



## Economics of Agrobiodiversity Conservation and Use Overview and Potential Role in the Nepali Context

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## Introduction – ABD Economics Concepts



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Illustration source: CIP- UPWARDS, 2003



## Biodiversity loss as seen by economists: The conversion process

- Replacement of the existing slate of diverse natural habitats and resources with a selection from a small range of specialised productions systems that provide more direct benefits to humans

Source: Swanson, 1997

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## Total Economic Value (TEV)

DUV + IUV + OV + BV + XV

Direct Use  
Values

- Food and Feed
- Medicine
- Fibres
- Construction Materials

Indirect Use  
Values

- Agroecosystem Resilience
- Maintenance
  - geneflow
  - Evolutionary processes
  - Indigenous knowledge

Option  
Value

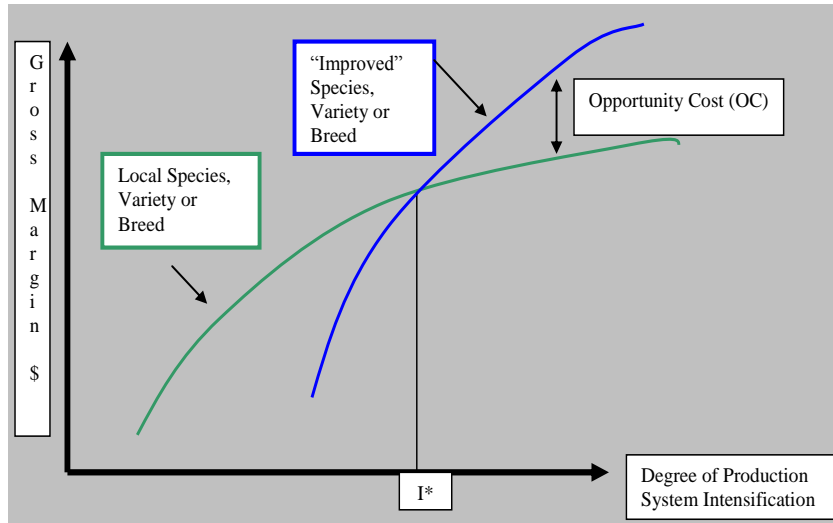
(for an uncertain future)

Bequest  
Values

Existence  
Values

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## 1: Economics of Agrobiodiversity Replacement (Financial/Private Perspective)



## Status of ABD and Policy Context

- FAO State of World Reports depict **unprecedented loss** of ABD & associated traditional knowledge across globe.
- **In situ** conservation preferred approach under the CBD.
- Need to **establish a global network for in situ conservation and on-farm management** of PGRFA (13th Regular Session CGRFA, 2011).
- CBD Strategic Plan for Biodiversity 2011-2020 specifically calls for the development and application of **positive incentives** for biodiversity conservation and use.
- CBD's COP 8 Decision VIII/25 calls for: Exploration of options for the **design/application of innovative tools** for *assessment and valuation* of biodiversity resources.

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## A Diversity of Methods and Tools

- Econometric methods;
- **Optimization models (including weitzman)**;
- Monte carlo simulations;
- Search theoretic frameworks;
- **Contingent valuation** and choice experiments;
- Experimental games
- Production loss, **opportunity cost, least-cost and safe minimum standards** methods;
- Economic surplus methods;
- Cross-sectional farm and household methods;
- Farm simulation and breeding programme evaluation;
- Use of genetic production functions
- ❖ Application of economic methods, decision-support tools & policy intervention strategies needed to support ABD conservation policy design & implementation that is cost-efficient and pro-poor.
- ❖ Implementation requires an accompanying programme of awareness-raising and national capacity building.

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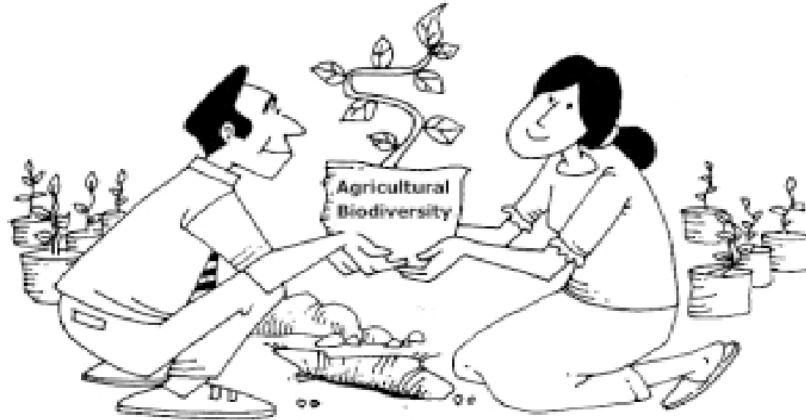
## Policy Relevance – Types of questions such research can be expected to answer

