

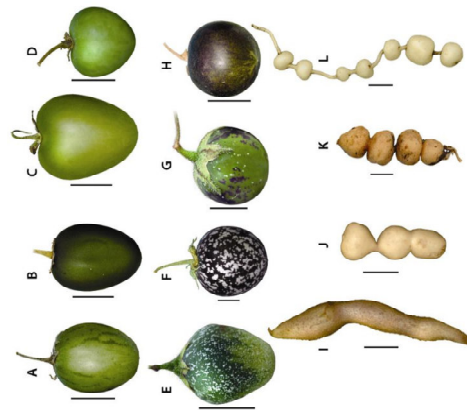
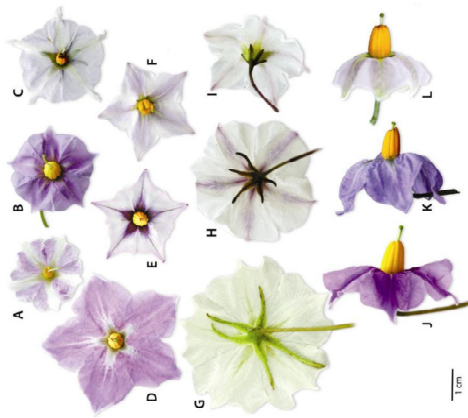


# ANDES: Threats of agrobiodiversity loss, climate