



Biotechnology for conservation and use of clonally propagated genetic resources

ABDC - 10

W. Roca

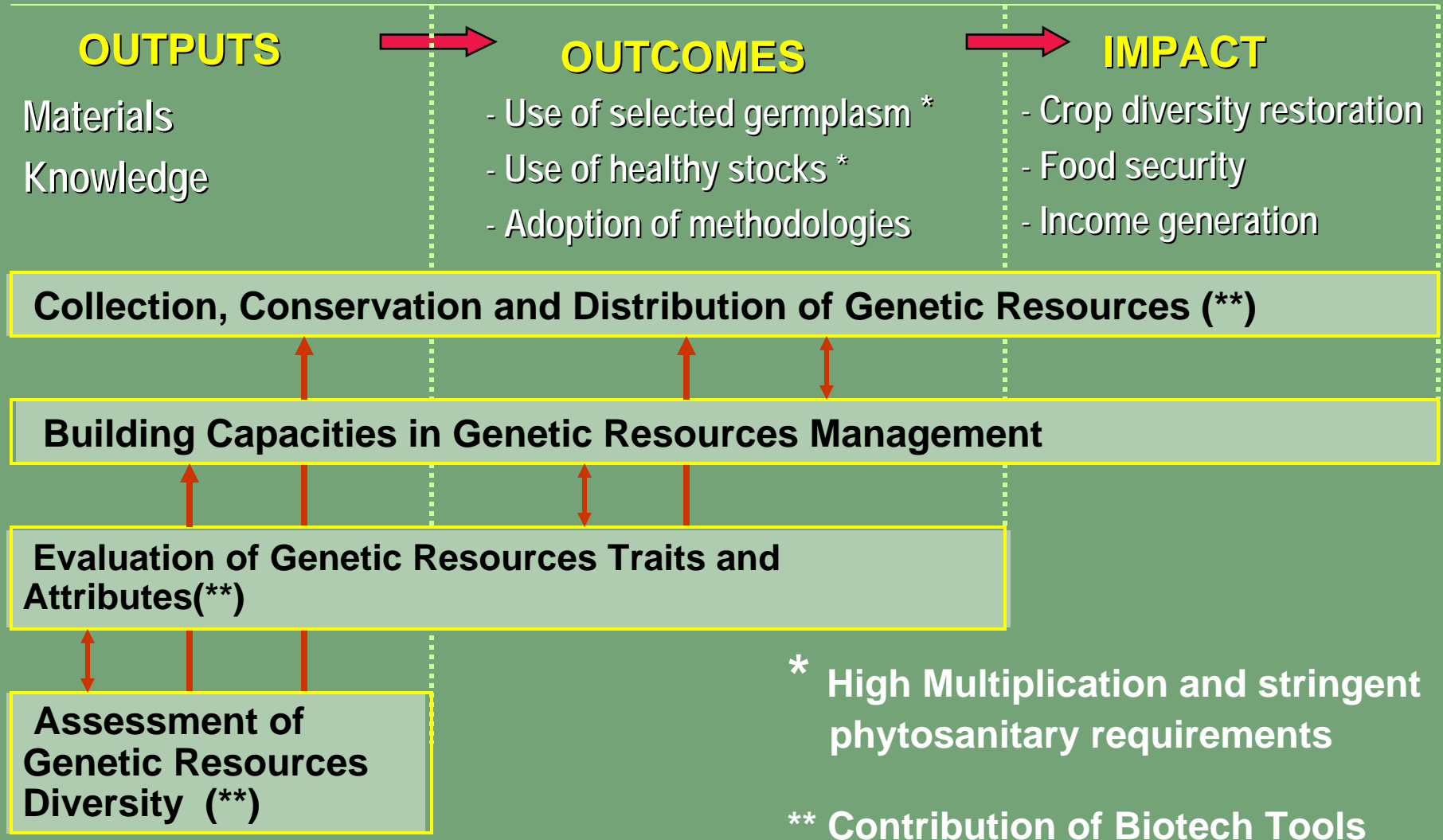
Guadalajara, Mexico

March 1-4, 2010

MAJOR CLONALLY PROPAGATED FOOD CROPS

<u>Crop</u>	<u>World Production</u>	<u>Planting Material</u>	<u>Ploidy Level</u>	<u>Germplasm Collections : # acces (*)</u>
Cassava	226 Mio T	Wood Cuttings	2x, 3x, 4x	6845 – CIAT 2700 – IITA
Potato	315 Mio T	Sprout Tubers	2x, 3x, 4x, 5x	5100 – CIP
Sweet Potato	124 Mio T	Sprout Cuttings	6x	6800 – CIP
Andean R&T	0.7 Mio T	Sprout Tubers	2x, 3x, 4x, 6x	1550 – CIP
Yams	51 Mio T	Root Tubers	3x - 10x	3200 – IITA
Banana / Plantain	105 Mio T	Corms	3x	2400 – BIOVERSITY, IITA
(*) From SINGER				

Clonal Crops Genetic Resources Management



LINES OF DEFENSE IN EX – SITU GGRR CONSERVATION

Example: POTATO*

FARMERS FIELDS



Community genebanks (eg. Potato park – “Condor route”)

FIELD MAINTENANCE

Annual propagation by tubers

IN VITRO COLLECTION

@ 2 year plantlet in test tubes, controlled cond.

TRUE SEED COLLECTION

@ 30 years – chamber (- 20 `C)

CRYOPRESERVATION

Shoot tips in LN

DNA BANKING

Deep Freezer (- 70 `C)

HERBARIUM

