

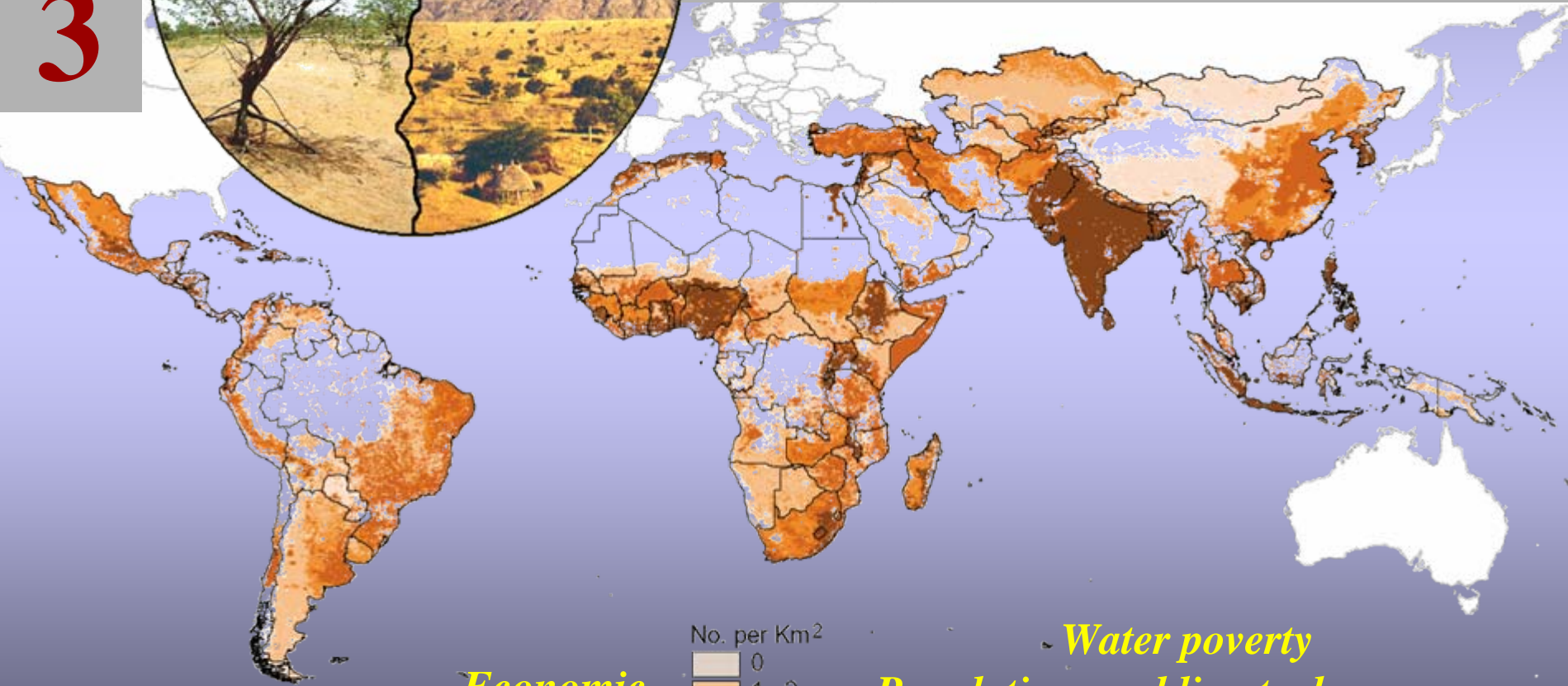
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Reducing

