





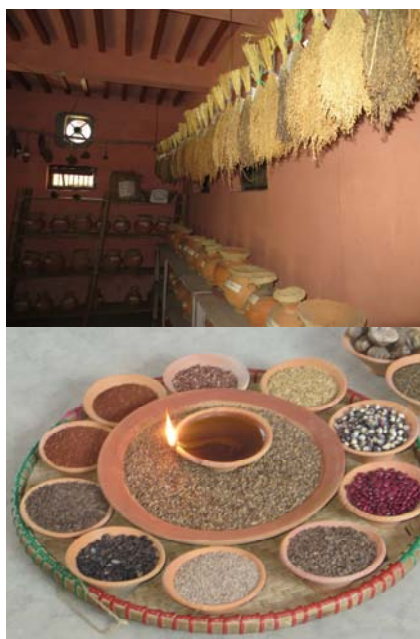
**Community Seed Banking: Appropriate Practices and Solutions for Food Security**

**Bhuwon Sthapit**

6-9 October 2015, Chiang Mai, Thailand

## Outline

- ✓ Global challenges
- ✓ Biodiversity Initiatives
- ✓ Theory
  - seed systems,
  - farmer seed networks and sources,
  - evolutionary breeding,
  - resilience
- ✓ Misconceptions
- ✓ Case studies and gaps
- ✓ Roles and links
- ✓ A way forward

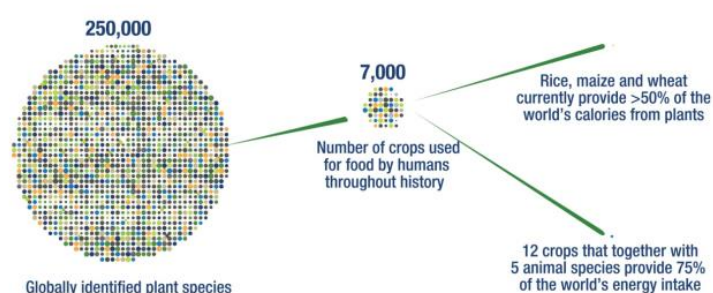


## Challenge: Address shrinking diversity

### Objective: Safeguard priority agricultural biodiversity for current and future needs

- Increasing crop yields and improving stress tolerance requires genetic diversity
- Intensification of agricultural systems has substantially reduced biodiversity

#### Shrinking diversity



## Threats

Continued push towards monocultures; shrinking diversity

Consolidation of seed supply into few, large companies

Reduced funds to public sector agricultural research, education and breeding

## Consequences

Loss of options to meet public and private needs:

Biotic and abiotic stress

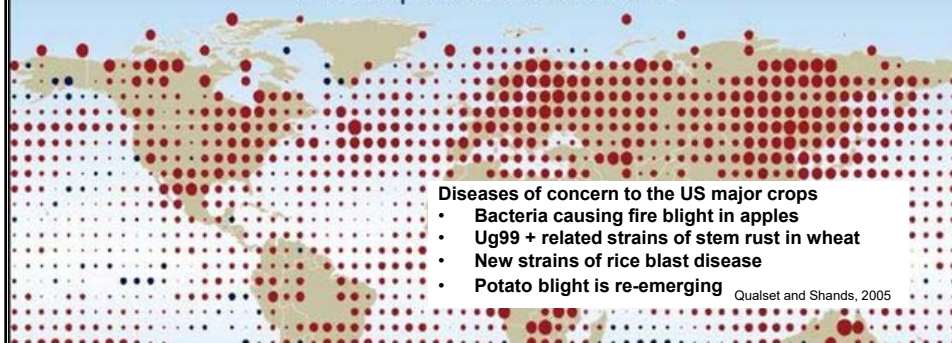
Diet diversity and nutrition

Market and cultural demands

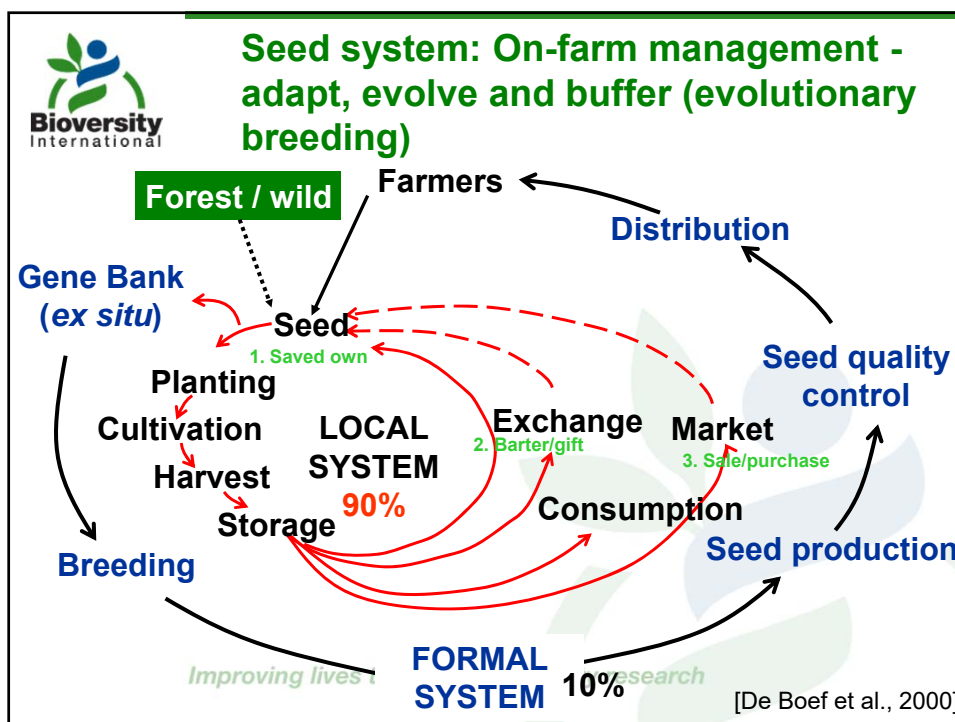
Ecosystem health and stability

## Climate change is already happening

Annual temperature trends: 1976 to 2000



We cannot predict which new pest or pathogen will develop or how the rain will fall next year -- **but we can use agricultural biodiversity to have a diverse set of crop varieties in agricultural systems to increase the options to buffer against an unpredictable change.** This explains why on-farm conservation can play key role in future!