Controlled temp. / humidity room

BLACK BOX

**In vitro / duplicate collection – outside country
Seeds – Svalbard Seed Vault (GCDT)**

(*) CIP's gene bank (cip-genebank@cgiar.org bulletin (iso 17025) ; Potato park communities, Andes Assoc. (Cusco); D Tay, A. Panta (CIP) 2009

Analysis of the Collections

- **Required for:**
 - Rationalization of collections: Improved conservation and use
- **Characterization and Evaluation**
 - Taxonomic , Morpho-agronomic , Phytosanitary Quality
 - Evaluation of important traits
- **Genotyping**
 - Marker development and use
 - ESTs
 - SNPs
 - OMICS

Biotech tools help to gain knowledge on clonal crop collections

Molecular markers

- Diversity assessment & gaps In- situ /farmer fields & ex-situ (collections); germplasm restoration and exchange; identity validation ; sorting out clonal mixtures
- Phylogeny, taxonomy, genepool structure .
- Identification of redundancies in collections
- Plant health testing

Modern genotyping tools

- Microarrays : Potato , sweetpotato , cassava ; Musa
- SNP profiling : Cassava , Potato

Genomics: Cassava, Potato , Musa (sequencing)

Eg . 1. Cultivated potato :
Native and Commercial (improved)