action and food for health

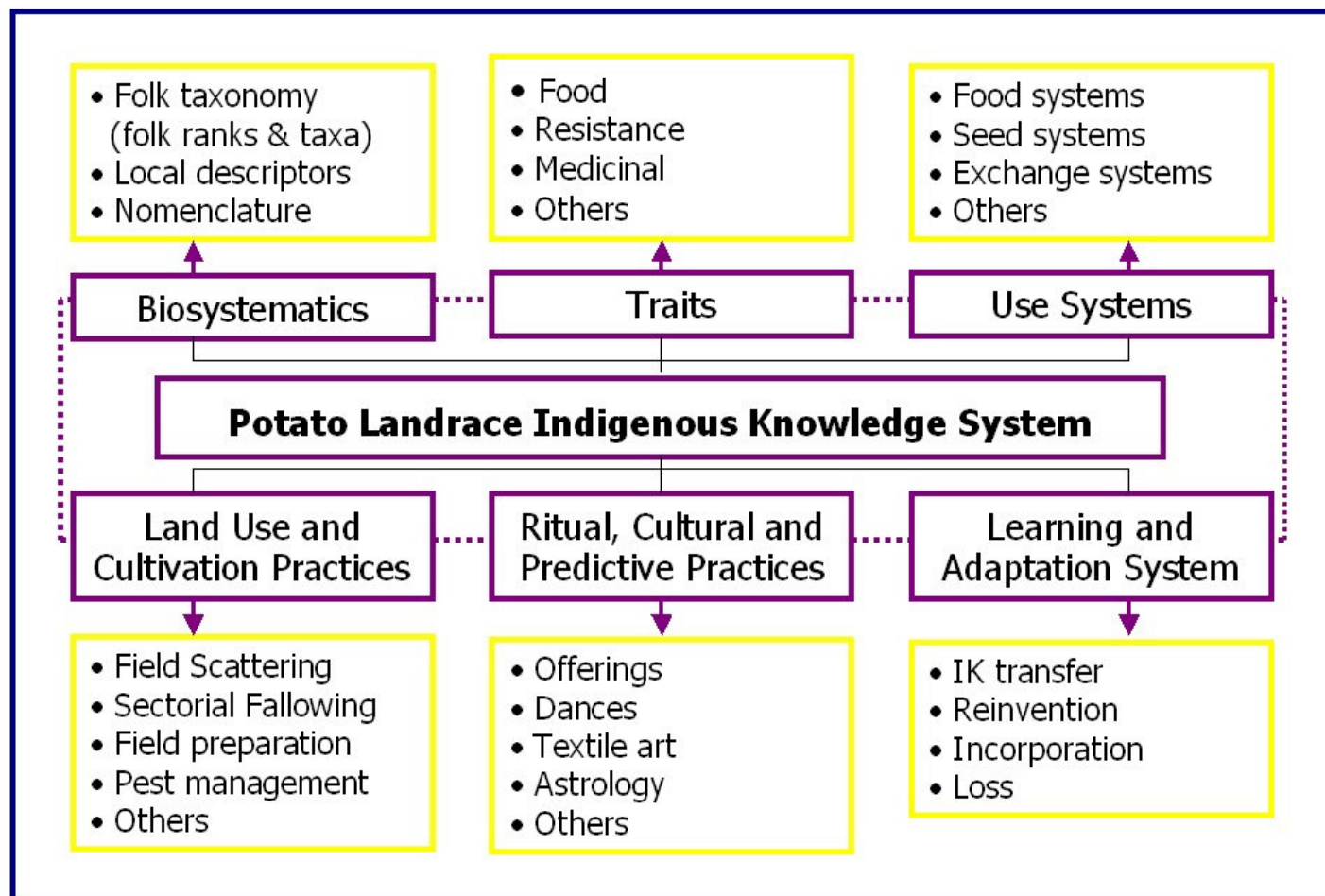
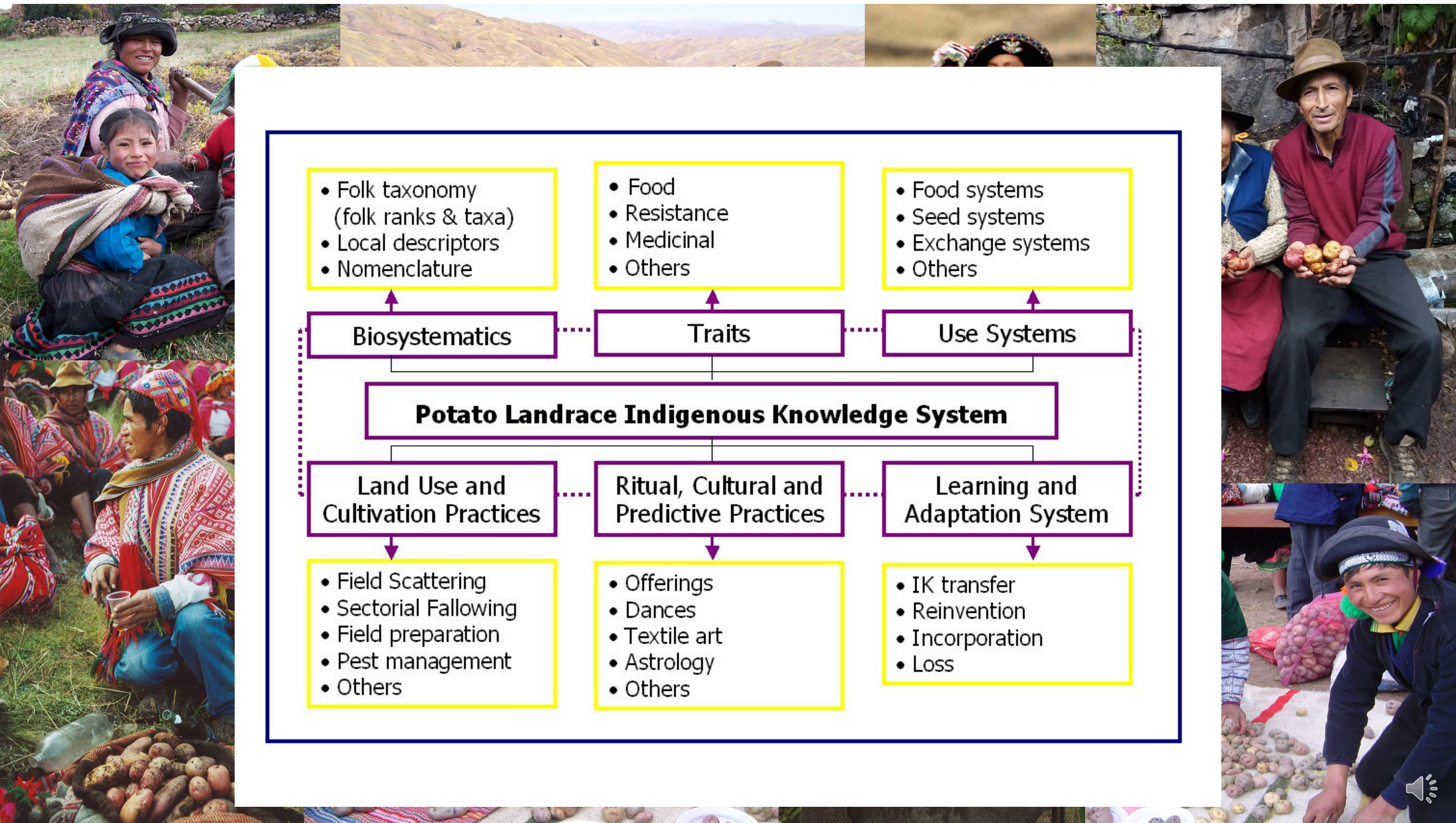
Stef de Haan, January 13, 2021