## Global context: Access for farmers a secure source of locally adapted seed

Country	Crop	Contribution of farmer seed system (source) %	Reference
Burkina Faso	Sorghum	95	Kabore, 2000
Mexico	Maize	75	Ortega-Packka et al., 2000
Morocco	Durum wheat	87	Mellas, 2000
Nepal	Rice	97	Baniya et al., 2003

In India alone-100 million farms-15-20% of them use seed from the regular seed trade; the remaining 80 m farms depend on self saved seed or seed supply from farmers! (Swaminathan, 1998)



## Himalayan Superfoods



**Amaranth (latte, marshe)**

Amaranth is considered as a nutritious grain in the high mountain communities and as an iron rich leafy vegetable in the rest of the country. Amaranth grain is green like a grass and a good source of protein and the essential amino acids. It is especially important for vegetarians. It can be part of a nutritious breakfast for busy urbanites. Amaranth is considered an ideal feeding food by various cultures. Over 25 years of amaranth is exported from India to India predominantly for this purpose annually.



**Barley & Naked Barley (Jau & Uwa)**

One of the oldest grains to be cultivated, barley has been grown for over 5000 years. Monks have consumed barley as a nutritious breakfast food that helps the body conserve energy in cold weather. Barley is an excellent source of complex carbohydrates that helps lower cholesterol levels and the risk of type 2 diabetes. Pearled barley can be used in nutritious soups, while barley grains and grits can be consumed as a part of a healthy and nutritious breakfast for busy urbanites in Kathmandu and elsewhere.



**Beans (simi)**

The high diversity of beans have been an important source of vegetable protein for the people in the high mountains of Nepal, where dairy and nutritional diversity is especially limited. Beans of different shapes, sizes and colours are cultivated and consumed as a source providing wholesome nutritional benefits. These mountain beans are now becoming increasingly popular among urban consumers.



**Buckwheat (phapar)**

Buckwheat is considered a gluten free flour and a leafy vegetable. Rich in fibre and more nutrients such as magnesium, copper, and manganese, it is a good alternative for people at risk of diabetes and cardiovascular diseases. Leafy buckwheat contains the chemical rutin that improves blood circulation. Mountain communities in Nepal have used leafy buckwheat as a stimulant for blood flow. Heavy metal-free buckwheat flower has a distinct taste and is a common soup remedy.



**Finger Millet (kodo)**

Finger millet is a good source of calcium, iron, fibre, and amino acids making it important for blood and bone health, better digestion and muscle repair. The finger millet grains are finger millet and are rich in iron. It is a good alternative grain for people at risk of diabetes. It has cultural importance in mountain communities for preparation of finger millet (kodo) central in every ceremony. Consequently, mountain people play the key role in maintaining the local diversity of finger millet.



**Foxtail Millet (kaguno)**

This widely sown small millet is a traditional staple food grown in the dry part of the high mountain landscape. It also grows well in the mountainous region. Regular consumption of foxtail millet leads to a significant fall in blood glucose, making it a useful food to help manage and prevent diabetes. Foxtail millet has a variety of uses, from being eaten as khado, a hearty porridge or used to brew alcoholic beverages. Foxtail millet cooked with milk and sugar (kaguno) is a pudding makes an excellent and healthy dessert.



**Proso Millet (chino)**

Proso millet (chino) has among the lowest water requirements of any cereal thus making it an incredibly climate resilient crop. It is a gluten free food, packed with a variety of essential nutrients, particularly in potassium, which contributes to various aspects of health. Proso millet is traditionally consumed in the mountain communities as a staple food, cooked in the form of khado where access to rice is still limited.



**Red Rice (dhan)**

The famous Janti variety of rice sets the record for being grown at the highest elevation, over 3000 metres above sea level in Chitwan, Nepal. The high mountains of Nepal are important for cold tolerant genes in rice. Our Chitwan rice has become the most important variety in Bhutan and Bangladesh covering around 80% of their rice area. Interestingly, rice of different hues and colours are increasingly popular in organic markets for their sensory and nutritional (antioxidants and minerals). It is time for Nepal's Red Rice to have its day in the sun.