Global Poverty

Through Molecular Breeding



*Economic
poverty*



*Water poverty
Population and livestock pressure
Marginal cropping systems*

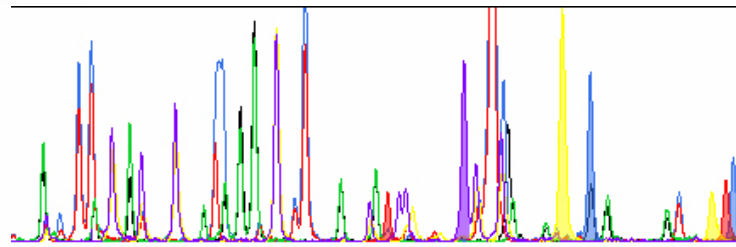
Driving Genomics Innovations into Farmers' Fields



SP3

Jonathan Crouch

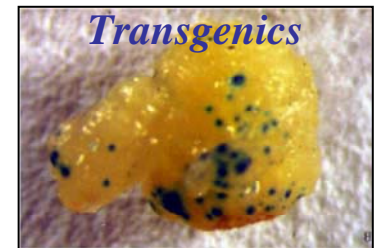
Genomics - Bioinformatics - Biometrics



Physiology - Modeling - Socio-economics



*Tissue
Culture*



Transgenics

Trait Capture for Crop Improvement

*Alliances with
NARS - NGOs - SMEs - IARCs - MNCs
essential for
product development and delivery*



Our future success will be judged here ...



... so we can not ignore the practical difficulties associated with product development, delivery and uptake in resource-poor cropping systems



SP3 Thematic Sessions



SP3 Activities 2004

Foundation and Capacity Building Activities:

- (i) Workshop on transgenic technologies
(Nairobi: April)
- (ii) Training course on molecular breeding
(Nairobi: Nov-Dec)
- (iii) Database of potential elite varieties as
targets for gene and trait introgression

SP3 Activities 2004

Molecular Breeding Activities:

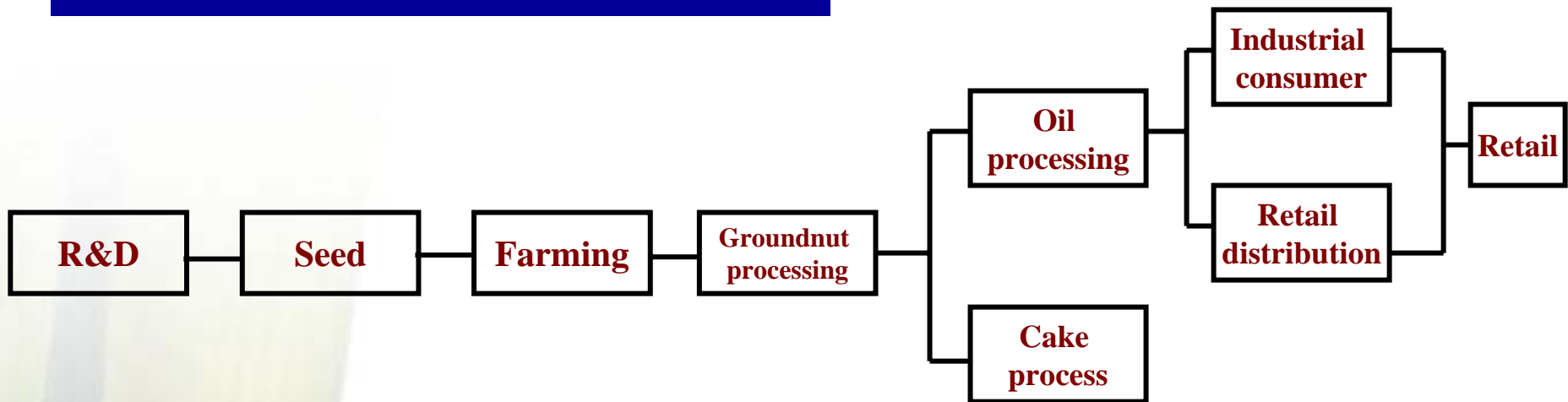
- (i) *Proof-of-concept* gene-based MAS for pyramiding many disease resistance genes in a single genotype (rice)
- (ii) *Validation* of SSR-based MAS for components of drought tolerance (maize, sorghum, millet and bean)
- (iii) *Development* of genetic populations and QTL mapping of components of drought tolerance (bean, cowpea and chickpea)