# About the Andes a Center of Origin and Diversity













# Threats to diversity over time: challenges, concepts, drivers



*WAYRU*

**Basic  
Morphology**



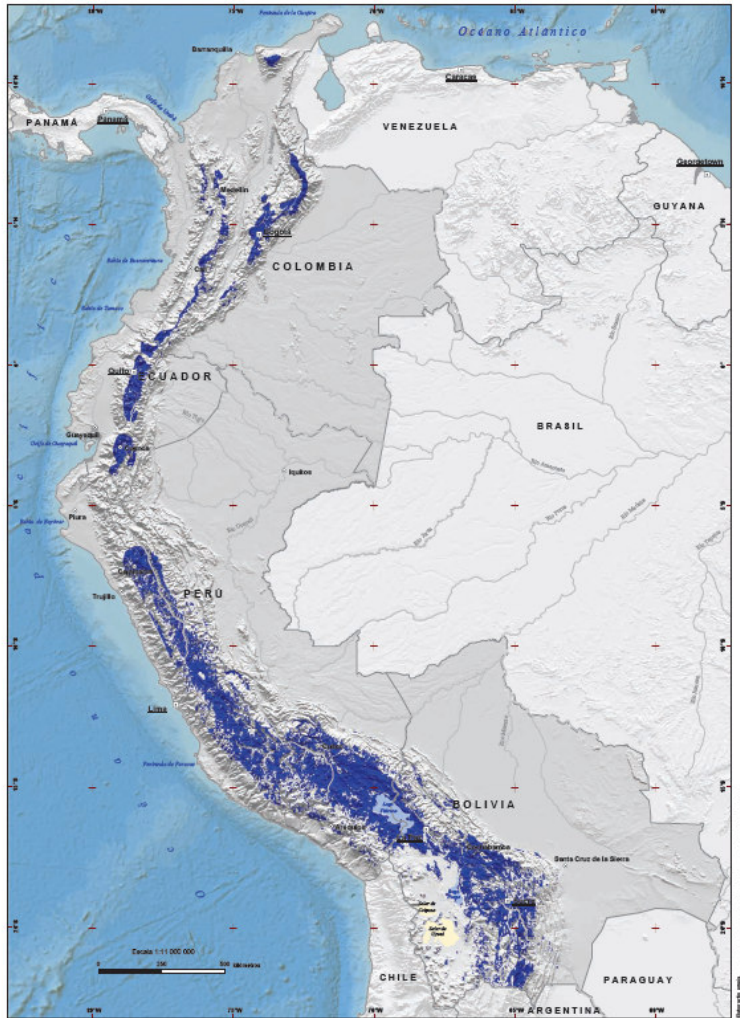
*PUMAPA MAKIN*

**Basic  
Morphology  
(Bertonio, 1612)**

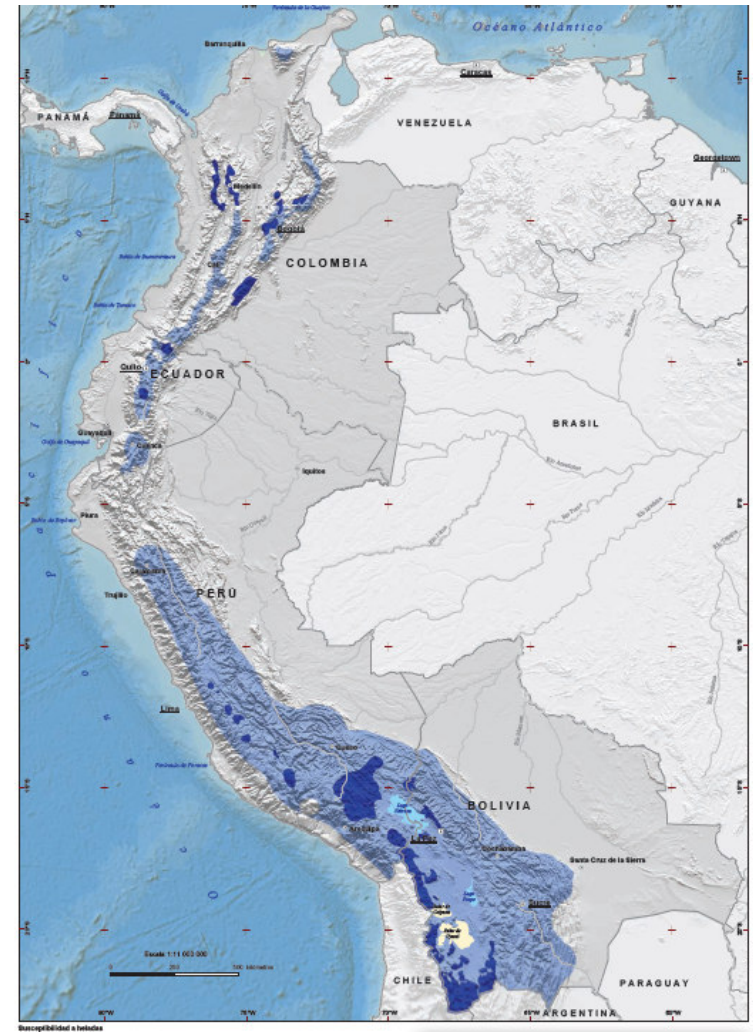




## Agricultural areas exposed to frost



## Areas susceptible to frost





# Abiotic factors (extreme events)







*Yungay* - modern variety



Frost tolerant bitter potatoes



Hail and capacity to recover



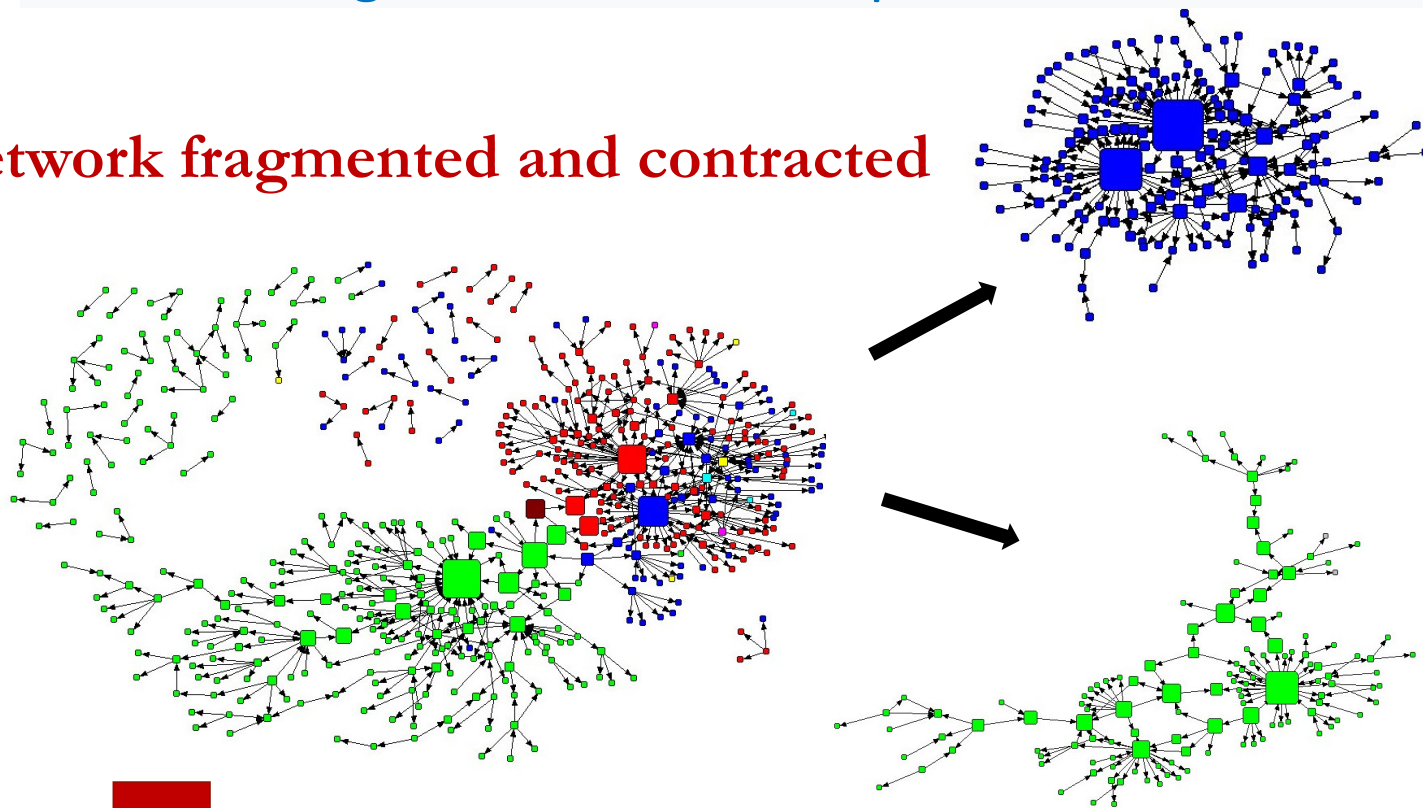