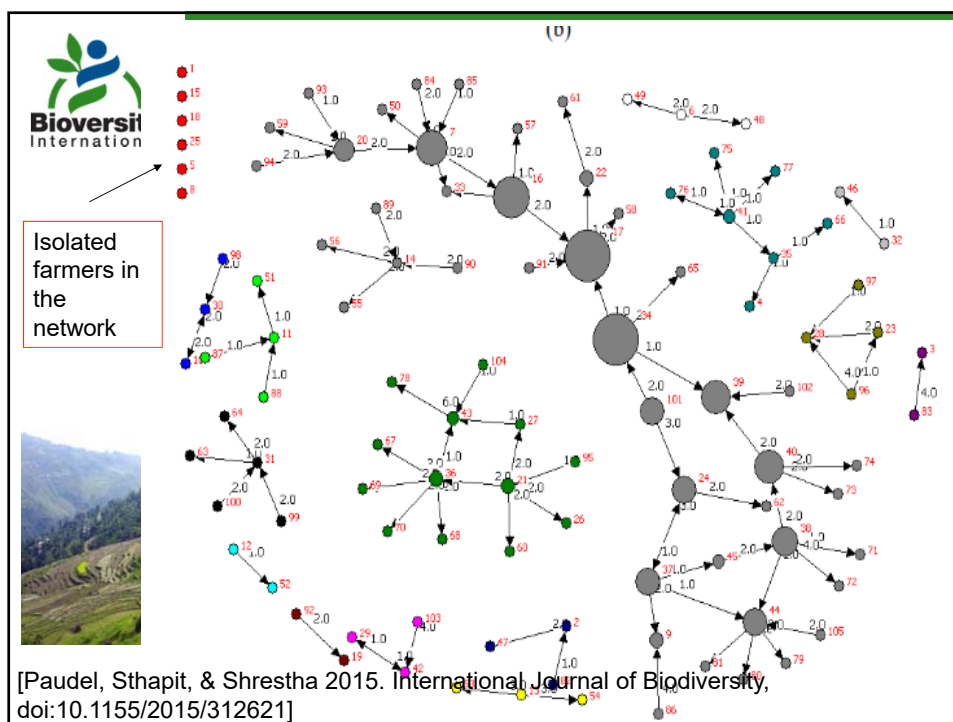
Collaborating for Research and Promotion of Alternative Crops in Nepal



## Contribution of informal seed sources to livelihood of mountain farmers, Nepal

Crops	Humla (2000m)	Jumla (2000m)	Lamjung (1500)	Dolkha (1700)
Amaranth	100	100	100	100
Barley	100	100	100	97
Beans	100	85	83	72
Buckwheat	100	100	100	95
Finger millet	100	100	100	97
Foxtail millet	100	100	100	97
Perso millet	100	100	100	NA
Rice	96	76	98	95
Total				

GEF LLI-BIRD Baseline survey, 2014



## Multi-functionality of farmer seed system:

### Germplasm base

- diversity, flexibility, selection

### Seed production and quality

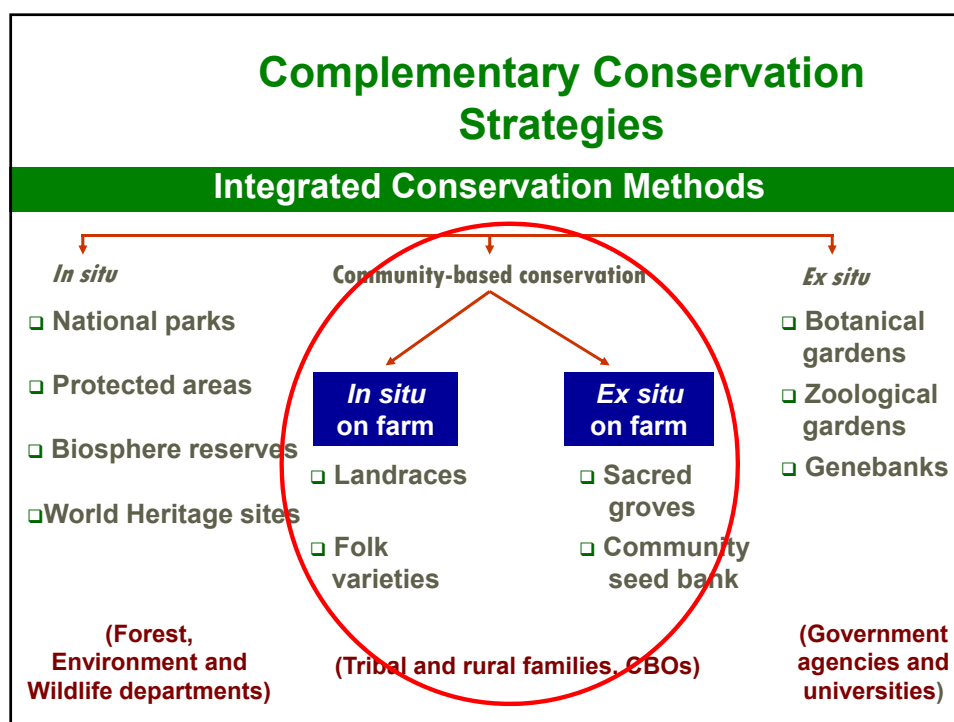
- germination, disease problems, quantity

### Seed availability and distribution

- seed sources, networks, markets

### Knowledge and information

- growing methods, utilization, knowledge of new materials, traits trade off





**Community Seed Banks**  
ORIGINS, EVOLUTION AND PROSPECTS  
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Article

**The Multiple Functions and Services of Community Seedbanks**

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**Abstract:** Although community-level seed-saving initiatives have existed in many countries around the world for about 30 years, they have rarely been the subject of systematic scientific enquiry. Based on a combination of a literature review and field research, we present a novel comprehensive conceptual framework that focuses on the multiple functions and services provided by community-based seed-saving efforts, in particular community seed banks. This framework is output oriented and complements an input oriented typology of community seed banks presented in 1997. The framework identifies three core functions: conserving genetic resources; enhancing access to and availability of diverse local crops; and ensuring seed and food sovereignty. The framework can be used for analysis of existing seed-saving initiatives and serve as a guide for the establishment of new community seed banks. In addition, it can inform the development or revision of national policies or strategies to support community seed banks. The framework's utility is illustrated by three case studies of community seed banks in Bangladesh, Guatemala and Nepal.