2. Wild potatoes

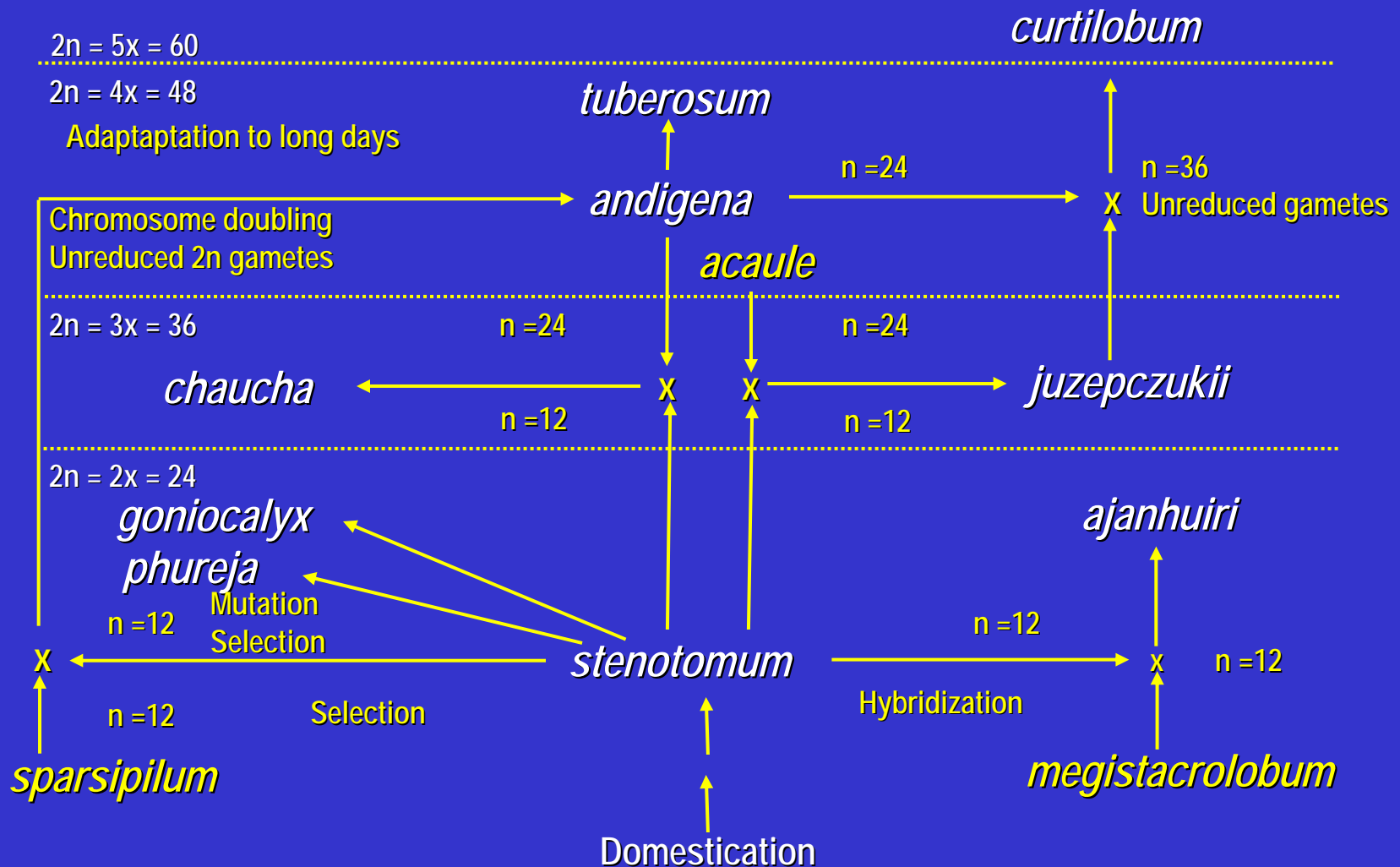
Solanaceae; several cultivated ssp ; many wild ssp;

Ploidy levels: $2n=2x,3x,4x,5x,6x$ ($n=12$)

(CIP genebank 2006)



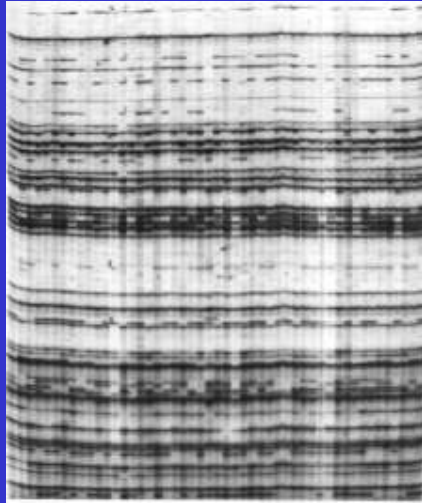
Species diversity of potatoes (*)