*Manua* landrace - frost tolerant





## Seed exchange networks: a comparison with and without acute stress

**Network fragmented and contracted**



**Seasons with stress:** 450 nodes (actors) and 755 transactions (seed input / output)

**Seasons without stress:** 527 nodes (actors) and 939 transactions (seed input / output).

68% less seed provision

15% less farmers involved

11% reduction in the volume of seed exchanged

59% more seed acquisitions

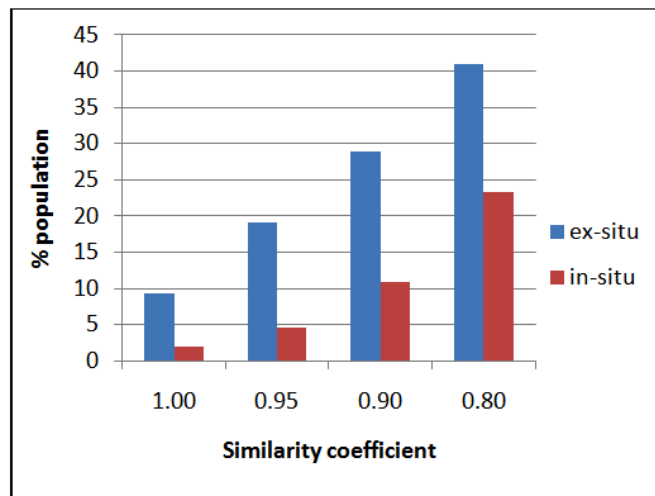
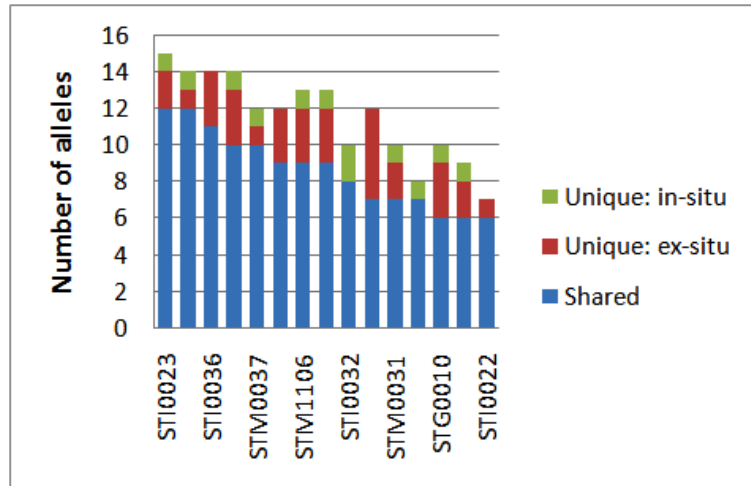
Source: Arce et al., 2018



