CIP
INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

Is Agrobiodiversity Key to Sustainable Crop Production in a Changing Environment?

Traditional Potato Farming in the Peruvian Andes: A model for the Future

Dave Ellis
Head of Genebank
Leader of the Program for Conserving Diversity for the Future
d.ellis@cgiar.org

APEC Climate Change Symposium, 16-18 September 2016, Piura, Peru

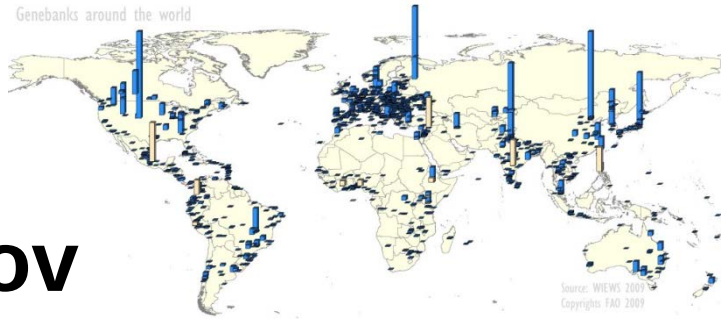
Diversity is the Driver of Crop Domestication, Crop Improvement and Genetic Gains

- Source of new traits (alleles, QTLs)
- Peruvian Andes, diversity used for millennia as insurance
- Potato farmers plant 10+ different potato varieties
- Differing ploidies, uses and tastes
- Bitter potatoes – ensure some harvest

Crop Diversity Conserved in Genebanks

- Genebanks are incredible places to visit

- Wealth of diversity that will feed the world for generations
  - Teach the children



- Dedicated – rice in Vavilov
- Vulnerable – Afghanistan, Philippines
- Economic value of one accession versus another hard to determine

The CIP Genebank >19,000 collections of cultivated root and tuber crops

CIP Genebank

- **World's largest in vitro genebank**
- **Collections held *in trust* under the International Treaty for Plant Genetic Resources for Food and Agriculture**
- **Distribution globally for research, training and breeding with SMTA**
- **Mostly Annex 1 crops**
- **Accession-specific information key to use**

CBD and ITPGRFA

- **Article 15 of the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA)**

- **Under agreement with FAO and the ITPGRFA, these materials are conserved *in trust* and distributed freely for use by humanity for research, training and breeding**
- **Nagoya Protocol – 4.4**

Where a specialized international access and benefit-sharing instrument applies … this Protocol does not apply…

The International Treaty ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

United Nations Decade on Biodiversity

Parque de la Papa: A 10 Year Partnership

- PdP/CIP/Andes
  - UW, OSU, USDA
- Understanding the use of native diversity
- Repatriation
  - Cultural awareness
  - Papa Arariwas
- Information exchange
  - Joint selection of cultivars
  - Scientific methods

Unprecedented Effects of Climatic Warming

1982 snow >3 months;
2014 there was no snow

4619 masl

Parque de la Papa
Potato Park / Cusco - Perú

¿Se perciben los efectos del cambio climático en este valle?

"Antes la lluvia llegaba puntual, las tierras eran muy fértiles y el sol brillaba lo suficiente. Ahora el sol es más caliente, la lluvia no llega a tiempo, caen granizadas y las temperaturas a veces son heladas, también la sequía a veces es peor que nunca antes. Además, han aumentado las plagas de insectos y las enfermedades. Las variedades de papas que cultivaban nuestros abuelos en las tierras bajas, donde está el río, ahora están creciendo más arriba, en las laderas de las montañas. En estas tierras nos rodean nuestras *apu* [montañas sagradas], que nos ayudan a proteger nuestras papas, nuestros cultivos y nuestros animales. Antes estas montañas estaban cubiertas de nieve, ahora se ven tristes porque el clima se está haciendo más caliente y ya no hay nieve. Otras especies y animales están sufriendo, como el cóndor, las zorras, los venados, los patos y los peces que siempre han vivido con nosotros y que apreciamos mucho. Sabemos que *Pacha Mama* no está contenta con estos cambios y tenemos que trabajar unidos para que vuelva a estar contenta."