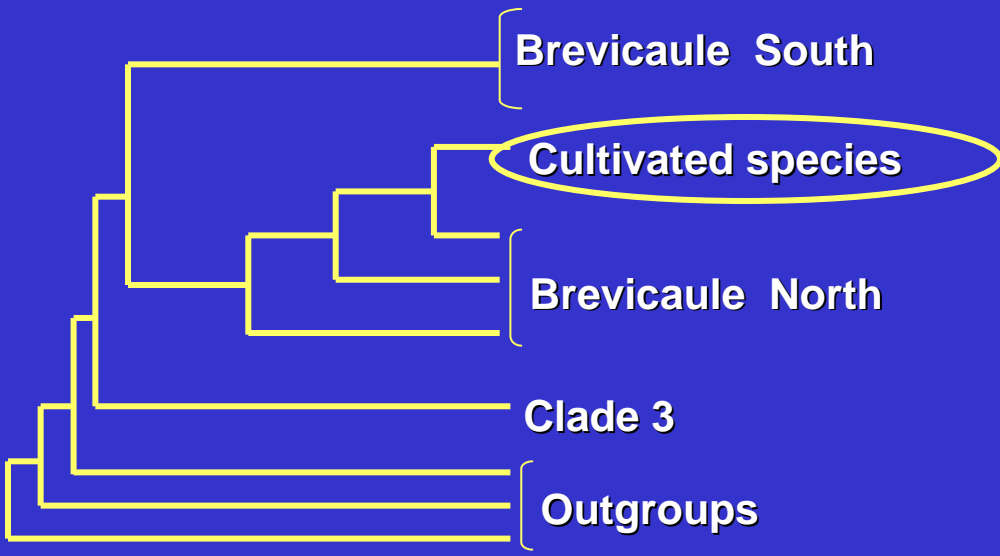
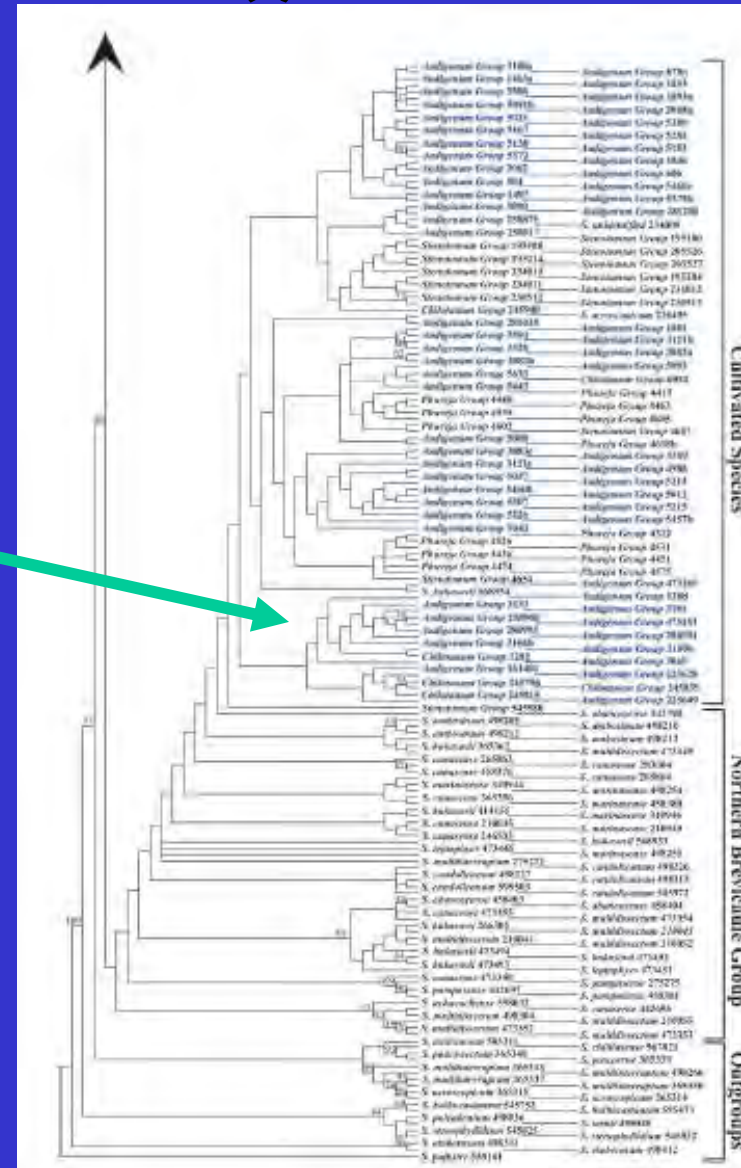
S. leptophyes (2x) *S. bukasovii* (2x) within the *S. brevicaule* complex (Spooner et al, 2005)