GCP as a Value Chain Orientated Initiative



Value in a product is built over a number of inter-connected activities

R & D >> farmer >> consumer



The Generation CP

2004

**Molecular Breeding Advocacy
and Community Building** (within the CGIAR)

2005

**Using Comparative Biology and Genomics to Develop
Drought Molecular Breeding Technologies**

SP3 Strategic Focus of Product Delivery Pathway: “Gene-based Markers for Complex Traits”



SP3 Commissioned Projects (2005-2006)

<i>Project Title (short)</i>	<i>PI (Institution)</i>
Low Cost Markers	Nollie Veracruz (IRRI)
Molecular Breeding Simulation	Scott Chapman (CSIRO)
DREB Trials	John Bennett (IRRI)
Product Development Pathways	Victoria Henson-Apollonio (IPGRI)

SP3 Competitive Grant Projects (2005-2007)

<i>Project Title (short)</i>	<i>PI (Institution)</i>
Studying drought tolerance in cassava (#3)	Alfredo Alves (EMBRAPA)
Utilizing peanut wild relatives (#5)	Jose Valls (EMBRAPA)
Cowpea Striga MAS (#6)	Festo Massawe
Cassava low cost MAS (#9)	Anthony Bellotti (CIAT)
Rice drought MAS (#12)	Zhi-Kang Li (CAAS)

Pioneer Involvement in SP3 Projects



Project Short Title	GCP PI Name	Pioneer Contact Name and Responsibilities
Low Cost Markers (SP3)	Nollie Veracruz	Dr. Wen-Chy Chu
Molecular Breeding Simulation (SP3)	Scott Chapman	Dr Mark Cooper
DREB Trials (SP3)	John Bennett	Pending negotiation with Mendel Biotech
Product Development, Pathways (SP3)	Victoria Henson-Apollonio	Dr Steve Ballenger
Physiology Modelling (SP1-3)	Marcel de Raissac	Dr Mark Cooper
iMAS (SP4-3)	Subhash Chandra	Dr Lane Arhur

New SP3 Commissioned Activities for 2006

Reaching the Breeders*

Molecular Breeding Communities of Practice

**Breeders in NARS and SME in addition to CGIAR*



SP3 Program Thematic Sessions

Friday 30 September



Session Name	Presenters
<i>Transgenics</i> (8:00-10:30)	Kazuko Yamaguchi-Shinozaki - John Bennett - Willy de Greef - Shawn Sullivan
<i>MAS Technologies</i> (10:45-12:30)	Victoria Henson-Apollonio - Nollie Veracruz - Festo Massawe - Martin Fregene
<i>Computational Tools for Molecular Breeding</i> (13:30-15:15)	Alfredo Alves - Marcel de Raissac - Fred Eeuwijk - Subhash Chandra - Jiankang Wang – [Hans Braun]
<i>Reaching the Breeders</i> (15:45-18:00)	Richard Edema - Nollie Veracruz - Luz George – [Alexandre Nepomuceno] - Carmen de Vicente (chair) & Luz George (rapporteur)

SP3 Transgenic Product Development, Evaluation and Deployment Session*



8:00-8:30	Overview of DREB research at JIRCAS	Kazuko Yamaguchi-Shinozaki, JIRCAS
8:30-8:45	Progress in evaluation of DREB transgenics	John Bennett, IRRI
8:45-9:15	Biosafety concerns specific to the deployment of abiotic stress transgenics	Willy de Greef, IPBO
9:15-9:45	Liability and redress issues related to GMO products	Shawn Sullivan, GCP legal counsel
9:45-10:30	Discussion for implications for transgenic research and development in the GCP	

