

CRPs Phase 2: A dialogue with Donors and Partners

**Montpellier, France,
17-18th June 2013**



Today's Agenda

- **Prioritizing MAIZE CRP Research 4 Development**
 - Partners and Prioritization
 - Supporting Partnerships
 - Flagship Projects
- **Outcomes-focused Performance**
 - MAIZE Impact Pathways & Theories of Change, IDOs & KPIs
- **Partnerships for Performance**
 - Regional assessments of the maize situation and outlook
 - SIMLESA and MasAgro
 - DTMA , Maize Lethal Necrosis, Doubled Haploid Breeding
 - Aflasafe™
- **The Way Forward**





Research
Program on
MAIZE

Partners and Prioritization



Supporting Partnerships

	Mean	Min	Max	Wheat76	Maize91	GRIISP129	A NutH34	AquaSys 20	CCAFS198	DryCer48	DrySys87	Forest78	G-Bank64	Legume79	HTrop23	Fish 76	Policy 70	RTub83	WLEco 58
Accessible people/information	64	48	80	67	68	70	68	80	70	63	56	65	61	75	48	63	57	63	53
Accountability	57	43	71	63	66	71	65	60	60	52	57	60	58	62	41	57	46	53	45
Capacity development	51	33	65	59	65	57	53	35	56	50	51	53	55	53	57	47	38	46	43
Complete/accurate information available	47	35	57	55	49	57	47	35	46	50	48	53	47	52	43	45	35	43	40
Developing partner networks	64	53	77	68	65	77	59	65	69	63	63	60	66	66	61	62	58	61	57
Distributing funding fairly	41	20	51	46	48	48	47	30	48	40	43	51	45	44	35	45	34	33	33
Facilitating access to knowledge	67	52	80	80	79	75	71	75	72	58	60	68	66	71	57	62	57	65	58
Fairly sharing workload/responsibilities	56	41	71	64	65	71	68	45	59	52	51	56	58	65	57	55	48	46	47
Global expertise	80	69	89	89	87	89	82	75	79	79	68	86	83	80	83	76	74	83	69
Helping others to innovate	61	43	72	72	63	71	68	60	67	60	55	56	64	70	57	62	43	53	47
High quality research	52	25	66	66	58	64	56	25	57	54	45	53	56	59	43	39	49	41	40
High-caliber staff	61	53	72	72	67	66	62	60	59	54	53	67	56	72	57	38	57	53	55
Innovation	70	57	85	80	77	85	74	80	72	65	63	73	64	76	65	62	61	65	59
Insightful external communications	64	50	74	74	74	71	65	70	69	56	61	72	56	65	65	64	58	58	52
Involving partners in decisions	54	46	75	57	56	63	59	75	62	56	52	49	47	58	48	47	46	48	48
Local expertise	64	44	80	72	73	71	65	80	64	71	56	63	61	59	70	58	48	64	55
Not duplicating efforts	53	43	62	62	58	58	59	60	55	50	45	54	55	53	52	54	43	51	48
Nurturing skills/knowledge	58	41	69	66	68	69	62	55	65	54	55	59	56	58	61	53	48	57	48
Research addresses agriculture challenges	73	60	84	84	79	84	82	75	75	69	69	81	72	72	74	64	60	66	64
Research addresses development challenges	66	55	81	79	70	81	74	60	69	63	58	72	69	71	61	59	59	59	48
Research results in significant outputs	66	50	80	80	79	78	74	55	71	67	57	74	69	70	57	64	57	61	59
Responsive to partners/donors	61	41	75	71	70	69	65	75	68	63	59	60	59	67	48	51	41	59	48
Sector-specific knowledge	76	64	85	84	85	84	82	85	75	67	68	81	77	72	78	74	67	80	67
Sharing credit	57	46	67	63	63	67	56	50	66	54	51	58	61	62	48	59	46	52	48
Timely external communications	64	47	75	75	73	72	71	65	72	58	57	62	59	71	57	64	49	60	57
Working effectively with partners	68	49	81	75	78	78	74	75	76	63	56	71	69	75	74	63	48	55	55
Total scores				1823	1792	1846	1708	1595	1701	1531	1451	1657	1589	1688	1490	1527	1294	1475	1326
Average	61	50	71	70	69	71	66	61	65	59	56	64	61	65	58	59	50	57	51
No Rank 1				30	4	10	0	5	0	0	0	1	0	1	0	0	0	0	0
No Rank 2				6	8	6	1	2	2	0	0	0	0	1	0	0	0	0	0
No Rank 15				0	0	0	0	3	0	0	2	0	1	0	3	3	7	3	9
No Rank 16				0	0	0	0	2	0	0	4	0	0	0	2	0	12	1	5

