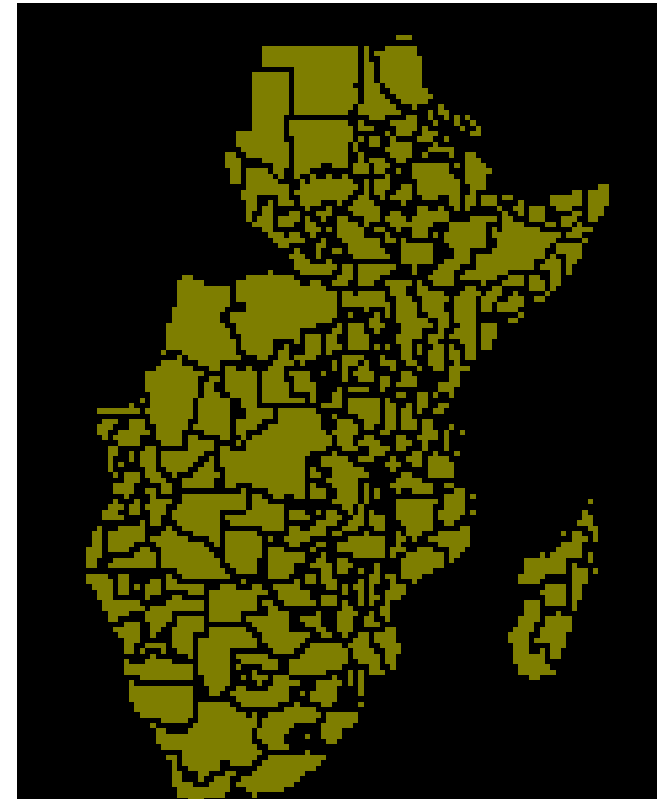
Estimated Postharvest Losses (%) of Fresh Produce in Developing vs. Developed Countries

Locations	Developed Countries		Developing Countries	
	Range	Mean	Range	Mean
From production to retail sites	2-23	12	5-50	22
At retail, foodservice, and consumer sites	5-30	20	2-20	10
Cumulative total	3.5-26.5	32	3.5-35	32

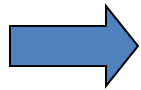


Estimated Postharvest Losses of Cereals (% of total annual production in Africa) 2008-2013