- Which species/varieties or breeds should be conservation **priorities** (given that we cannot save everything)?
- What are the **costs of ABD conservation** programmes and how can we minimise these? What are the related benefits?
- How important are particular local species/varieties or breeds to **livelihoods** and how can such values be harnessed to support poverty alleviation efforts?
- **Which traits and functions** (both marketed and non-marketed) are the most important and degree they can be traded off against each other?

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## Domesticating Payments for Ecosystem Services (PES)



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Illustration source: CIP- UPWARDS, 2003



## Payment for Environmental Services

PES principle defined as:

1. a **voluntary** transaction where
2. a **well-defined** environmental service (ES) - or a land-use likely to secure that ES -
3. is being "bought" by a (min. one) ES **buyer**
4. from a (min. one) ES **provider**
5. if and only if the ES provider continuously secures ES provision (**conditionality**).

- Four areas of application: carbon, watershed, biodiversity and landscape beauty protection

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## Payment for Agrobiodiversity Conservation Services (PACS) 2009-2011

### **General Background:**

- Innovative exploration of “payment for environmental services” application in the field of ABD with focus on indigenous communities
- Implemented in partnership with MSSRF (India), PROINPA (Bolivia), CIRNMA (Peru) and University of Cambridge (UK).

### **Goal/Objective:**

- Assess potential for PACS schemes to **create incentives for conservation** of agrobiodiversity and improve indigenous farmer livelihoods.
- Assess impact of PACS schemes on institutions of **collective action**

### **Additional considerations**

- Consider **complementarity of market/value chain development** and PACS for achieving conservation goals.

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## PACS Implementation Steps

1. Define the conservation strategy (*what do we want to conserve?*)
2. Define the conservation goal (how – at what level – do we want to conserve it?)
3. Assess farmer Willingness to Accept (WTA) rewards to undertake conservation.
4. Award conservation service contracts while accounting for effectiveness, efficiency and equity trade-offs.
5. Identify how rewards can be financed by the project (i.e. sources of rewards/funding)

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## 2. How much to conserve? Safe Minimum Standards (SMS) approaches

- Adapted from wild biodiversity management
- SMS decision rule places a bound upon what otherwise might be economically rational actions, whenever such actions threaten irreversible damage to the environment.
- Framework considers that the uncertain benefits of plant and animal genetic resources (PAGR) conservation can be maintained, as long as a minimum viable population also maintained.
- Costs of implementing such a SMS are made up of the opportunity cost differential of maintaining the local rather than improved PAGR.
- However, given modest conservation goals cost of establishing a SMS is hypothesised to be relatively low.

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Source: Drucker 2006



## Animal Genetic Resources SMS

- FAO criteria of “not at risk” = more than 1000 breeding females and 20 males.
- Conservation costs in EU, Italy and Mexico determined for variety of livestock species/breeds based on opportunity cost differential plus administration
- Results: Costs of SMS small (<1%) compared to existing subsidies and benefit-cost ratio (>2.9)

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Source: Drucker 2006



## How to define a PGR in situ conservation goal?

What can be considered to be a “safe minimum standard” for a given landrace, from a conservation perspective?

- How much land to be cultivated?
- How many farmers?
- What degree of spatial distribution?
- How functional does the seed system need to be (openness and heterogeneity) ?
- How much seed (and of what age) should be stored in the communities?
- Degree of traditional knowledge we wish to maintain
- Other?