**Keywords:** agricultural biodiversity; conservation of biodiversity; plant genetic resources; community seed banks; farmers' rights; food sovereignty; seed sovereignty; Bangladesh; Guatemala; Nepal

## 35 Case studies review 25 Countries

- Diverse actors diverse objectives
- Differences
  - Origin and evolution
  - Functions and activities
  - Governance, management and cost
  - Technical operations
  - Support and networking
  - Policy and legal environment
  - Sustainability
- Analysis of new scope, opportunities and partnership
  - "Out of box" initiative



## Origins and Evolution of Community Seed Banks

### Timeline

1975	USA-Based Seed Savers Network established by Diane and Kent Whealy to preserve heirloom varieties
1986	PGR Ethiopia, Seed for Survival Program supported by USC, Canada to re-integrate local varieties in local seed system <a href="#">Australian seed networks and seed library in Europe</a>
1992-1996	The Philippines by SEARICE and CONSERVE; Brazil, Chile; UBNING, Bangladesh, CTDZ Zimbabwe, DDS, ADS, Green Foundation, Gene Campaign and MS Foundation, India, USC Canada-Asia
2003 to date	LI-BIRD/Bioversity International/Development Fund Norway/Oxfam, Action Aid etc in number of countries

**NGOs are key player in past & now Governments taking interest!**



## Seed Savers Exchange Network



<http://www.seedsavers.net>

### Conceptual framework: **Classification of global community seed banks by functions**

Functions	Case study examples (book chapter)
Conservation	Bhutan, Malaysia, Mexico and Rwanda
Access and availability	Burundi, Canada, Costa Rica and Uganda
Conservation and Access & Availability	Bolivia, Brazil, China, Guatemala, Honduras, India, Mali, Nepal, Nicaragua, South Africa, Sri Lanka, USA, Trinidad, Zimbabwe
Conservation; Access & Availability & Seed and food sovereignty	Bangladesh, Brazil , Nepal and Spain

**Result: Multiple functions; Diverse actors/Diverse objectives**

### Governance, Management and Cost

- Legitimacy, and Rules and regulations
- Daily operations and management governed by collective actions, social capital building, voluntary work, empowerment
- Accountability, transparency and leadership
- Roles and responsibilities
- Building local capacity
- How much it cost to establish CSB?
- 1000\$ to \$10000