2008	15.6
2009	14.8
2010	15.2
2011	14.9
2012	15.0
2013	14.8

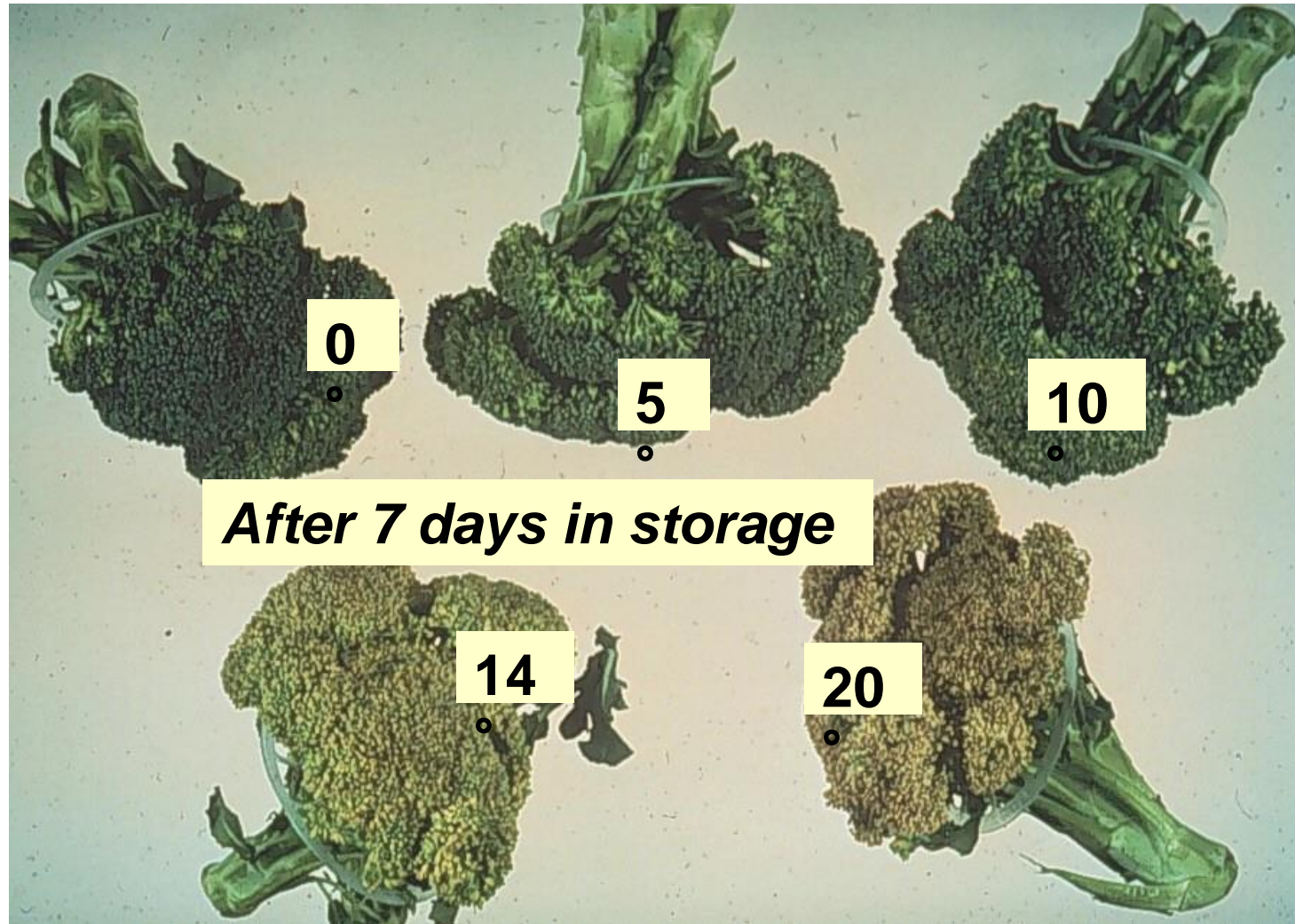


Effect of Temperature on Deterioration



Temp. °F	Temp. °C	Relative Velocity of Deterioration	Relative Shelf-life
32	0	1.0	100
50	10	3.0	33
68	20	7.5	13
86	30	15.0	7
104	40	22.5	4

Cool temperatures are key



USAID
FROM THE AMERICAN PEOPLE

HORTICULTURE
INNOVATION LAB

UC DAVIS
UNIVERSITY OF CALIFORNIA

Water Loss



How much to affect quality?
<3% no visual effect, texture
3-5% visual quality affected
>5% shrivel, lose salability

Loss of Salable Weight
Loss Fresh Appearance
Loss of Texture

Temperature Control
Appropriate Packaging



Careful handling to Reduce Injury and Reduce Decay

- **Care in harvest and handling**
 - Do not throw, squeeze, etc.
 - Avoid rough & dirty surfaces
 - Minimize product contact
- **Packaging and packing**
 - Pack gently
 - Use boxes strong enough to support weight above them
 - Do not overfill box



Wounding During Harvest and Handling



Impact Bruising

Good Packaging Essential

- Protection from damage
- Moisture barrier to reduce water loss
- Accessible/reusable



Examples of Shipping Containers Used in Developing Countries





**Policy and Trade
Issues Affect Choice
of Packaging**

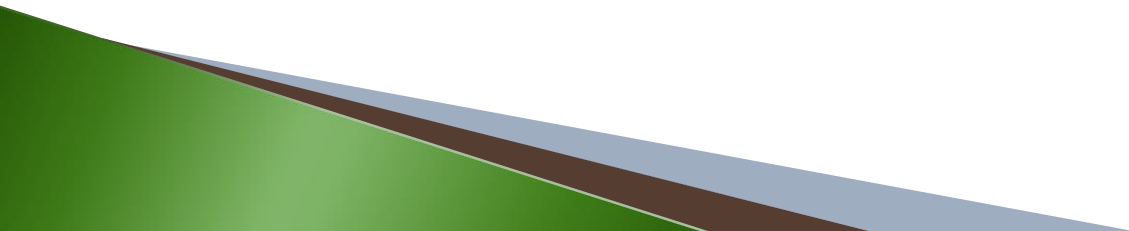
Postharvest Principles



- Select good varieties with shelf life potential
- Harvest at proper maturity
- Avoid sun exposure to reduce water loss and temps
- Cool (or dry) quickly to lowest safe temp (m.c.)
- Protect from physical damage
- Maintain cold chain (dry chain)
- Expedite marketing whenever possible

SAME for LARGE and SMALL-SCALE OPERATIONS!!