*product development discussion in coffee break

*strategic discussion to be continued on Saturday evening if appropriate

SP3 Trangenic Product Development, Evaluation and Deployment Session



DISCUSSION POINTS

- Gene validation versus product development
 - Partnerships for product development
 - Differentiation across a consortium of MNCs
 - The Role of SMEs in GMO product development



SP3 Marker-assisted Selection Technologies Session



10:45-11:00	IP issues and product development pathways for molecular breeding technologies	Victoria Henson-Apollonio, IPGRI
11:00-11:15	Low-cost marker technologies in major cereal crops [rice, maize, and wheat - barley and sorghum]	Nollie vera Cruz, IRRI
11:15-11:30	Status of marker-assisted selection technologies in legumes and clonal crops [cowpea and groundnut - chickpea, pigeonpea, lentil]	Festo Massawe, IITA
11:30-11:45	Status of marker-assisted selection technologies in clonal crops [cassava and banana - yam and coconut]	Martin Fregene, CIAT
11:45-12 :30	Discussion on future priorities for marker-assisted selection technologies	Discussion on concept note for new 2006 commissioned project

*product development discussion in lunch break



SP3 Marker-assisted Selection Technologies Session



DISCUSSION POINTS

- Gene-based markers versus linked markers
 - GCP strategic pillar versus molecular breeding advocacy
 - Drought versus other traits

SP3 Computation Tools for Molecular Breeding Session



13:30-13:45	Cassava drought physiology	Alfredo Alves, EMBRAPA
13:45-14:00	Whole plant physiology modelling	Marcel de Raissac, CIRAD
14:00-14:15	New approaches to GxE and QTLxE	Fred van Eeuwijk, WUR
14:15-14:30	iMAS integrating mapping and molecular breeding software	Subhash Chandra, ICRISAT
14:30-14:45	Future plans for molecular breeding simulation tools	Jiankang Wang, CAAS
14:45-15:00	A practical perspective on the application of molecular breeding simulation tools	Hans Braun, CIMMYT
15:00-15:15	Discussion on future priorities for computation methods in molecular breeding	

*product development discussion in coffee break

*strategic discussion to be continued on Saturday evening if appropriate

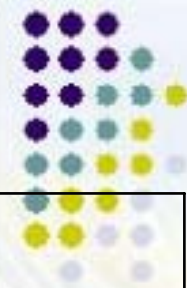
SP3 Computation Tools for Molecular Breeding Session



DISCUSSION POINTS

- **Breadth versus depth of functionality**
 - **Cereals, legumes and clonal crops**