2014 lowest level Native Potatoes

1982 lowest level Native Potatoes

200 METER INCREASE IN POTATO CULTIVATION DUE TO WARMING ENVIRONMENT IN 30 YEARS!!!

PdP Elevational Potato Plots Monitoring Climate Change

Participatory Evaluation of Landrace Diversity at Higher Elevation

Participatory Evaluation of Landrace Diversity at Higher Elevation

Repatriation (1997-2015)

Communities	# acc	Reason
Dpto. Apurimac		
Tintay (Aymaraes)	55	Disease
Dpto. Arequipa		
Chuquibamba Inst.Agrop (Condesuyos)	25	Capacity building
Chuquibamba (Condesuyos)	25	Capacity building
Dpto. Ayacucho		
Llamanniyoc (Huanta)*	86	Terrorism
Chiara, INIEA-Canaan	80	Disease
Dpto. Cajamarca		
Cajamarca – ONG	28	Disease
INIA-Baños del Inca	112	Disease
Dpto. Cusco		
Urinsaya Anansaya Ccollana Chisicata (Espinar)	172	Disease
Chahuaytire, Pampallacta, Paru-paru, Amaru, Cuyo Grande, Sacaca	410	Restoration
Instituto Tecnico Agropecuario Bilingue Patacancha	60	Restoration
Conservacionistas de papas nativas	156	Restoration
Dpto. Huancavelica		
San Jose de Aymara (Tayacaja)*	344	Restoration
Collpatambo (Tayacaja)	244	Restoration
Castrovirreyna	35	Disease
Ticrapo	35	Disease
Paucará	35	Disease
Chopkas, ONG RuruInka	50	Disease
Chopkas, ONG Yanapai	172	Restoration
Chonta, MP Churcampa	150	Restoration
Chupamarca (Castrovirreyna)	50	Disease

* not all communities listed due to space limitations

Communities	# acc	Reason
Depto Huanuco		
Iscopampa	51	Disease
Huamally	73	Disease
PRAA-Huanuco	53	Disease
Depto. Junin		
Racracalla (Concepción)	88	Restoration
Mamac (Concepción)	88	Restoration
Andas (Concepción)	88	Restoration
Pahualtupo (Concepción)	95	Restoration
Cayash (San Pedro de Cajas)	68	Disease
Cascas (Tarma)	68	Disease
La Libertad (Concepción)	50	Disease
Muqui (Jauja)	100	Restoration
Tarmatambo (Tarma)	20	Restoration
Depto. Lima		
Cochas-Paca (Cajatambo)*	109	Restoration
Laraos (Yauyos)	22	Restoration
Miraflores (Yauyos)	47	Capacity building
Huancaya (Yauyos)	47	Capacity building
Laraos (Yauyos)	47	Capacity building
Curquish (Cajatambo)*	55	Capacity building
Depto. Pasco		
UNDAC-Pasco	33	Disease
Chinchan (Huariaca)	22	Restoration
Depto. Piura		
Sondorillo (Huancabamba)	15	Restoration
Depto. Puno		
INIA-Puno	45	Disease

- **89 communities 6 institutions**
- **7,686 total germplasm transfers**
- **>1,250 unique accessions (~30% of the collection)**