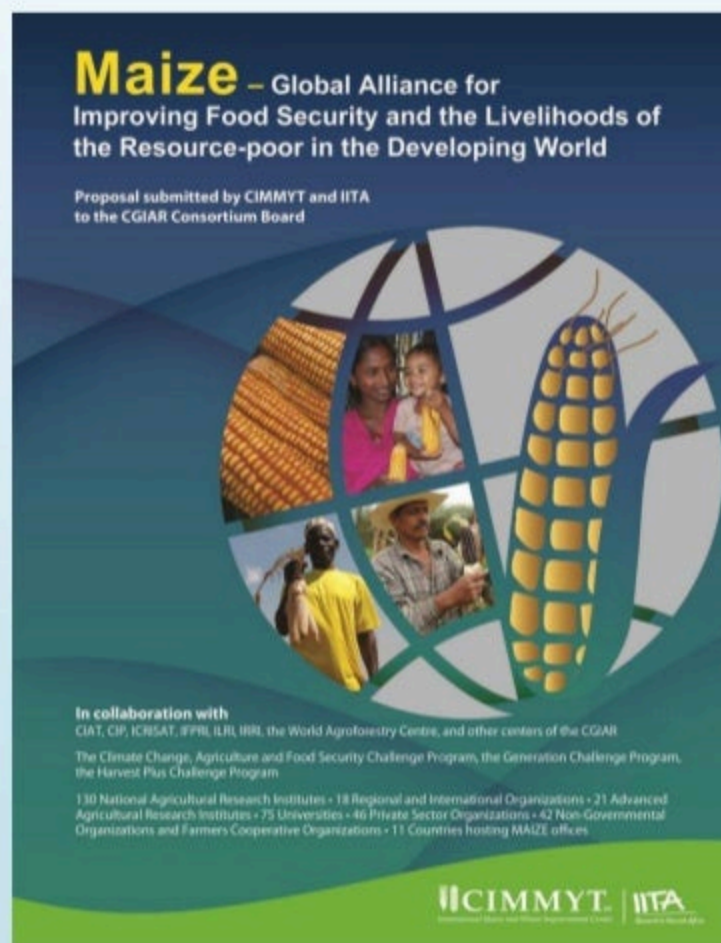
- 40% of total funds flow through to partners

- Ranked either 1st or 2nd on 12 partnership criteria out of 26




Flagship Products

1. Socioeconomics and policies for maize futures
2. Sustainable intensification and income opportunities for the poor
3. Smallholder precision agriculture
4. Stress tolerant maize for the poorest
5. Towards doubling maize productivity
6. Integrated postharvest management
7. Nutritious maize (with CRP4)
8. Seeds of discovery
9. New tools & methods for NARS & SMEs
- 1-9. Strengthening local capacities



Maize – Global Alliance for
Improving Food Security and the Livelihoods of
the Resource-poor in the Developing World

Proposal submitted by CIMMYT and IITA
to the CGIAR Consortium Board



In collaboration with
CIAT, CIP, ICRISAT, IFPRI, ILRI, IRRI, the World Agroforestry Centre, and other centers of the CGIAR
The Climate Change, Agriculture and Food Security Challenge Program, the Generation Challenge Program,
the Harvest Plus Challenge Program