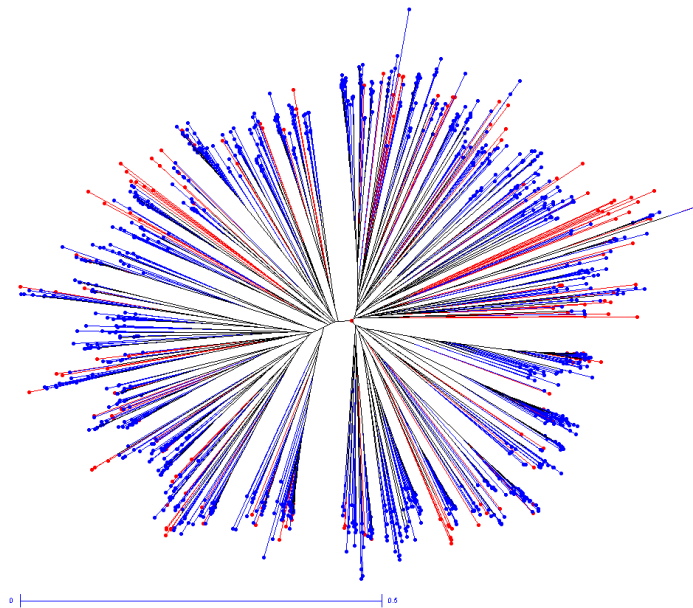


# Darwinist selection: comparing diversity in time

## Comparing allelic diversity



## Comparing landrace diversity



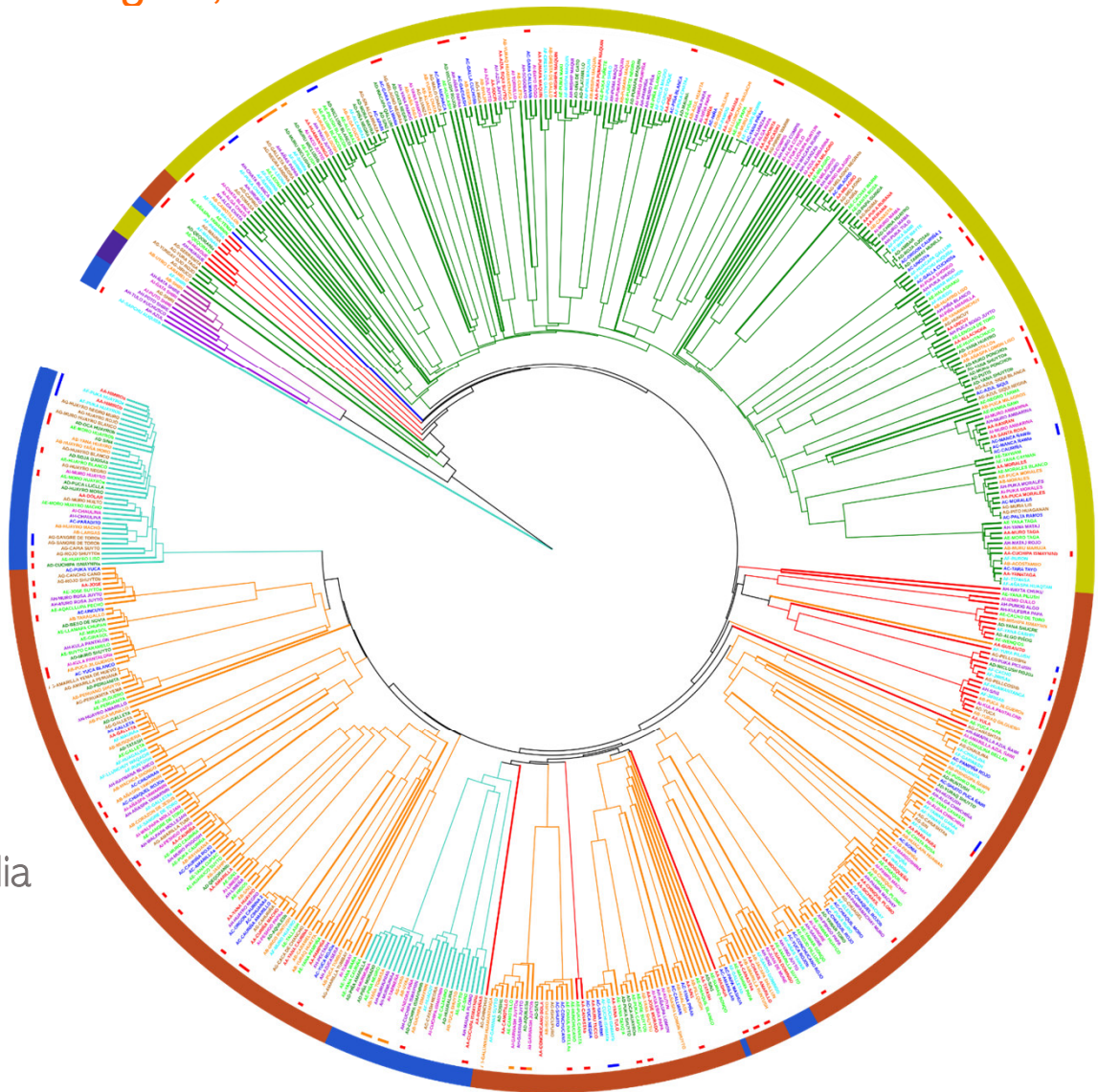
Unweighted neighbor joining dissimilarity tree comparing an *in-situ* and *ex-situ* population (n = 989 / n = 173)

*Diversity* **2013** 5:505-521





Dendrogram prepared with 2763 SNP molecular markers for 544 landraces, 9 communities, Pasco Region, Peru