San Jose de Aymara

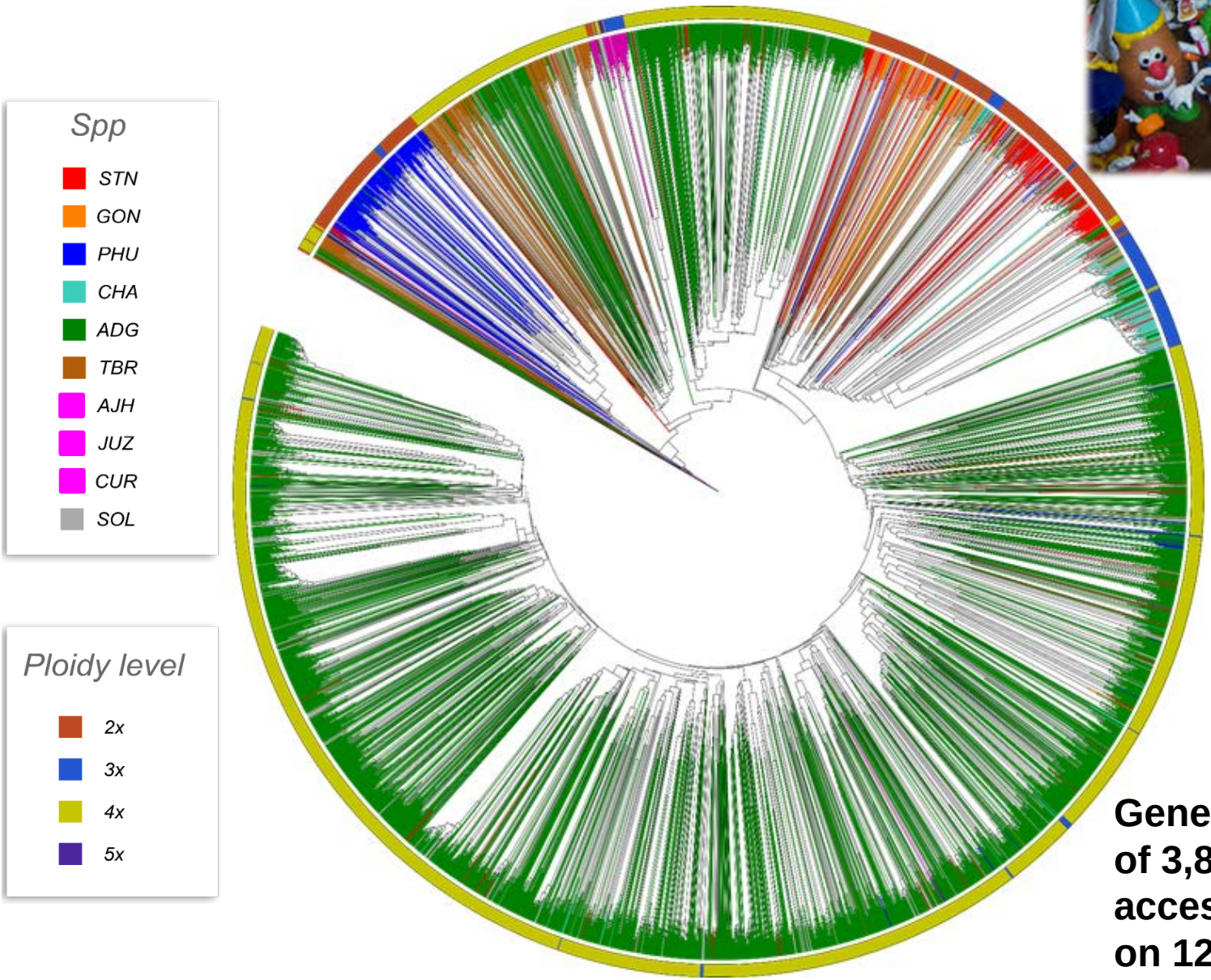
- Single community – 93 families
- Started with selling papa nativas
- 2014 exported over 40 containers of chips to three countries
  - 7 landraces
  - 5 repatriated from CIP
- Community genebank