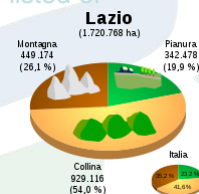
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Illustration source: CIP- UPWARDS, 2003



## Defining a PGR in situ conservation goal: Lazio, Italy

- Crop species/variety considered highly threatened (vs. medium and low)
  - covers <1% of the regional area (vs. >1-5% and >5%)
  - has an absence of new areas under cultivation (vs. presence)
  - is grown by less than 30 farmers (vs. >30-100 and > 100)
  - is not found in the market (vs. niche or widely available)
  - is not listed in commercial seed catalogues (vs. being listed or listed)



Source: PSR Lazio, 2008; Porfiri O., Costanza M.T., Negri V. 2009

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### 3. How to identify least cost conservation service providers? Competitive Tender Approach

- Good understanding of farmer opportunity costs fundamental to incentive setting and determining total conservation resources required.
- But existence of asymmetric information (only farmers know their true opportunity costs, not incentive setting conservation agency)
- Competitive tender schemes using auction-based mechanisms allow conservation costs to be minimised and hence more to be conserved.
- Conservation tenders increasingly being applied in PES settings

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### 4. How to select service providers? Accounting for Trade-Offs

Potential outcomes evaluated concerning their:

- **ecological effectiveness:** reaching the conservation goal
- **economic efficiency:** least-cost conservation
- **social equity:** pro-poor outcomes
- Distribution of rewards is very sensitive to the selection approaches used.
- Equity may need to be sacrificed if cost-efficiency is the overarching goal. But this may impact likelihood of long term success.
- Articulation of a clear conservation goal, based on single criteria or combinations thereof is required

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## **Exploring PACS: Activities and Initial Findings from India**



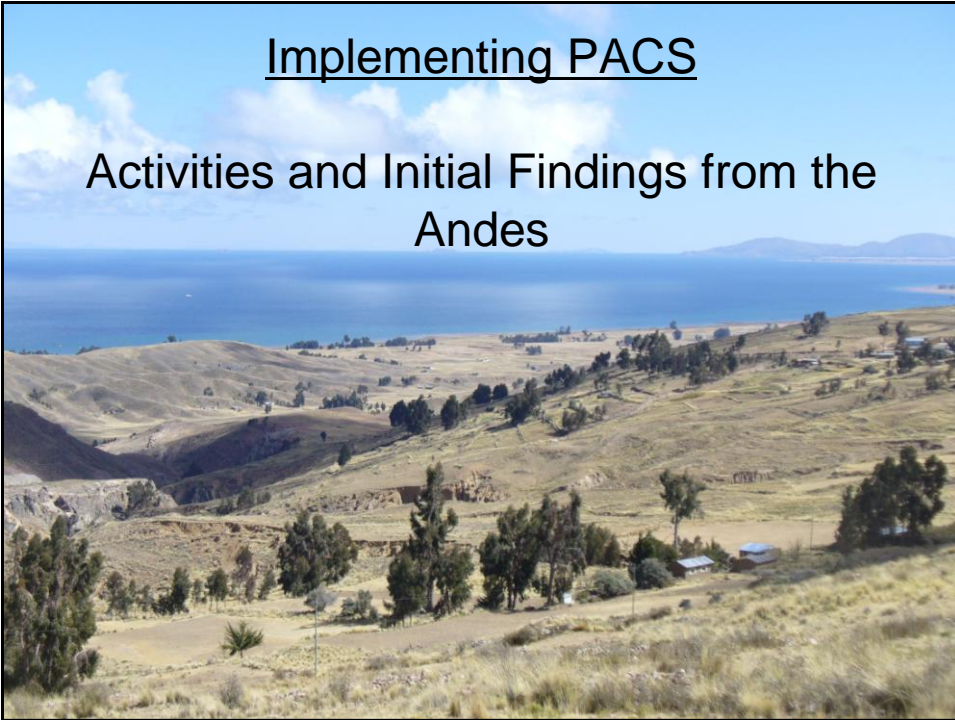
### **Minor Millets, Tamil Nadu, S. India**

- Species/varieties identified as being at risk (planted on less than 5 acres or by less than 20-30 farmers across the 5 panchayats):
  - all varieties of Italian, common and kodo millets
  - all but one of the varieties of little millet.
  - Relatively small areas of household agricultural land area dedicated to these species (6.7% average).
- Average WTA (contingent valuation approach) for threatened little, Italian and common millets is approx. Indian Rs. 3,300 – 4,300/acre p.a.
- Kodo millet, the least preferred variety, has a much higher WTA (> Rs. 14,000).
- “Ballpark” estimate of the overall conservation program incentives required (all 10 threatened varieties)
  - approx US\$4,400 for a 5 acre safe minimum population.
  - excludes management/administration costs