Comunidades

- SAN GENARO
- PAUCARTAMBO
- LA QUINUA
- INO
- HUAYO
- HUACHON
- GARGAR
- CHUPACA
- BELLAVISTA

*Spp*

- STN
- PHU
- JUZ
- GON
- CUR
- CHA
- ADG

Ploidia

- 2x
- 3x
- 4x
- 5x





## Agricultural Innovation & Diversity Change

Going back 25 years later

Journal of Development Economics 39 (1992) 365–387. North-Holland

### Technology adoption and biological diversity in Andean potato agriculture\*

Stephen B. Brush and J. Edward Taylor

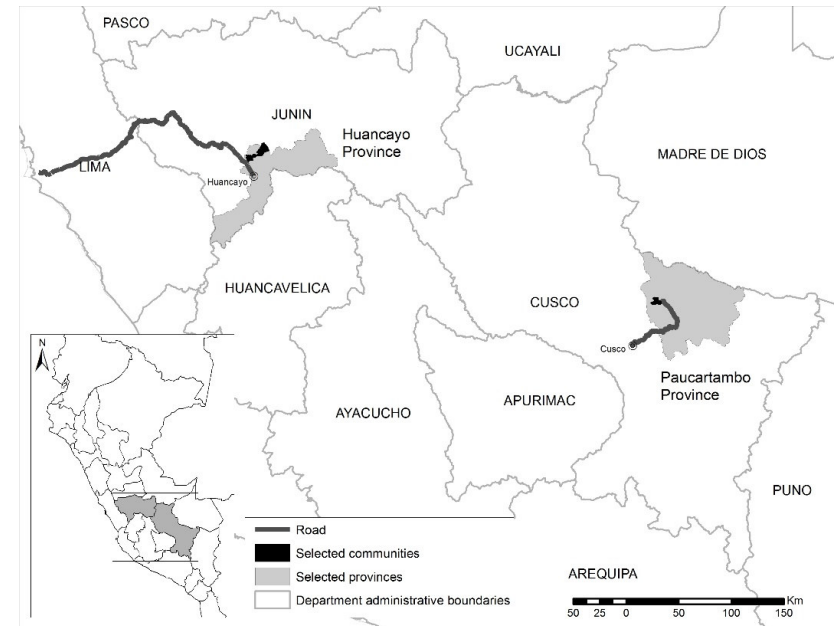
University of California, Davis CA, USA

Mauricio R. Bellon

Universidad Nacional Autónoma de México, Mexico City, Mexico

Received May 1990, final version received December 1991

Biological diversity in cradle areas of crop origins has been an important source of genetic resources for world agriculture. The loss of biological resources in agricultural systems due to the introduction of high-yielding varieties is a potential cost of agricultural development. Our econometric analysis using data from Peru indicates that the adoption of high-yielding potato varieties results in a reduction but not a complete loss of biological diversity on individual farms and a possible loss in aggregate diversity. We conclude that on-site conservation of seed resources may be a viable complement to the off-site methods now in place.



JUEGO 12				
ALTERNATIVA 1		ALTERNATIVA 2		ALTERNATIVA 3
NÚMERO DE PARCELAS CON VARIETADES DE PAPAS NATIVAS EN CHACCRU O CHALO	RENDIMIENTO DE LAS VARIETADES MEJORADAS	NÚMERO DE PARCELAS CON VARIETADES DE PAPAS NATIVAS EN CHACCRU O CHALO	RENDIMIENTO DE LAS VARIETADES MEJORADAS	<div>NO CAMBIO, ME QUEDO COMO ESTOY AHORA</div>
NÚMERO DE VARIETADES DE PAPAS NATIVAS EN CHACCRU O CHALO	PRECIO POR ARROBA DE LAS VARIETADES MEJORADAS	NÚMERO DE VARIETADES DE PAPAS NATIVAS EN CHACCRU O CHALO	PRECIO POR ARROBA DE LAS VARIETADES MEJORADAS	

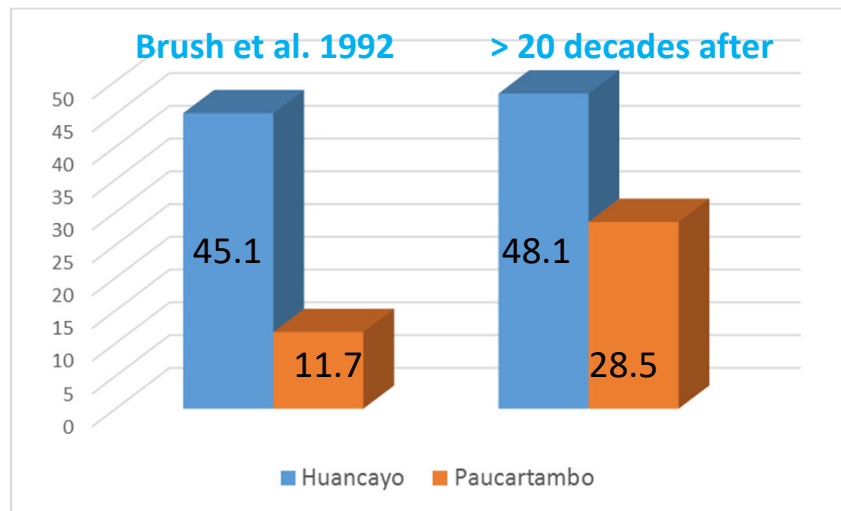


## Trade-off for area, not diversity

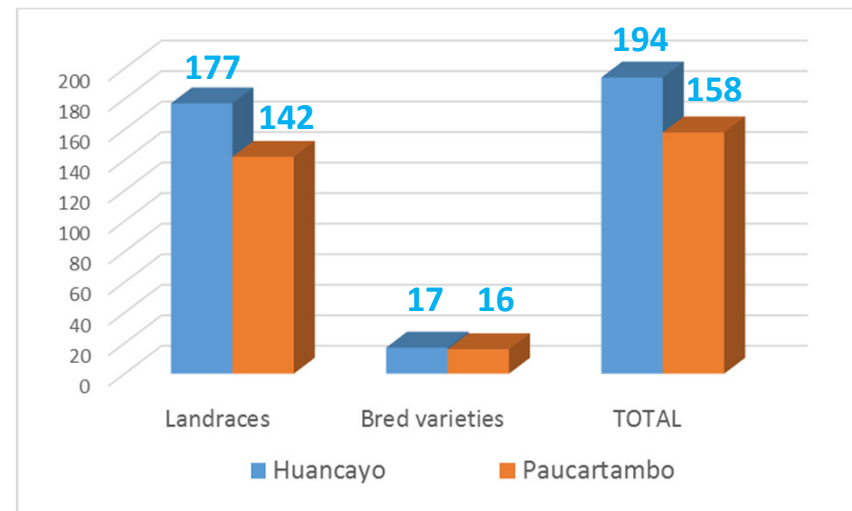
	Huancayo (n=102)	Paucartambo (n=93)
Diversity of native potatoes	0.016*** (0.006) ; (p=0.0098)	0.024*** (0.006) ; (p=0.0001)
Yield of modern potatoes	0.760*** (0.264) ; (p=0.004)	0.711*** (0.263) ; (p=0.007)
Price of modern potatoes	0.132*** (0.025) ; (p=0.000)	0.071*** (0.024) ; (p=0.003)
Area of native potatoes	- 0.111 (0.185) ; (p=0.549)	- 0.329* (0.185) ; (p=0.075)
Sample size	102	93
Normalized Hannan-Quinn	2.17	1.86
Log likelihood	-759.4	-588.9