130 National Agricultural Research Institutes • 18 Regional and International Organizations • 21 Advanced
Agricultural Research Institutes • 75 Universities • 46 Private Sector Organizations • 42 Non-Governmental
Organizations and Farmers Cooperative Organizations • 11 Countries hosting MAIZE offices

CIMMYT | **IITA**
International Center for Maize and Wheat Improvement Center | International Institute of Tropical Agriculture

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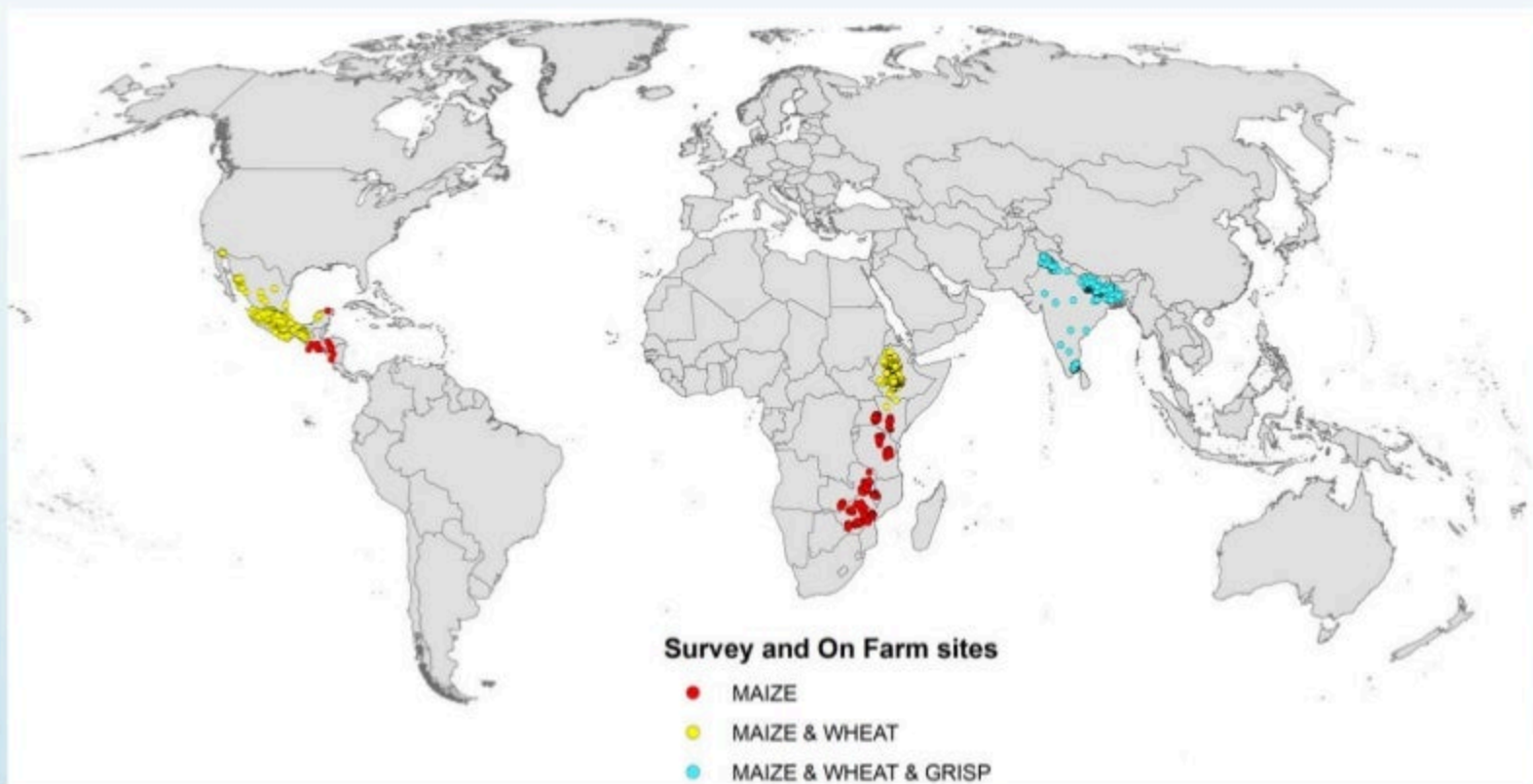
Outcomes-focused Performance