(*) Basado en Hawkes (1990) & Salaman (1937)

Current molecular evidence : Single domestication of potato (*)

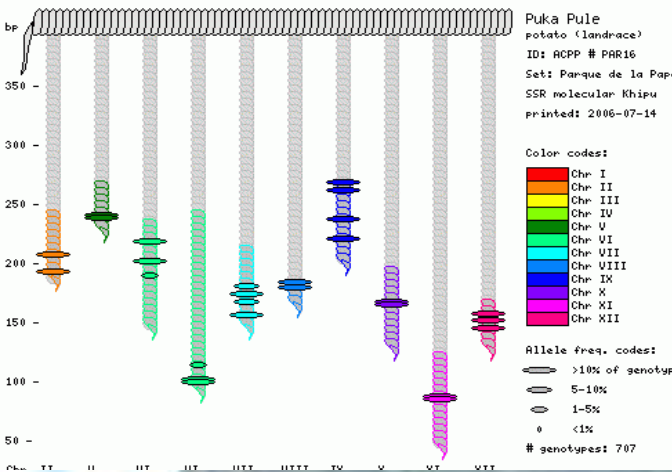


Solanum bukasovii



(*) Spooner, et al., 2005, PNAS 102:41

Molecular markers and local knowledge for characterization of farmers clonal biodiversity (CIP genebank , Potato Park , Andes Assoc, Cusco – Peru, 2005)



	PAM	CHA	PAR	REPATRIATED FROM CIP
Cultivares	208	195	58	246
Riqueza alélica	112	114	93	130
Diversidad genética	0.77	0.76	0.76	0.78
Alelos exclusivos / comunidad	0	3	0	15
Alelos exclusivos total		7		15
Diferenciación molecular		79.83%		96.30%

PAM: Pampallacta
CHA: Chawuaitire
PAR: Paru - Paru

Native cultivated potatoes as source of tolerance to drought (*)

Order	Name	Species	Procedence
1	Sullu (**)	<i>andigena</i>	Cuzco
2	Venancia	<i>xchaucha</i>	Pasco
3	Renacimiento	<i>andigena</i>	Ancash
4	Yana mataj	<i>andigena</i>	Junín
5	Muru markatina	<i>xchaucha</i>	Huanta
6	Wayru	<i>andigena</i>	Huamanga
7	Yana putis	<i>xchaucha</i>	Cuzco
8	Rosita	<i>andigena</i>	Ancash
9	Hayruro	<i>andigena</i>	Cuzco
10	Yana rucunag	<i>xchaucha</i>	Junín
11	Color uckuna	<i>xchaucha</i>	Cuzco

(*) Cabello, R. et al, CIP (2007)

(**) Schafleitner, R, et al, CIP: Plant Physiol. & Biochem. 45: 673 – 690 (2007)