### % area modern varieties



### Varietal diversity (LRs, bred)



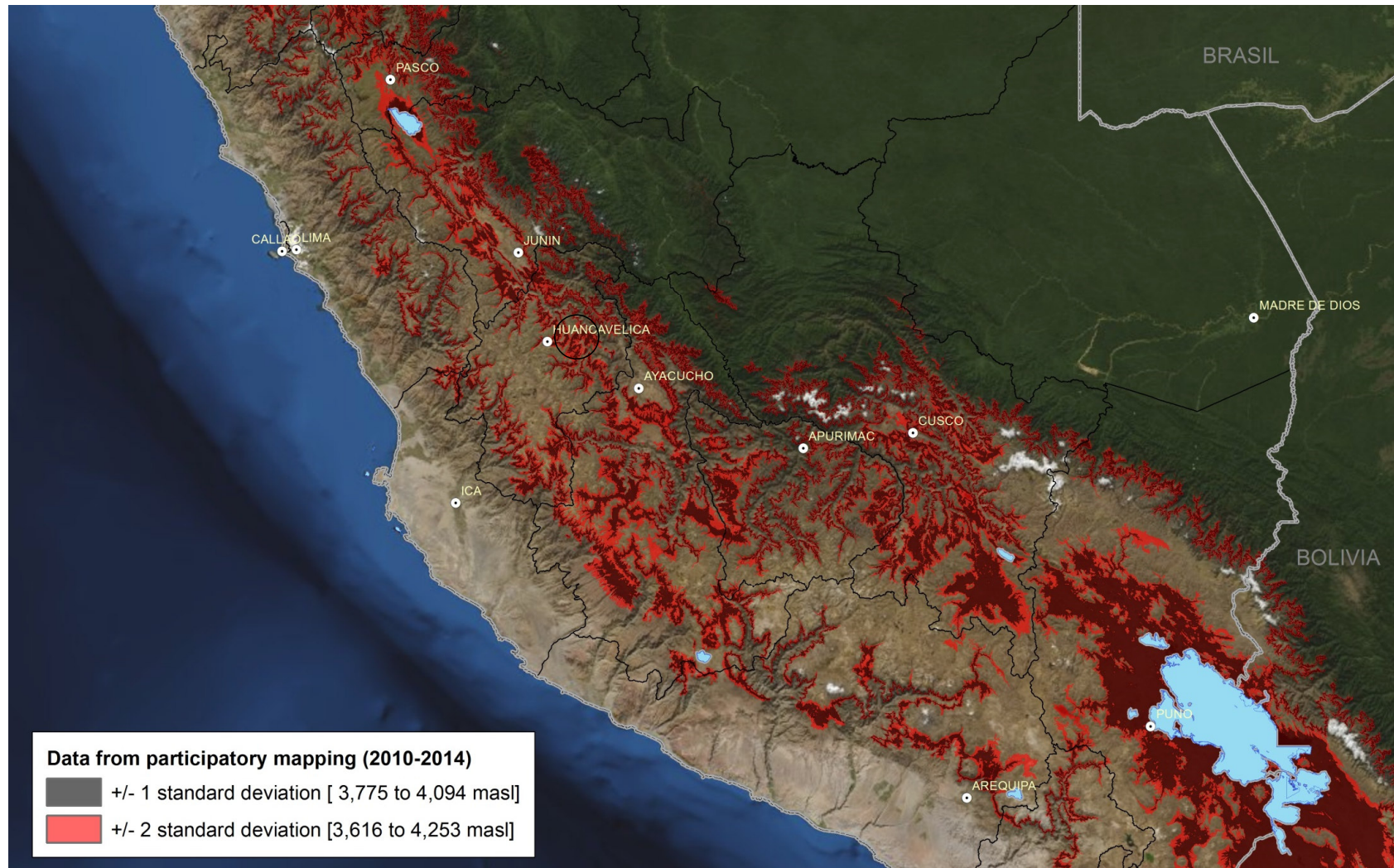


# Distribution of potato landraces Peru (two points in time)

1. Germplasm collections CIP (period 1970-1994)

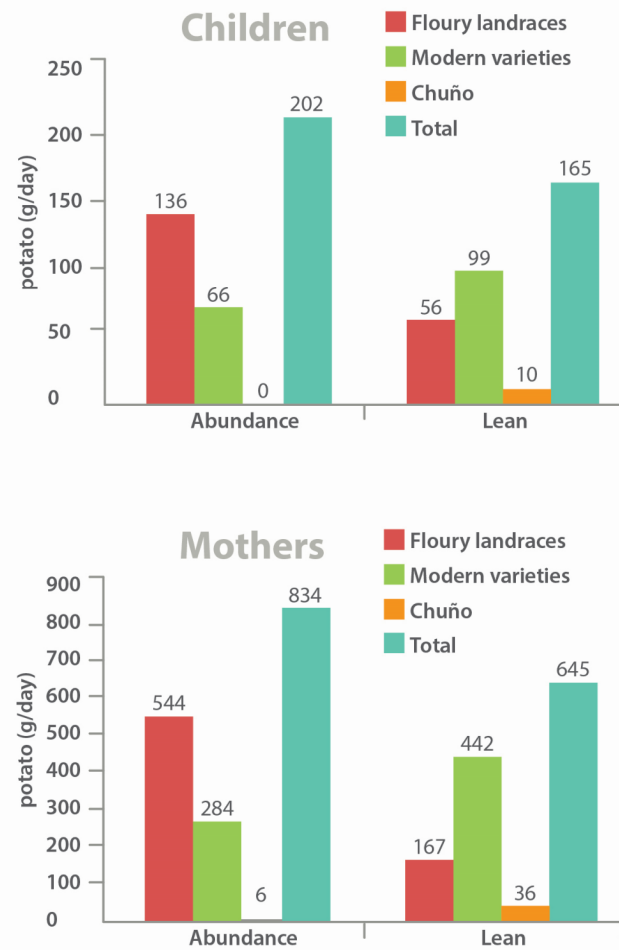
2. Participatory mapping (period 2010-2014)