Horticulture Innovation Lab Postharvest Projects



Extension of Appropriate Post-Harvest Technology in Sub-Saharan Africa: A Postharvest Training and Services Center (PTSC)

Principal Investigators:

Diane M. Barrett, University of California – Davis

Lisa Kitinoja, World Food Logistics Organization

Rob Shewfelt, University of Georgia

Ngoni Nenguwo, AVRDC, Arusha, Tanzania

Radegunda Kessy, PTSC Manager, AVRDC

Selection of Master Trainers

Call for Nominations

```
graph TD; A[Call for Nominations] --> B[200 Applications from 10 Sub-Saharan African countries]; B --> C[PIs reviewed applications - selected top 60]; C --> D[Requested completion of Training Needs Assessment form]; D --> E[Selected top 40 to become Master Trainers];
```

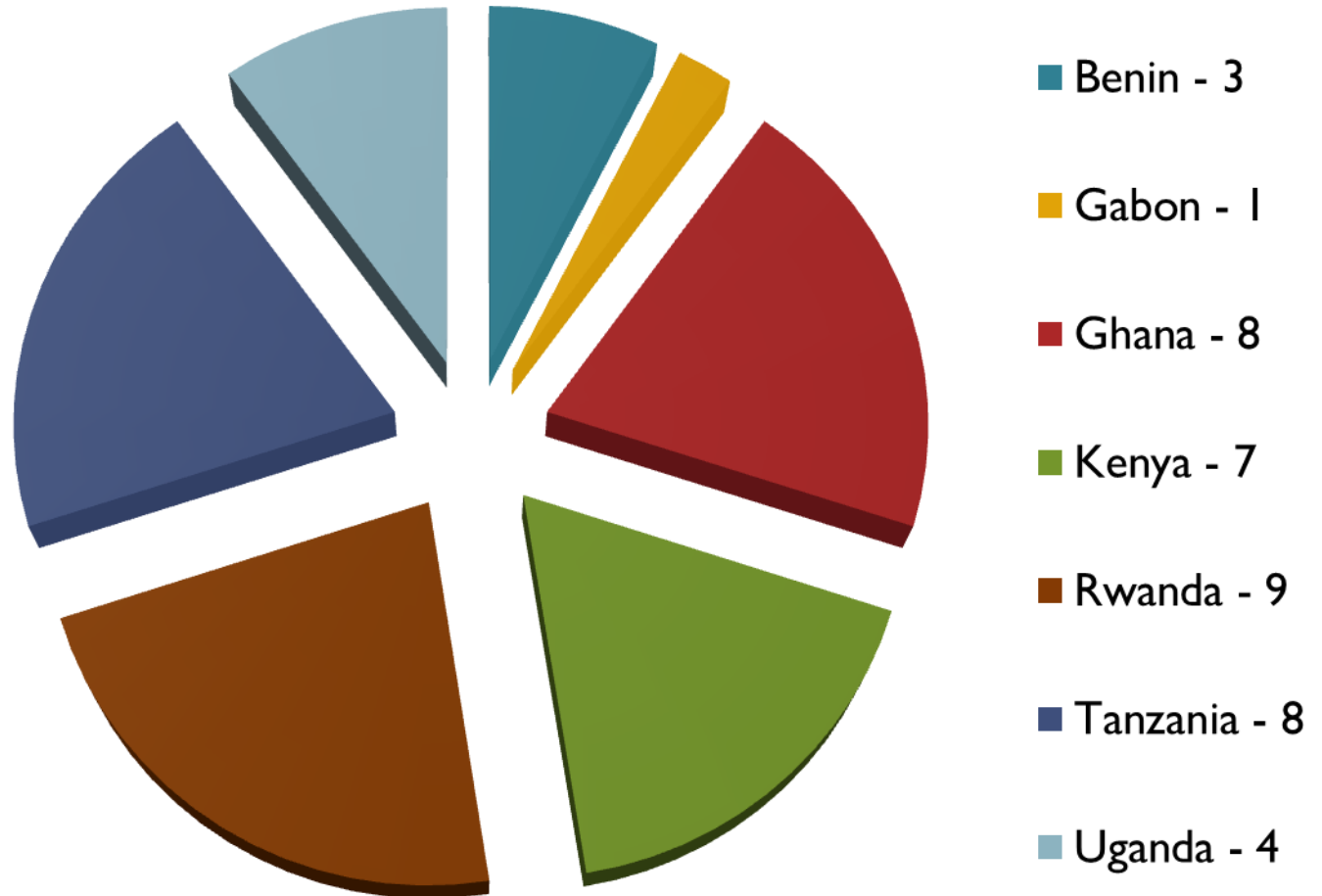
200 Applications from 10 Sub-Saharan African countries