Users of MAIZE Germplasm



Innovation Platforms: Worldwide



- 75 operational Innovation Platforms expanding to 100
- Combining Innovation Platforms
- KIT - Improving Effectiveness of Innovation Platforms



Taking stock of innovation platforms: Understanding how best to mobilize science and technology for development



KIT

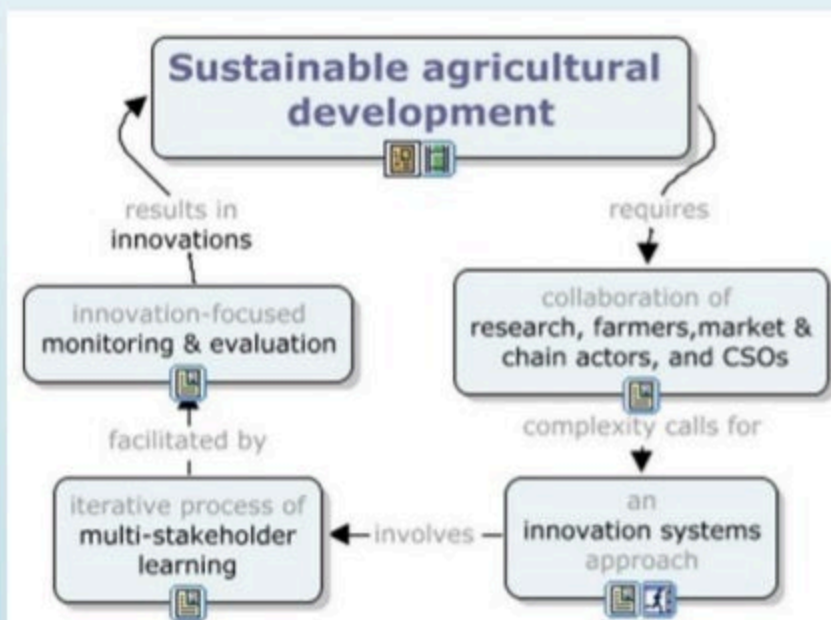


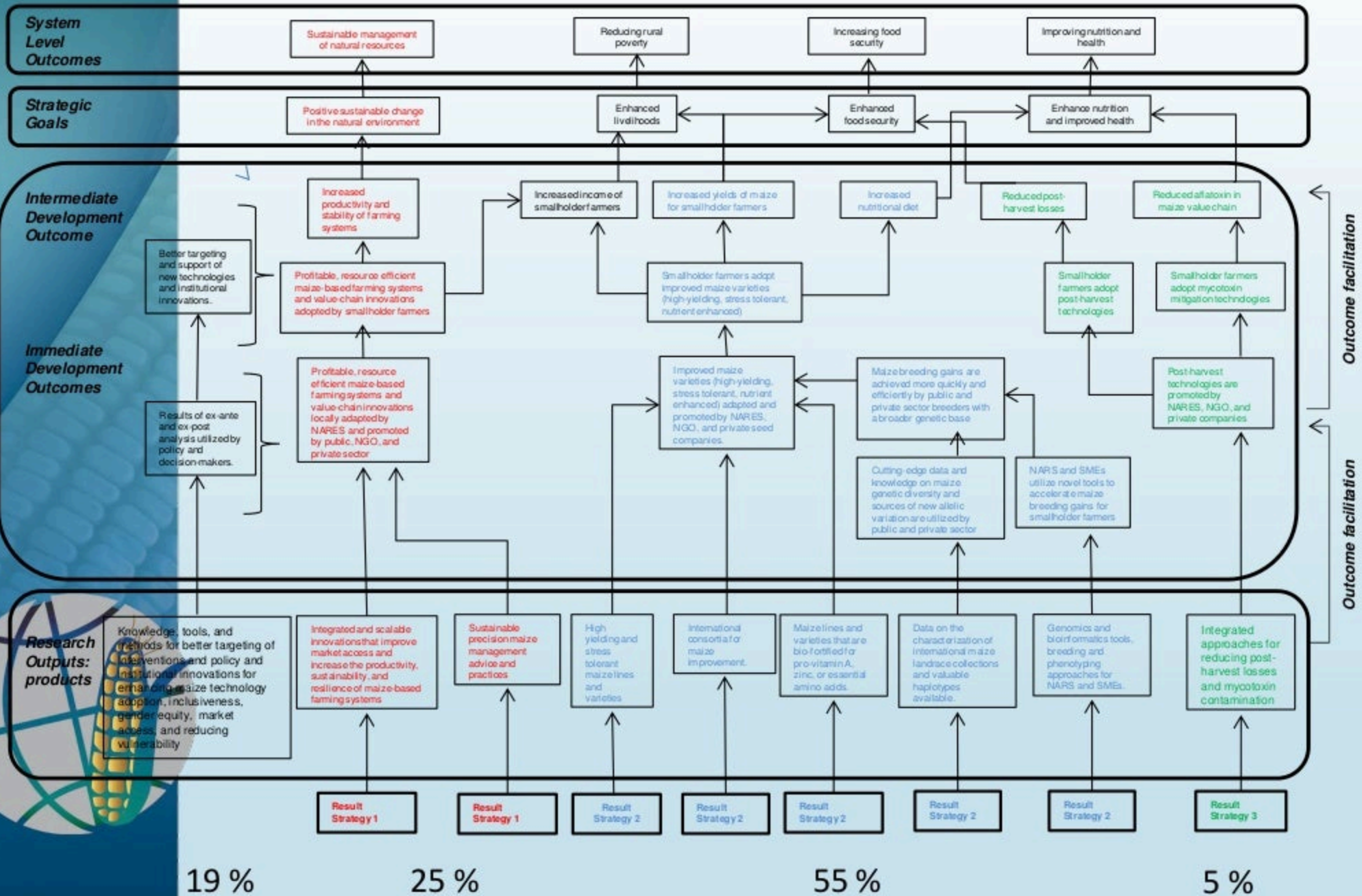
Fig. 1: The function of innovation-oriented monitoring & evaluation in a rural innovation systems approach. M&E can work to support iterative, multi-stakeholder learning and bring out innovative win-win solutions.