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# Implementing PACS

## Activities and Initial Findings from the Andes



Peru – Lake Titicaca



Bolivia - Salar de Uyuni



Quinoa varieties



Quinoa farmer



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## Bolivia/Peru Tender Process

- 9 varieties of quinoa identified as “at risk” :
  - Chillpi Blanco, Huallata, Hilo, Kanchis, NovetonMisa quinua, Chullpi anaranjado, Janko witulla, Cuchi wila.
- Based on expert opinion of area planted, # of farmers, degree of traditional knowledge, quantity of seed available, dissimilarity of the varieties)
- 39 organisations invited to submit a conservation service offer. Offers received from 25.
- Total conservation budget available = \$4,000 in each country (but goal should be to reach a safe minimum standard of conservation)
- Single round, sealed-bid reverse auction. Offers needed to specify:
  - Area to be planted for each variety
  - Number of farmers to be involved
  - Availability of seed
  - Compensation required

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## Example of trade-offs (Bolivia)

Selection criteria (aim) / Outcome	Aim 1: Max avg (across landraces) cost effectiveness (\$/ha)	Aim 2: Max. avg cost effectiveness (\$/farmer)	Aim 3: Max. avg. cost effectiveness (\$/CBO)	Aim: Max. Weighted avg. cost effectiveness across criteria (e.g., 0.4, 0.4, 0.2)
Total area (outcome)	2.9 ha	0.6 ha	2.6 ha	2.6 ha.
Total n. Farmers (outcome)	12 farmers	25 farmers	16 farmers	16 farmers
Total n. CBOs (outcome)	4 CBOs	5 CBOs	8 CBOs	7 CBOs

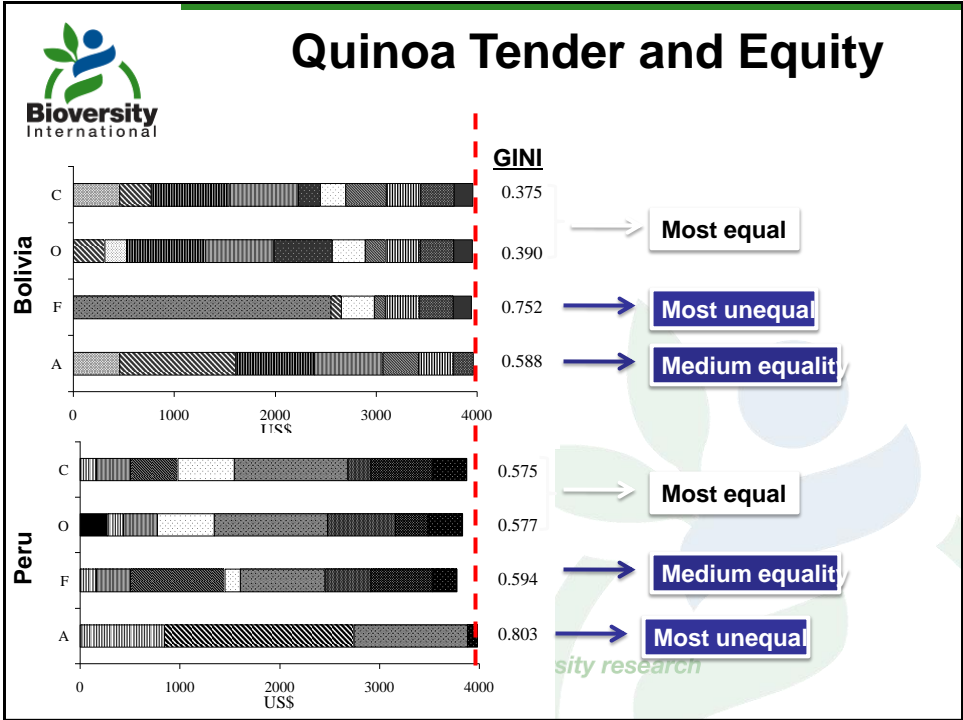
MAX EFFICIENCY

MEDIUM EFFICIENCY

MIN EFFICIENCY

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## Peru/Bolivia Competitive Tender Farmer Comments and Intervention Sustainability

- Satisfaction from cultivating landraces last cultivated by their grandparents
- Yields of the threatened varieties were in some cases equal or higher than the more commercial varieties
- Intend to replant next year regardless of whether project incentives exist
- Would like to plant other threatened varieties next year
- Are pleased with the quality seed received
- Community-based approach strengthened linkages within the community
- In-kind incentives will benefit other community members too.