Santa Cruz de Pichu

l

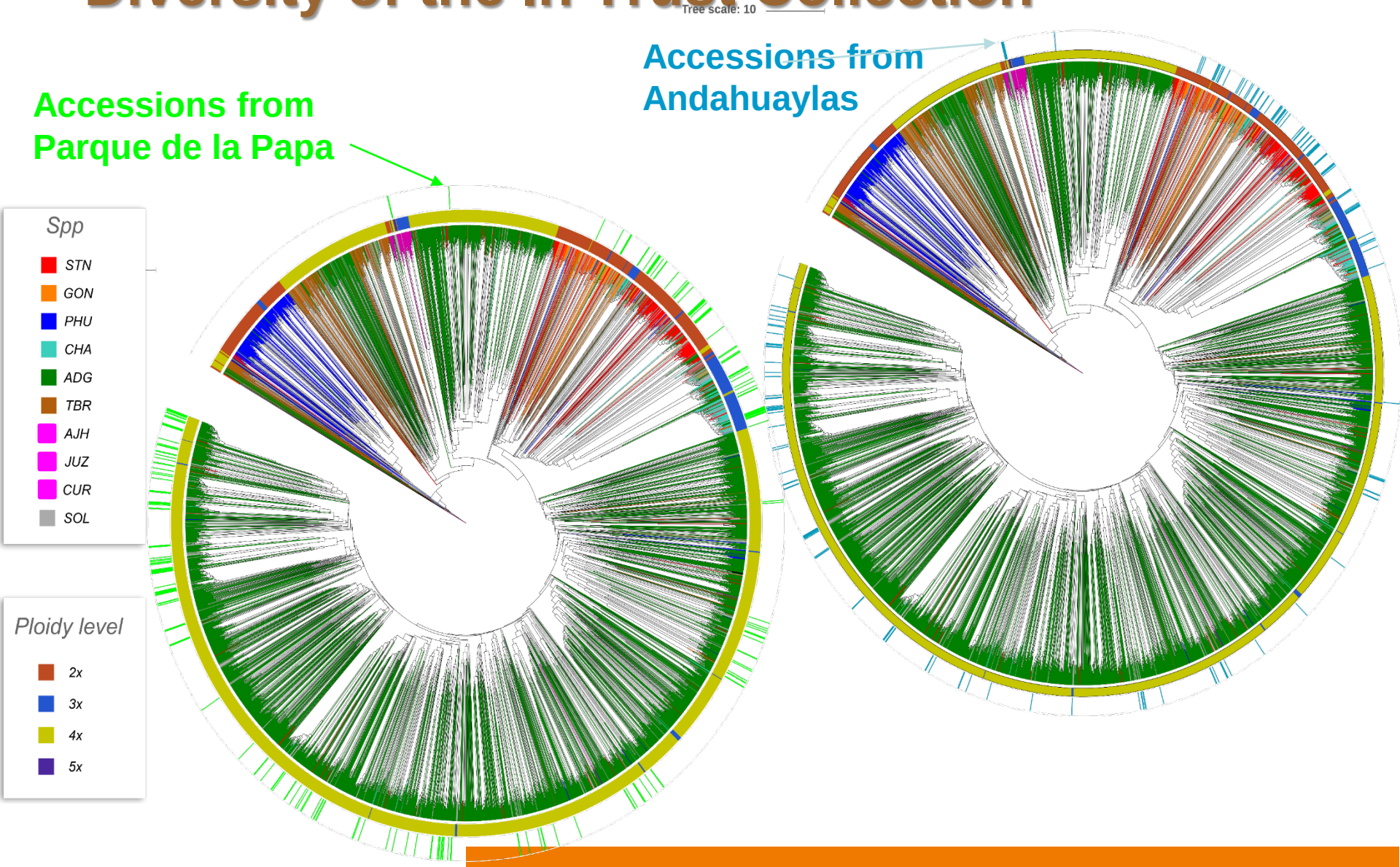
prove

How Do You Measure Diversity?