## Technical operation and issues



Community and site selection

Choosing crop species and varieties

Collecting seed and planting materials

Documenting, sharing and communicating information

Storing seed, structure, methods, monitoring

Regenerating seed

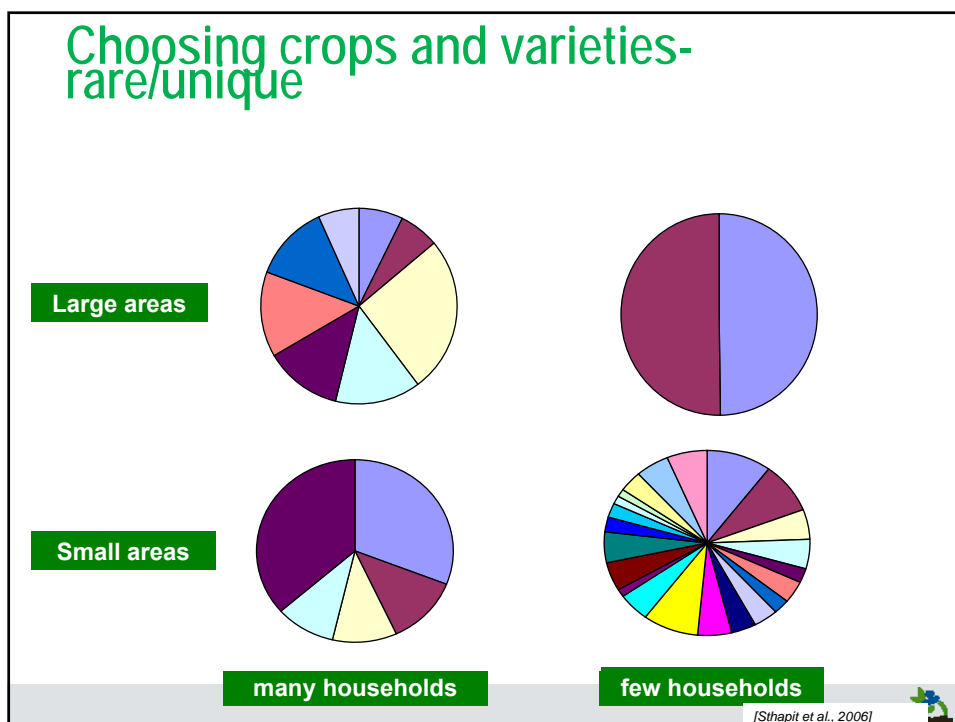
Distribution system and tracking



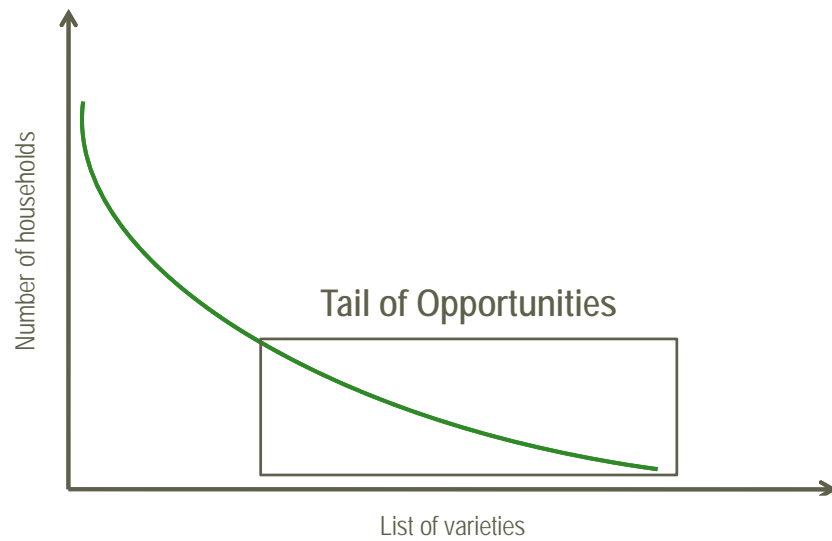
Bhuvon Shrivastava

Walter de Boer

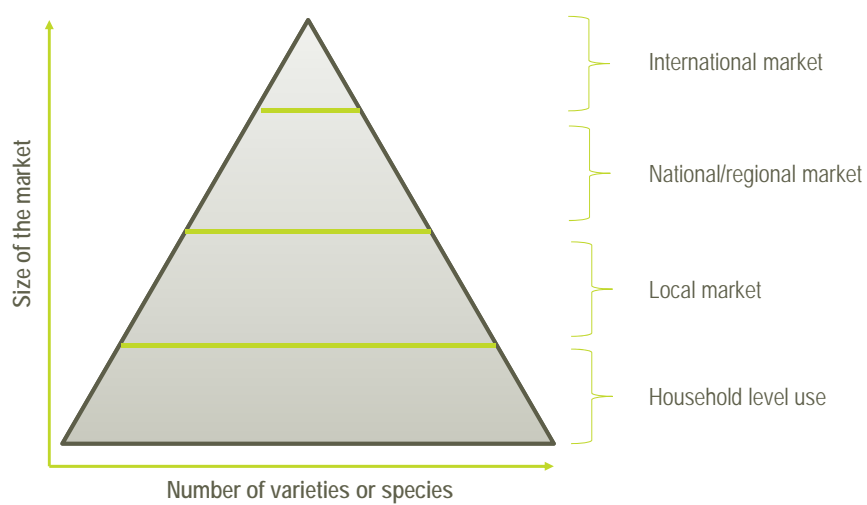


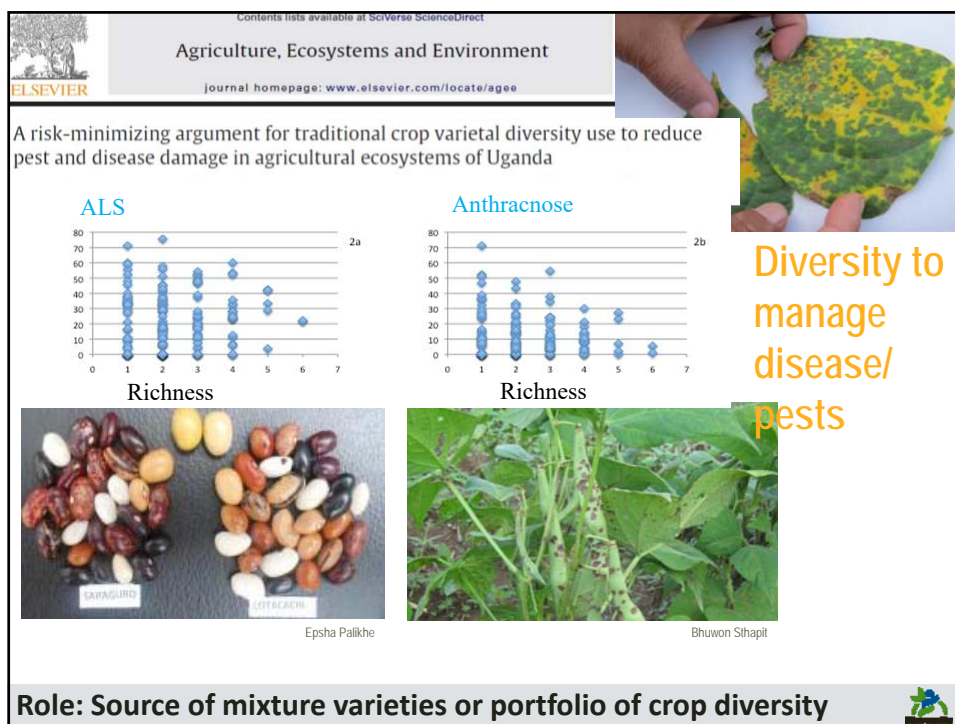


### Distribution of Varieties



### Market Pyramid





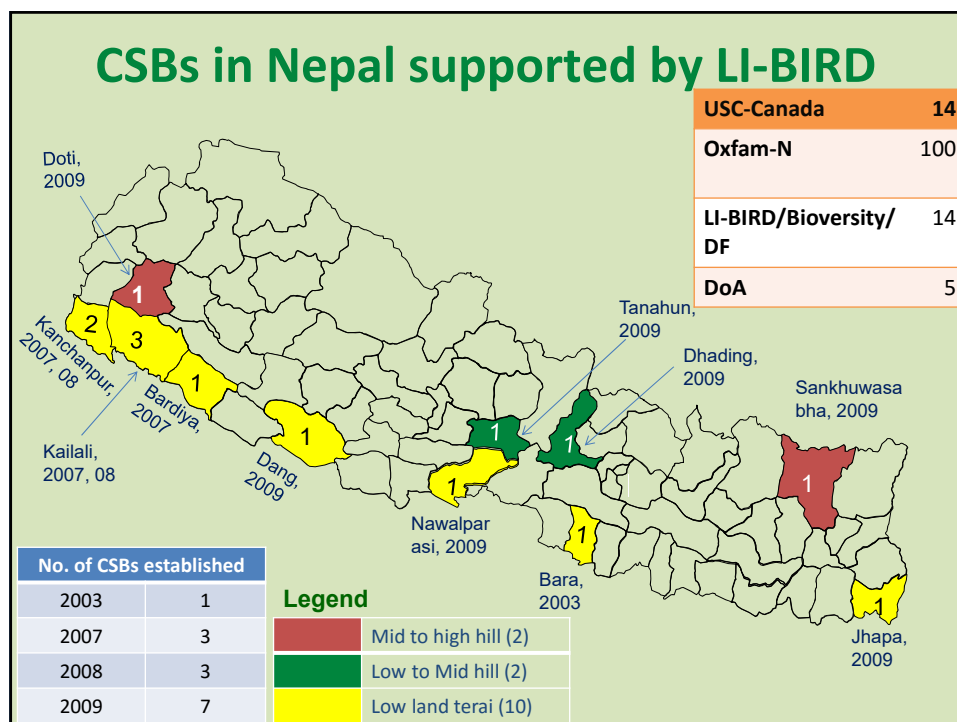
## Seed Storage

- ❖ Goal in storing seeds is to slow metabolic processes-dry and cold (sleep)
- ❖ Maximizing seed longevity:
  - ❖ Start with good quality seed
  - ❖ Keep them appropriately dry
  - ❖ Keep them as cold as possible
  - ❖ Minimize exposure to light
  - ❖ Minimize access to air
  - ❖ Minimize changes in conditions
  - ❖ Exclude insects and rodents
- ❖ Longevity doubles for every 1% reduction in seed moisture content and for every 5°C drop in temp.
- ❖ Short-term storage: 5–10°C
- ❖ Long-term storage: -18°C

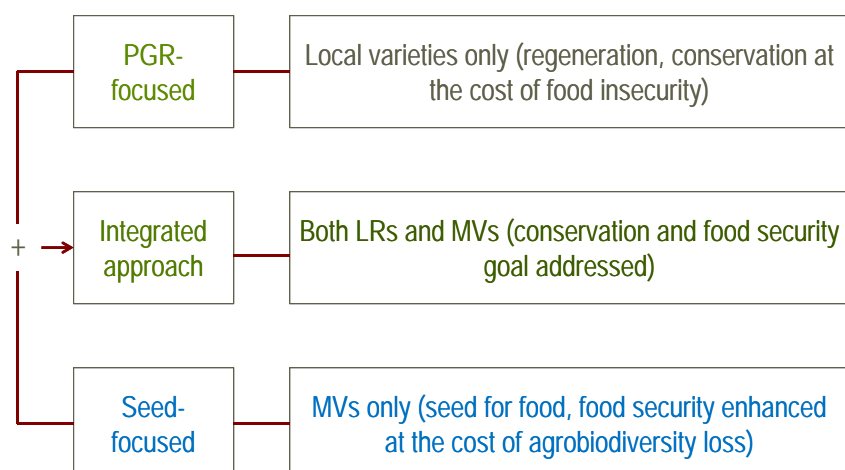


## Storage Insect Control using Drying Beads





## Typologies



[Source: PC Chaudhary, 2012 LI-BIRD]



## Hypothesis and research questions

- ❑ Whether or not CSB improve access of unique, endangered and rare local varieties?
- ❑ Whether CSB improve equitable access of seed to marginalized and poor smallholder farmers?