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## Conclusions and Policy Implications



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Illustration source: CIP- UPWARDS, 2003



## Potential Elements of a PACS-related Policy Intervention Strategy

- Where interventions should take place (**targeting** interventions to areas of high agrobiodiversity and high poverty in order to maximize impact)
- What should be conserved (**prioritisation** of particular PAGR such that the most diversity can be conserved for any given budget)
- How much should be conserved (establishing of PAGR **monitoring systems, baselines and conservation goals**)
- Which farmers or communities should be involved in conservation activities (**identifying least-cost providers** so that limited conservation budgets can achieve maximum impact).
- How to **sustainably finance** such interventions (identifying combinations of market, public and private sources of finance).

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## PACS General Findings

- PACS schemes appear to have potential as an environmentally effective and cost-efficient mechanism through which to provide conservation incentives.
  - Equity/Pro-poor considerations may also be accounted for.
- Payments/rewards permit farmers to diversify their income sources by:
  - providing conservation services *per se* for wider society; and
  - potential participation in monitoring and verification activities.
  - Payments/rewards may be made in-kind and at a community level (not only in cash to individuals).
- Prioritisation protocols, competitive tenders and least-cost approaches
  - can be used to minimise overall conservation costs, thereby allowing more to be conserved *in situ*
- Development of baseline status measures, monitoring systems and conservation goal definition is required for key PAGR.
- A range of private and public financing options for such agrobiodiversity-related PES interventions can be explored.

## Financing PACS



## Potential sources of payments/incentives

### Potential rewards could include:

#### *In-Kind*

- Seed fairs
- Awards/recognition (e.g. for "custodianship")
- Training on different species
- Infrastructure (inc community seed banks)
- School materials
- School meal programmes (as a type of market as well)
- Extension advice
- Seed access

#### *Monetary*

- Index-related crop insurance
- Increased market price (value addition, market chain development)
- Direct payment
- Loans
- Landrace or local breed subsidies

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## Financing PACS

- Payments/rewards may be in-kind, involving services and infrastructure that can be provided through existing govt. development programmes (inc. those related to poverty alleviation)
- Private sector involvement could be encouraged by:
  - appealing to corporate social responsibility
  - requiring agrobiodiversity impacts to be offset (drawing on concepts underlying BBOP = Business and Biodiversity Offset Program)
  - facilitating capture of premium prices through “ABD-friendly” labeling.
- Facilitate niche product market development of threatened PAGR with commercial potential.

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## PACS and Market Chain Development Complementarity

*Not everything can be conserved through niche product market development*

- Some PAGR do not currently have niche market potential
- Successful market chain development of other PAGR can lead to displacement
- Where conservation goals are modest, alternative interventions may be more cost-effective given required magnitude of market development costs
- Need for complementary instruments within a priority conservation and use portfolio context

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## Some Potential Future Areas of PACS Development

- Deepen existing work, e.g.
  - address lack of baseline data (participatory monitoring)
  - definition of safe minimum standard
  - account for non-annual planting of varieties
  - consider seed availability, and seed system openness and heterogeneity
  - assess impact and costs of multi-year tenders
- Opportunities to expand work to a wide number of crop species/varieties or livestock breeds
- Assess costs, conservation impact and complementarity of PACS and market chain development interventions
- PACS as an early warning system (longer-term goal)
- Consider sources of sustainable conservation funding

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## Key Take-Home Messages

- FAO notes an unprecedented loss of agrobiodiversity occurring across the globe.
- Nations have a commitment under the Convention on Biological Diversity (CBD) to conserve and sustainably use agrobiodiversity (ABD).
- Given the existence of public good values positive incentives are required to ensure socially desirable levels of ABD conservation and use.
- Agrobiodiversity-related PES can provide such incentives and permit cost-efficient and pro-poor concerns to be accounted for.
- Tools available and a number of scientific challenges
  
- **FUTURE DEVELOPMENTS: TO SEE THE UPTAKE OF PACS AND RELATED PROTOCOLS AS PART OF A GLOBAL ON-FARM AGROBIODIVERSITY CONSERVATION STRATEGY**

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# Thank you



*For more information about PACS project, factsheets, publications and video, see [www.bioversityinternational.org](http://www.bioversityinternational.org)*

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Photo: Drucker 2009