PIs reviewed applications - selected top 60

Requested completion of Training Needs Assessment form

Selected top 40 to become Master Trainers

Countries of Master Trainers (40)



Hort CRSP Postharvest Trainers from Sub-Saharan Africa at the PTSC (Workshop #1) October 7-12, 2012



AFFO Parfait Babatoundé



Dari Linda



Noel Nekesa Makete



Pendo G. Bigambo



Tigist Tadesse Shonte



Vida Ofori



Samuel Njuguna Ndirangu



Sadoti Eustace Makwaruzi



Andrews Wiafe



Dr. Jane Ambuko



Mfashubumenyi Kizito



Merius Eleuter Nzalawahe



Francis Appiah



Christine Kasichana Masha



Esther Bernard Mwaisango



Gloria Grace Aguti

Hort CRSP Postharvest Trainers from Sub-Saharan Africa at the PTSC (Workshop #2) October 14-19, 2012



HERVE INEZA



XANFON BITALA



CHARITY GATHAMBIRI



MILDRED OSEI-KWARTENG



MUGABUSHAKA NORBERT



SAMUEL NII QUARCOO



ROBERT ODOI



KADJOGBE GUY



FRANCIS ABOAGYE NUAMAH



NANCY NJOGU



MOLLY ALLEN



ODETTE NGULU



ACHOM HARRJET OKOED



JANNE REMMY



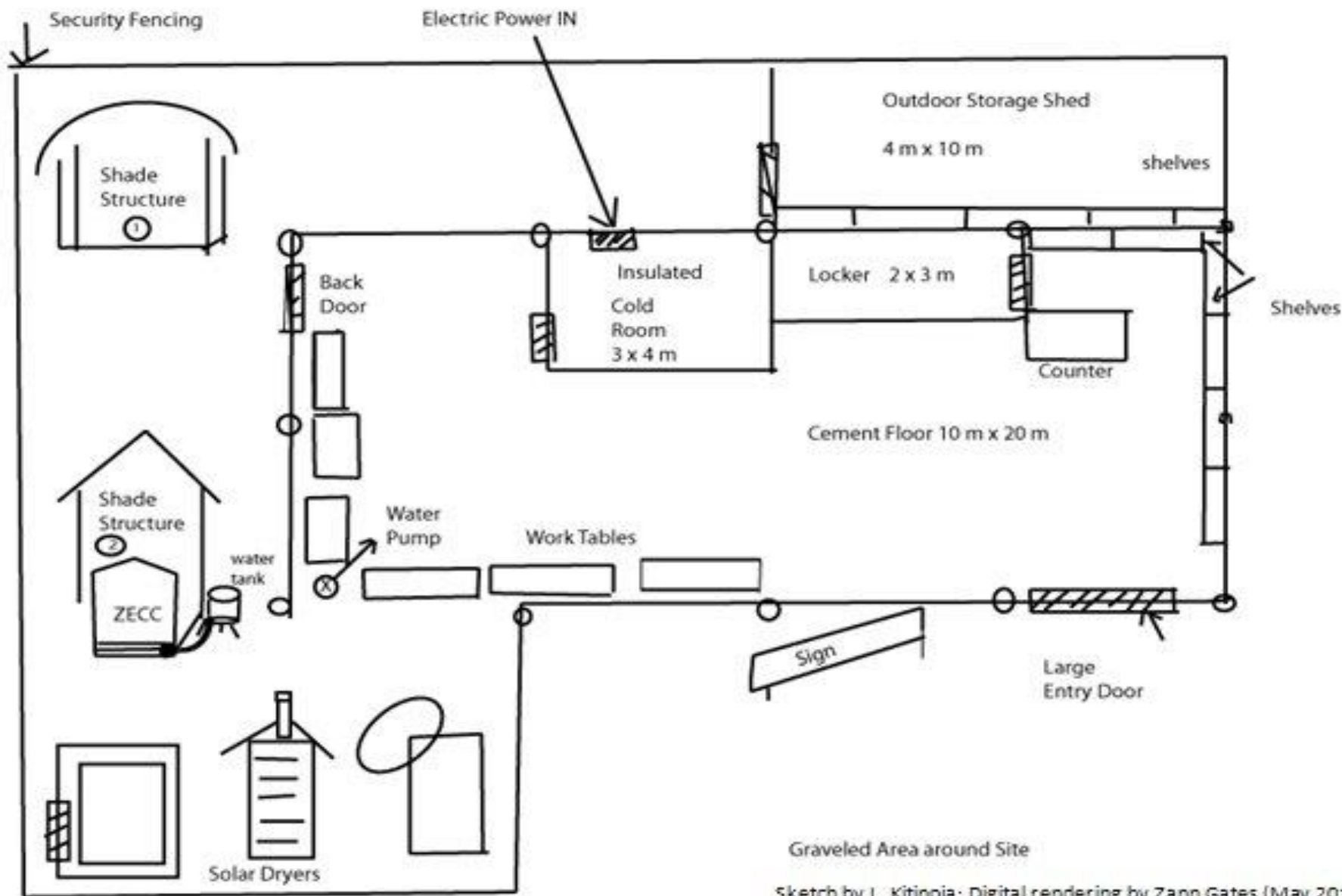
JOAN STEVEN



WALTER K. TONUUI

Model Postharvest Training and Services Center (PTSC)

 Locking Doors



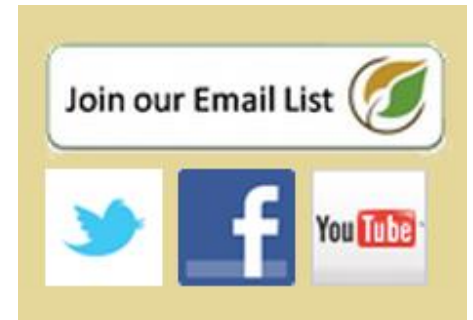
Sketch by L. Kitinoja; Digital rendering by Zann Gates (May 2011)

Postharvest Technology Center

<http://postharvest.ucdavis.edu>

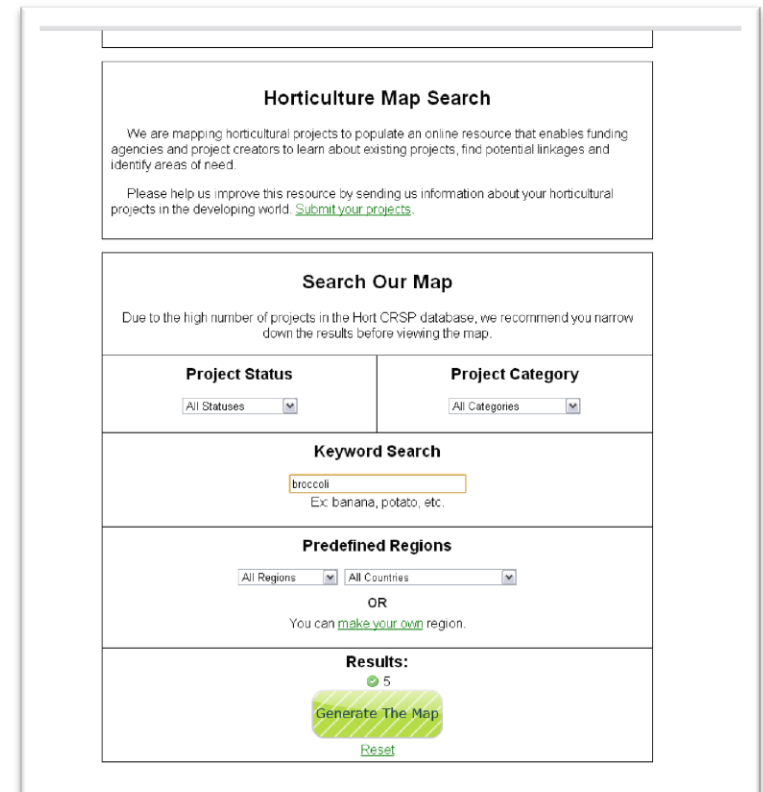
Connect with the Horticulture Innovation Lab

- ▶ Visit our website
- ▶ Visit our Regional Centers
- ▶ View Short Videos on YouTube
- ▶ Find a Collaborator/Become a Collaborator
- ▶ Connect on Twitter or Facebook



Add Your Projects to the Map

- ▶ Currently 1 870 projects listed in more than 150 countries with a website or email link





USAID
FROM THE AMERICAN PEOPLE

FEED THE FUTURE INNOVATION LAB FOR
COLLABORATIVE RESEARCH ON HORTICULTURE

UC DAVIS
UNIVERSITY OF CALIFORNIA

Thank you!!

For more information:

<http://horticulture.ucdavis.edu>