- ❑ Whether CSBs address farmer's concern of seed accessibility or availability or both?
- ❑ Are CSBs relevant and appropriate interventions where social seed networks are strong, open and well-connected?
- ❑ Whether CSBs can be a platform of open source of seed exchange and social learning?
- ❑ What are key drivers of success and failures ?
- ❑ What are key principles that ensure sustainability of CSBs after completion of the project?



## Community Driver: Rapid erosion of rice landraces in Kochorwa, Bara (Shrinking local crop diversity and options)

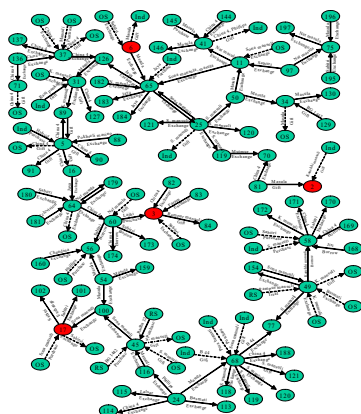
Year of study and type	No. of LRs/MVs		No. of growers		% of area occupied by	
	LRs	MVs	LRs	MVs	LRs	MVs
Baseline 1998 (n=202 HHs)	33	20	137	-	16.7	83.3
CBR 2003 (n=349 HHs)	14	26	111	-	3.4	96.6

Note: LRs=Landrace, MVs=Modern varieties, HHs=Households, CBR=Community biodiversity Register

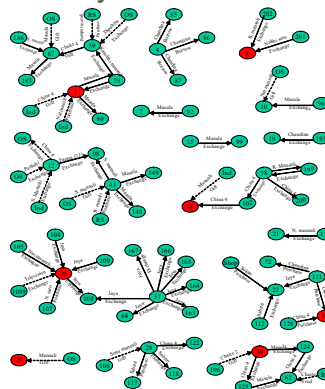
[Source: Adapted and modified from Rana et al., 2000]

## Community Driver: Weakening social seed networks

**Non-commercial:** Resilient to climate change



**Commercial area:** Vulnerable to climate change and adversity



[Paudel D, Sthapit BR and P Shrestha 2015. An Analysis of Social Seed Network and Its Contribution to On-Farm Conservation of Crop Genetic Diversity in Nepal," International Journal of Biodiversity, vol. 2015, Article ID 312621, 13 pages, 2015. doi:10.1155/2015/312621]