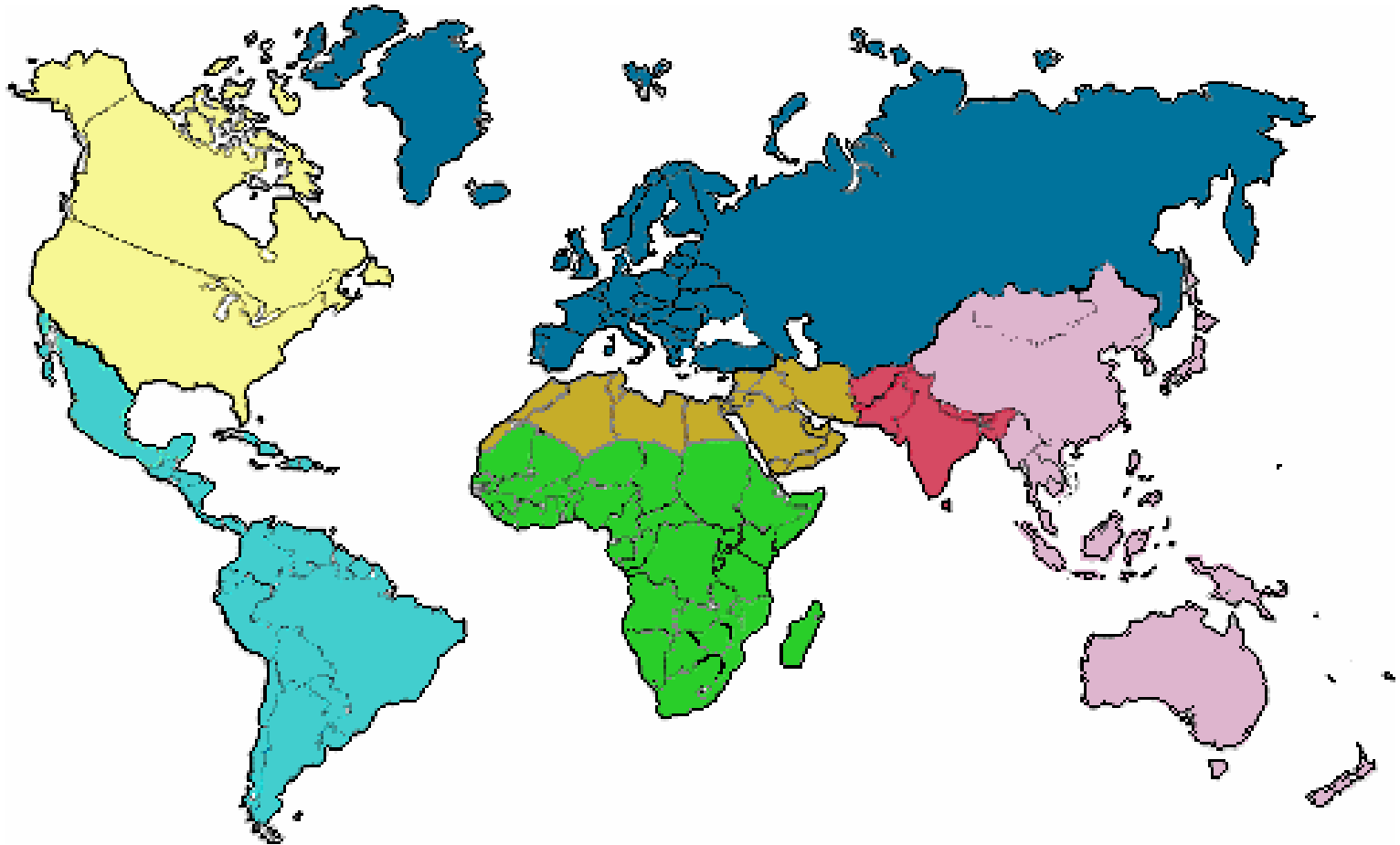
Reaching the Breeders - Discussion Group C*



Molecular Breeding in Asia		
15:45-16:00	AMBIONET - Maize MAS in Asia	Luz George, CIMMYT
16:00-16:15	ARBN - Rice MAS in Asia	Nollie Veracruz, IRRI
16:15-16:30	Discussion on needs for molecular breeders in Asia	
Molecular Breeding in Africa		
16:30-16:45	AMMANET - Maize, sorghum and cassava MAS in Africa	Richard Edema, AMMANET
16:45-17:00	Discussion on needs for molecular breeders in Africa	
Molecular Breeding in Latin America		
17:00-17:15	MAS Networks in Latin America ...?	
17:15-17:30	Discussion on needs for molecular breeders in Latin America	
Discussion on Next Steps		
17:30-17:45	Discussion on needs and opportunities for regional shuttle molecular breeding programs with CGIAR, NARS and SME	
17:45-18:00	Introduction and feedback on molecular breeding communities of practice questionnaire - including suggestions for other mechanisms for maximizing impact of GCP technologies in national and regional breeding programs (service hubs and HelpDesk etc)	