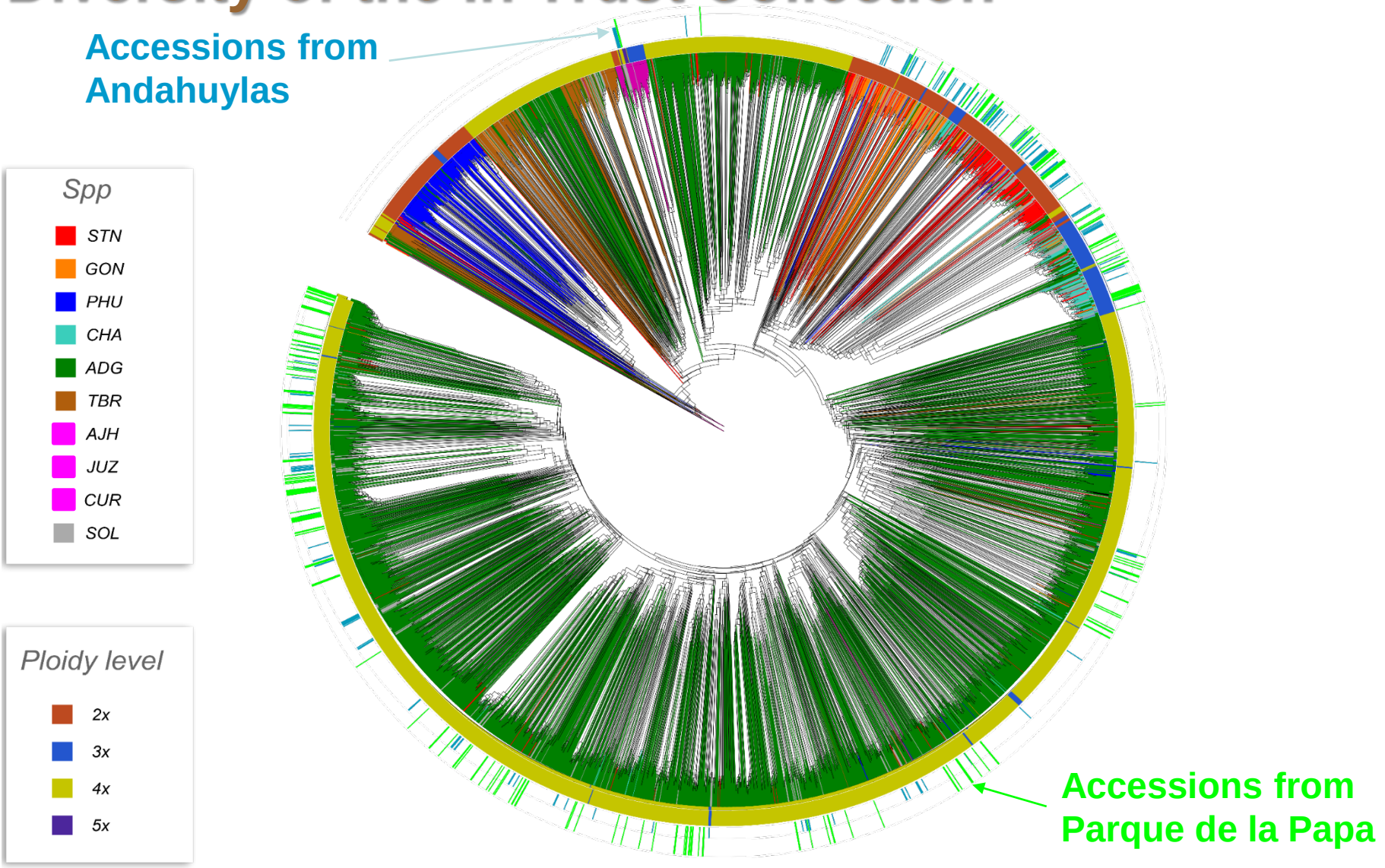


Genetic relatedness of 3,860 potato accessions based on 12K SNP markers