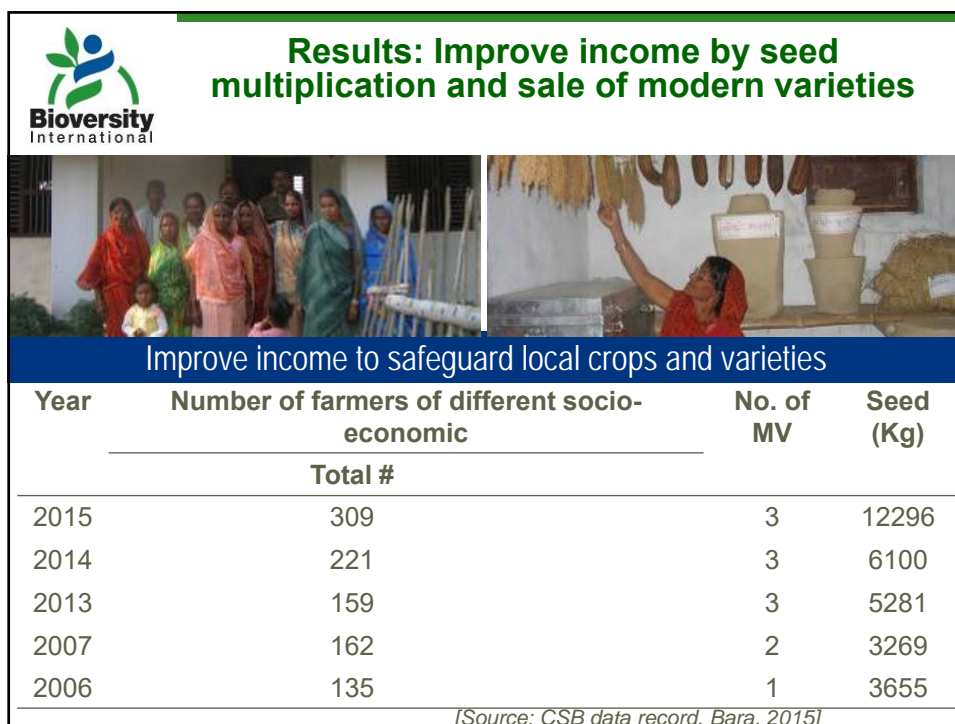
## Results: Improve access of local varieties for poor smallholder farmers and social equity

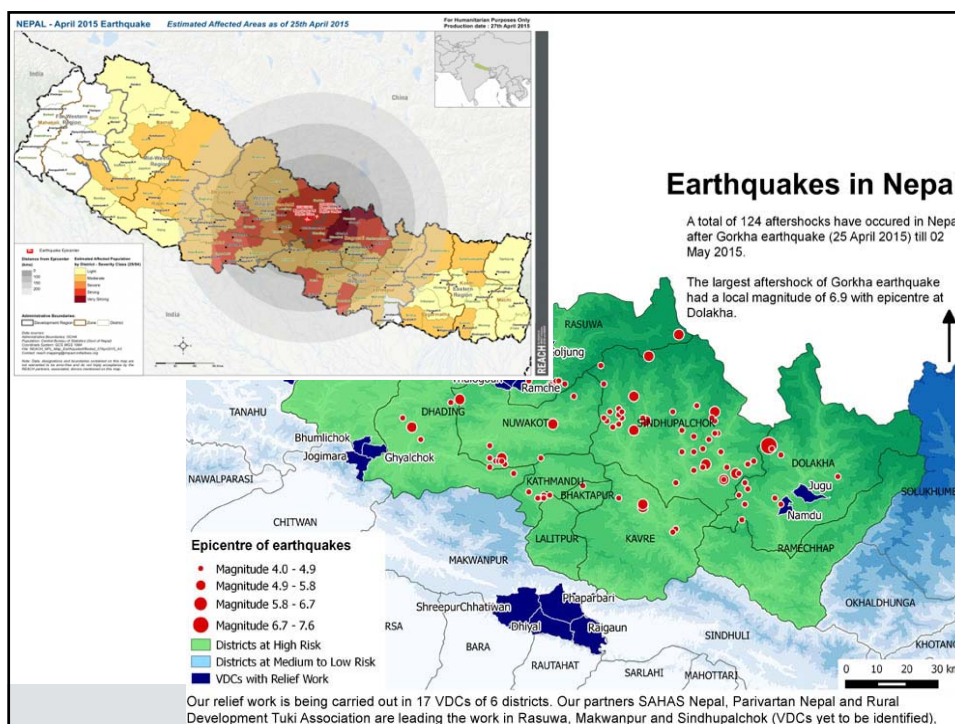


### Improve access to landraces: Pro-poor women farmers

Year	Number of farmers of different socio-economic				No. of landrace	Seed (Kg)
	Rich	Medium	Poor	Total		
2007	23 (23)	34 (33)	45 (44)	102	28	103
2006	7 (11)	25 (39)	32 (50)	64	21	80
2005	17 (20)	37 (42)	33 (38)	87	23	197
2004	6 (17)	14 (40)	15 (43)	35	13	69
2003	5 (12)	19 (48)	16 (40)	40	11	87

[Source: Pitambar Shrestha and BR Sthapit, 2008]





## Emerging roles of Community seed bank in seed relief and reiving local seed system



9750 kg truthfully labelled rice seeds supplied to suitable earthquake affected areas

Income for a single CSB: USD 3600 (NPR 358,750)

**Pride: Able to help earthquake affected families**



(Credit: P Shrestha, LI-BIRD)



**Participatory seed exchange at the meeting held in community seed bank**



## Improved access to unique materials and information to wider groups (Diversity kits)

*Luffa cylindrica* L. Traits: aroma, taste, delayed net

### • Good practices

- Diversity fairs
- Diversity blocks
- Diversity kits
- CBR
- Community seed bank