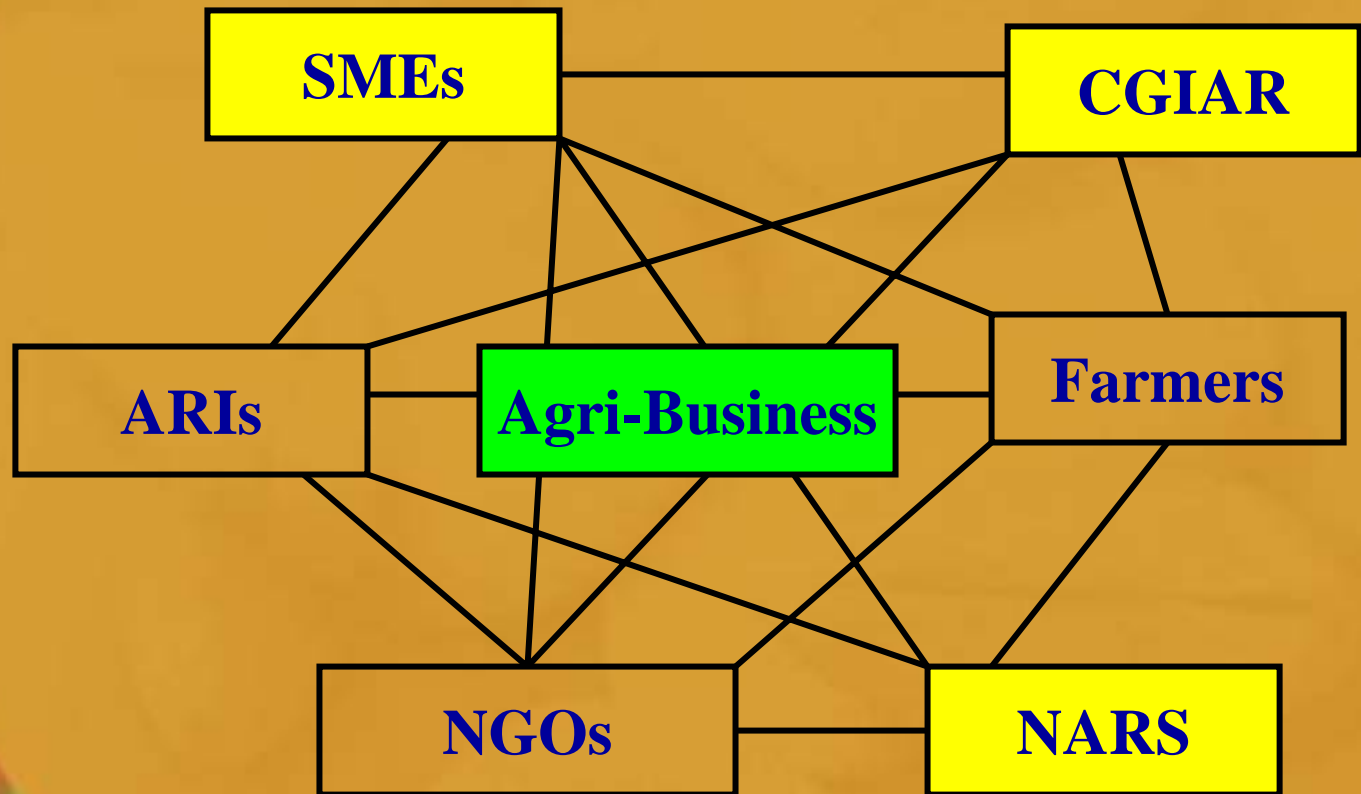
Carmen de Vicente (chair) & Luz George (rapporteur)