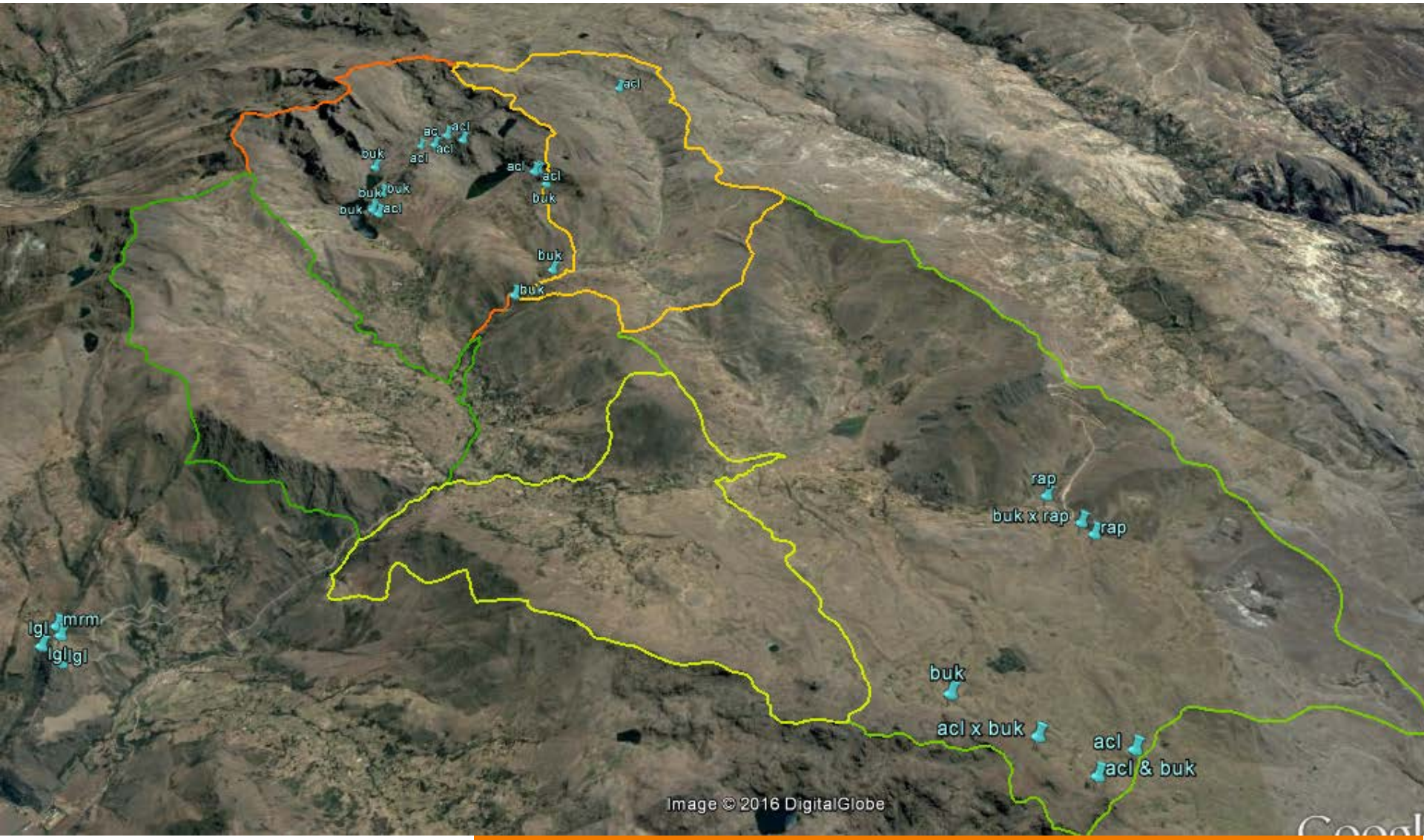
Material Donated to CIP Compared to the Diversity of the In Trust Collection