1998

1 HH Diversity fair

2000

Diversity block 7HH

2001

70 Diversity kits

2002

195 HHs

1998  
Rare

2002  
Common

Improved access by community actions; many examples

## Big task shared by many citizens:

### Amaranth Diversity Kits in Jumla

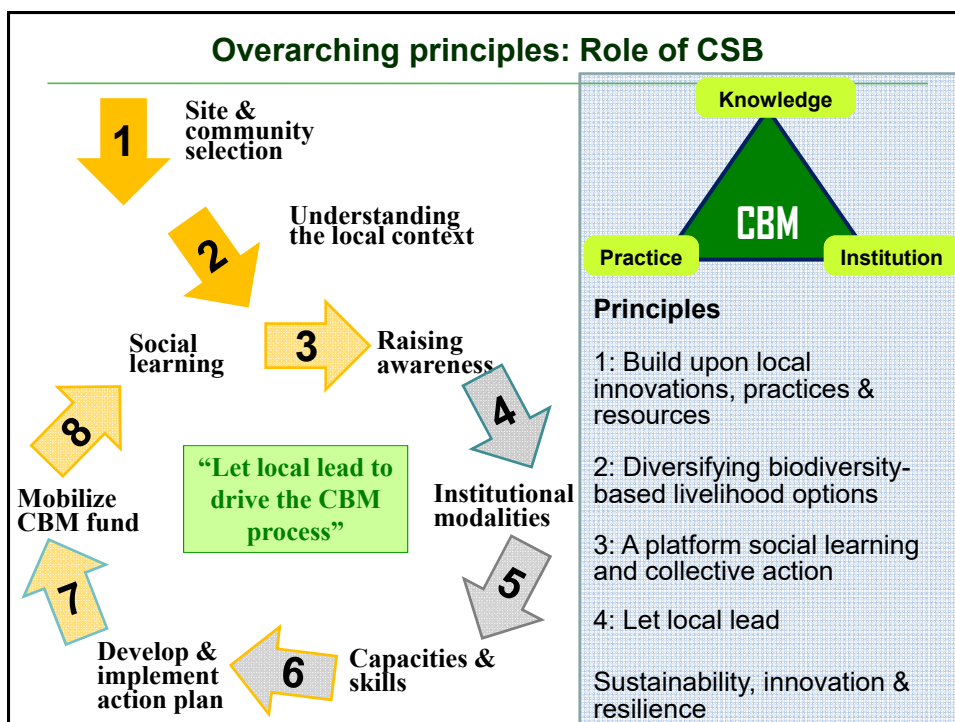
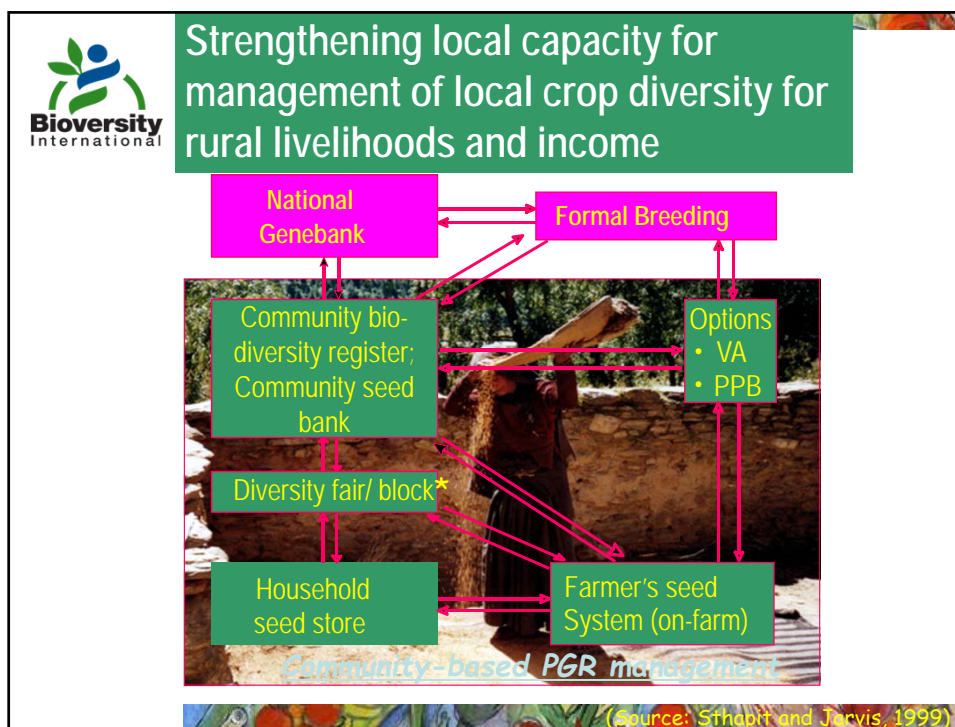
[www.libird.org](http://www.libird.org)  
[facebook.com/libirdkochautari](https://facebook.com/libirdkochautari)



Collaborating for Research and Promotion of Alternative Crops in Nepal

N=>2100





## Take home message

- New roles of community seed banks and national gene banks are emerging and new scope and opportunities
- Cultivate partnership for creating space for country specific innovation in this field
- Misconception-let's science drive the process of understanding and appreciating
- Strengthen technical capacity of community seed banks (introduce \* system by NGB)
- Link to PPB/PVS and crowdsourcing approach
- Policy space for CSB (Seed regulatory framework, Farmer's Rights, ABS/Nagoya protocol)
- Potential platform of community biodiversity management and social learning and change (institutional issue)