A Regional/Systems Approach

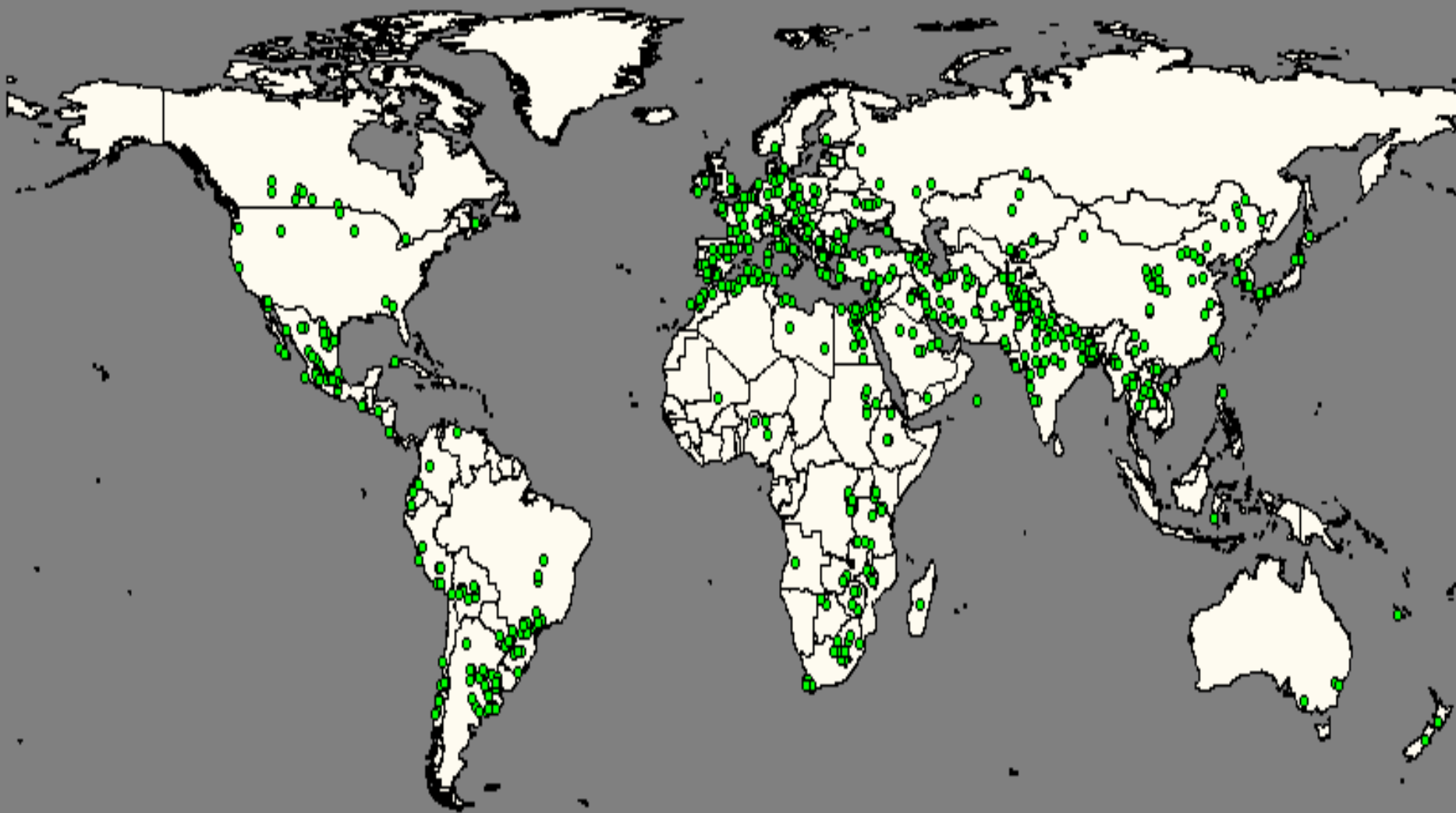


Decentralized communities built around regional centers of excellence

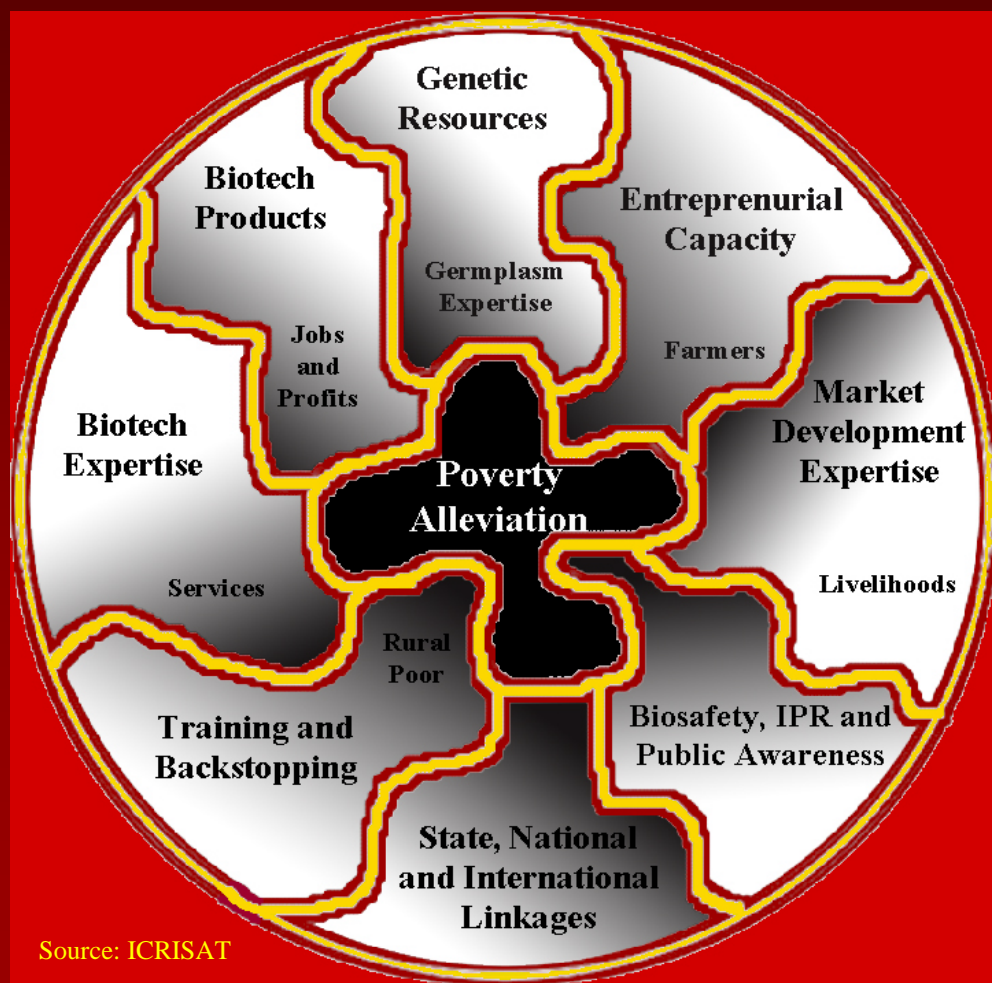
Inputs and Partnerships in the Value Web



CIMMYT Wheat International Trial Locations



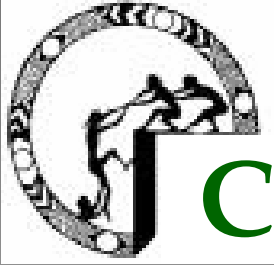
Creating an Integrating Environment for Incubating Innovation to Impact



Crop improvement programs must become systemically integrated with farmers, traders processors and consumers

There are many ways to alleviate poverty that do not involve freely available international public goods

The private sector will play an increasingly important role in agricultural development



Creating Impacts on *Livelihoods*

What do we need for effective product development ...?

Multidisciplinary R&D teams

(trait-specific specialists, agronomists, breeders, farmers)

What do we need for effective product delivery ...?

Multisector product delivery teams

(scientists, NARS, NGOs, SME commercial seed companies, farmers, processors, traders and appropriate policy support)

Reaching the Breeders

Molecular Breeding Communities of Practice

DISCUSSION POINTS

- **Crops versus regions**
- **Drought versus other traits**
- **NARS versus SMEs and IARCs**