300 m altitude increase in 50 years



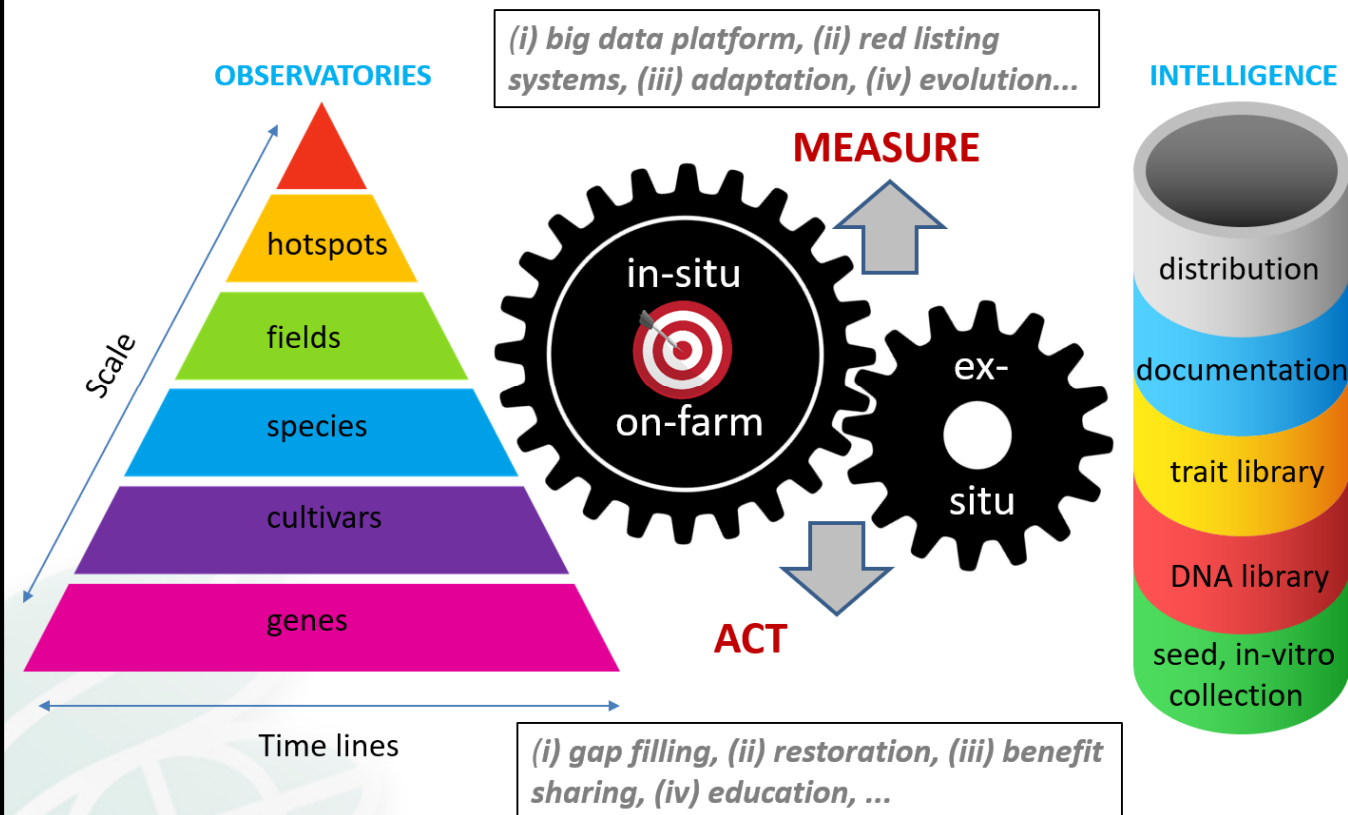


## Understanding the role and potential of agrobiodiversity in Andean food systems

De Haan et al. 2019 *AJPR* 96:151-163



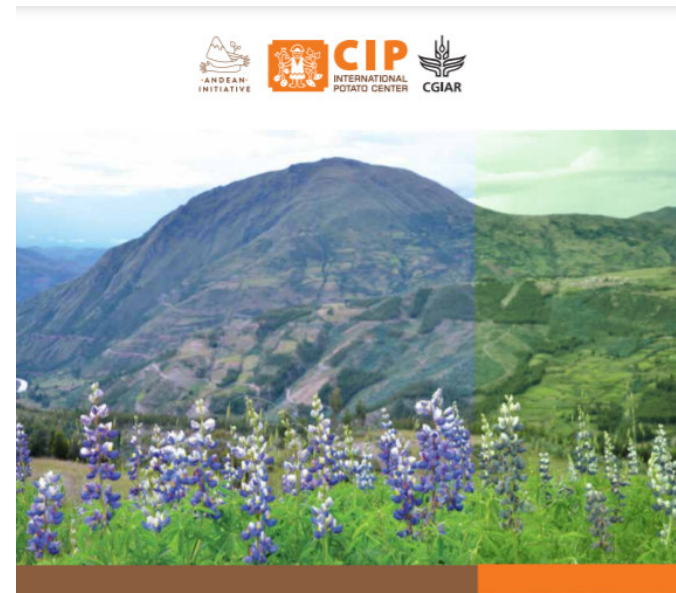
# An Integrated Conservation Framework



# Thank you for your Attention!



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**The Andean Initiative**  
Elevating a collaborative  
agenda on agrobiodiversity,  
climate action and healthy diets

**STRATEGY**  
2020-2030