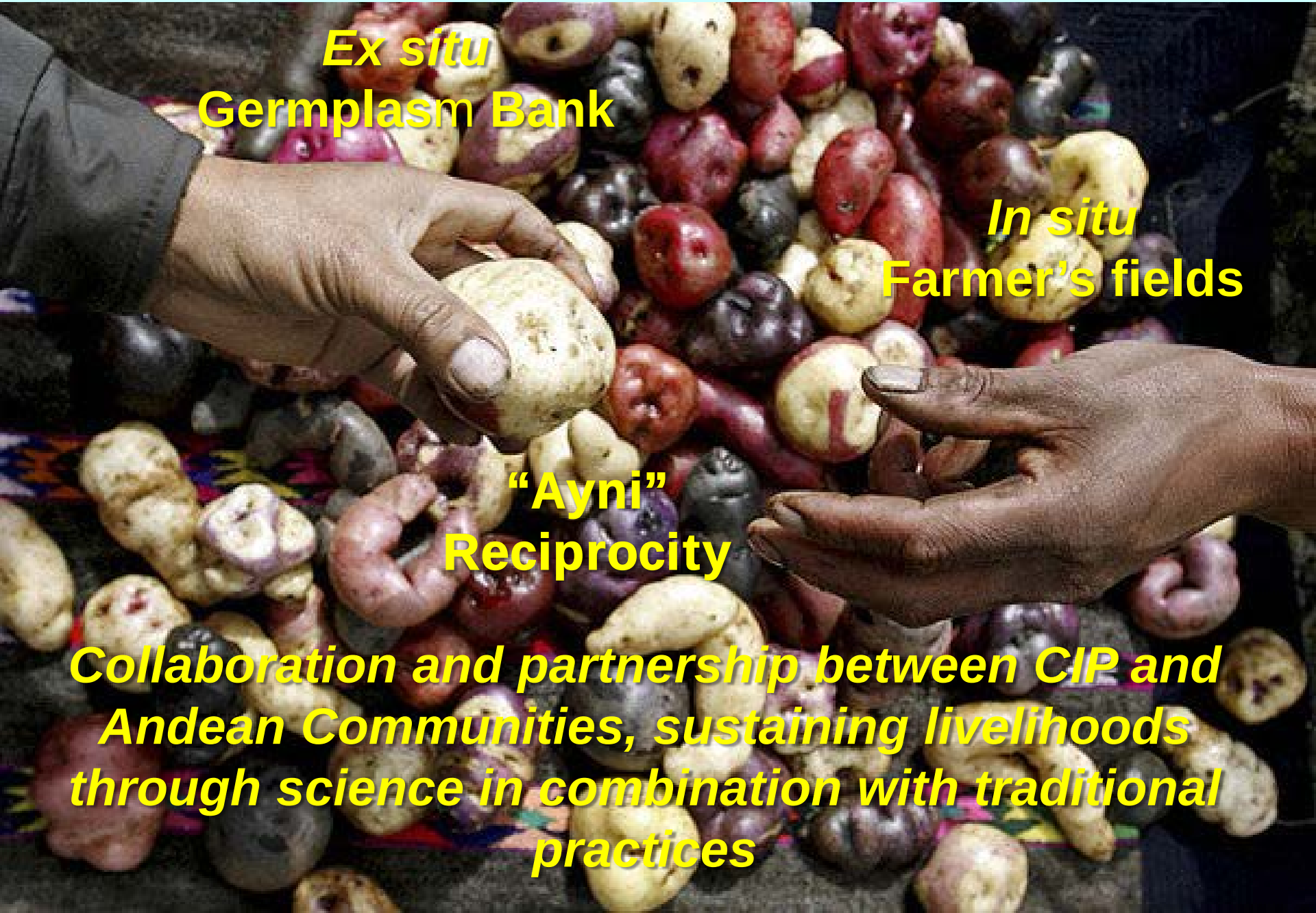
Material Donated to CIP Compared to the Diversity of the In Trust Collection



Diversity Includes Crop Wild Relatives – Monitoring Wild Potato Species in PdP



Dynamic conservation in potato - Andean concept



Collaboration and partnership between CIP and Andean Communities, sustaining livelihoods through science in combination with traditional practices

Key Partners

International Potato Center

Comunidad Santa Cruz de Pichu

Comunidad San Jose de Aymara

Rene Gomez
Alberto Salas
Noelle Barkley

Asociación ANDES
ASOCIACIÓN PARA LA NATURALEZA Y EL DESARROLLO SOSTENIBLE

THANK YOU!

Parque de la Papa
Potato Park / Cusco - Perú

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

GLOBAL CROP DIVERSITY TRUST
A FOUNDATION FOR FOOD SECURITY

THE GENEBANK CRP

IN TRUST FOR THE INTERNATIONAL COMMUNITY

CIP
INTERNATIONAL POTATO CENTER
A member of the CGIAR Consortium

1 BILLION PEOPLE
eat potato in more than 140 countries worldwide

World Food Prize is awarded to scientists from the International Potato Center - CIP

Global Presence

23 Country Projects

18 Country Offices

Operations in 23 countries spanning South America, SSA, Asia + China

Lima
PERU

45 Anniversary 2016

45 years old
based in Lima, Peru

3rd
POTATO
most important crop

6th
SWEETPOTATO
most important crop world wide

CGIAR
PROGRAMA DE INVESTIGACIÓN SOBRE Raíces, Tubérculos y Banano