Today's Agenda

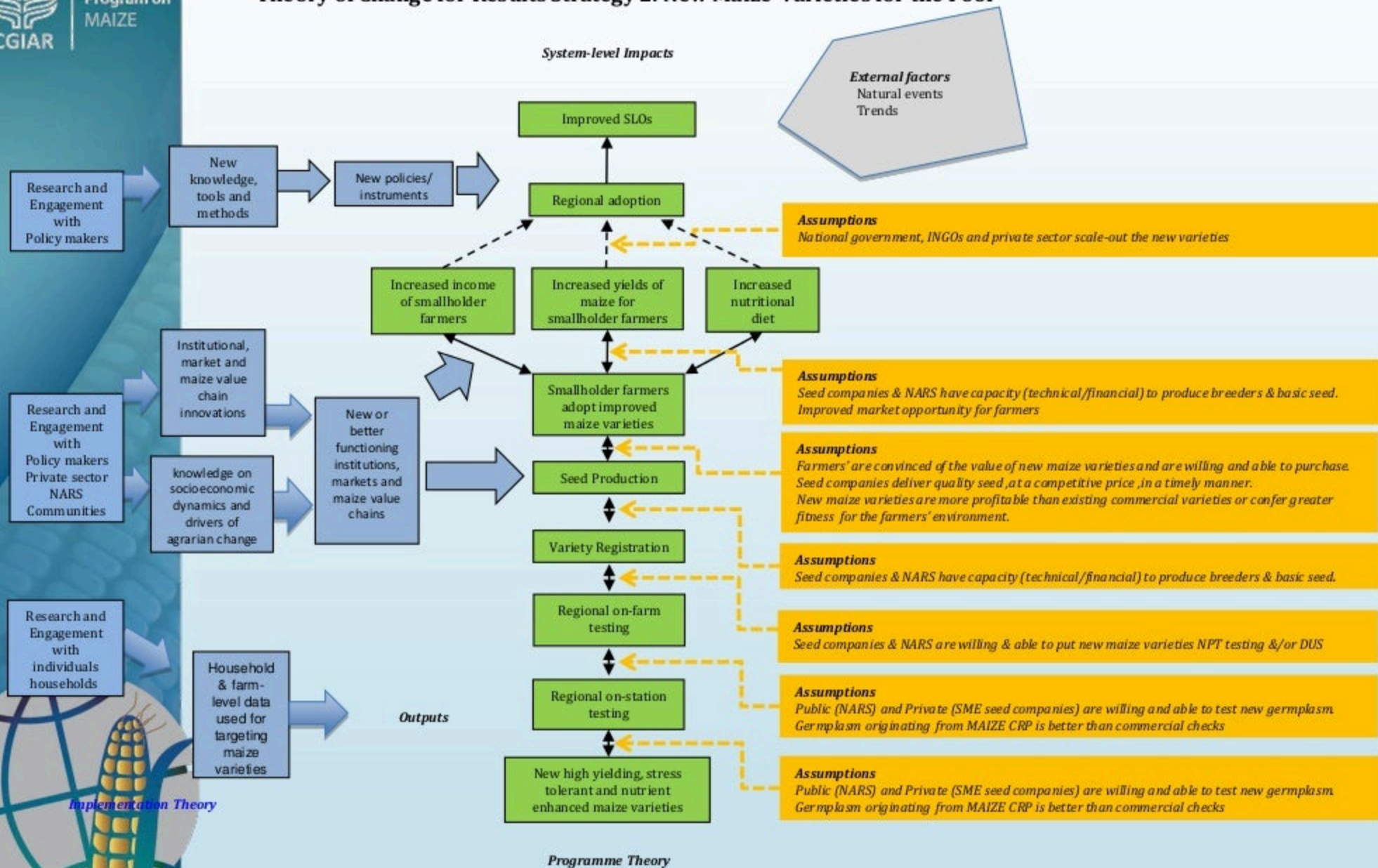
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MAIZE CRP: Output-Outcome Mapping



Theory of Change for Results Strategy 2: New Maize varieties for the Poor



Intermediate Development Outcomes (IDOs)

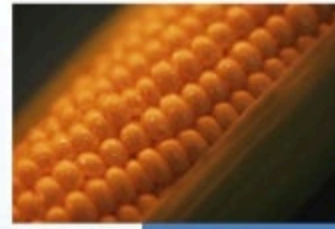




Research Strategy 1: Sustainable Intensification and income opportunities for the poor

- System-Level Outcomes
- SLO1 Reducing Rural Poverty
- SLO4 Sustainable management of natural resources
- Intermediate Development Outcomes
- **IDO 1.** Increased productivity and stability of farming systems
- **IDO 2.** Increased income of small holder farmers

Research Strategy 2: New Maize Varieties for the Poor



- System-Level Outcomes
- SLO1 Reducing Rural Poverty
- SLO2 Increasing Food Security
- SLO3 Improving Health & Health
- Intermediate Development Outcomes
- **IDO 2.** Increased income of small holder farmers
- **IDO3.** Increased yields of maize for smallholder farmers
- **IDO4.** Increased nutritional diet

Research Strategy 3: Integrated Post-Harvest Management



- System-Level Outcomes
- SLO2 Increasing Food Security
- SLO3 Improving Health & Health
- Intermediate Development Outcomes
- **IDO5** Reduced post-harvest losses
- **IDO6.** Reduced aflatoxin in maize value chain



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Research Strategy 1:

Sustainable Intensification and income opportunities for the poor

Africa



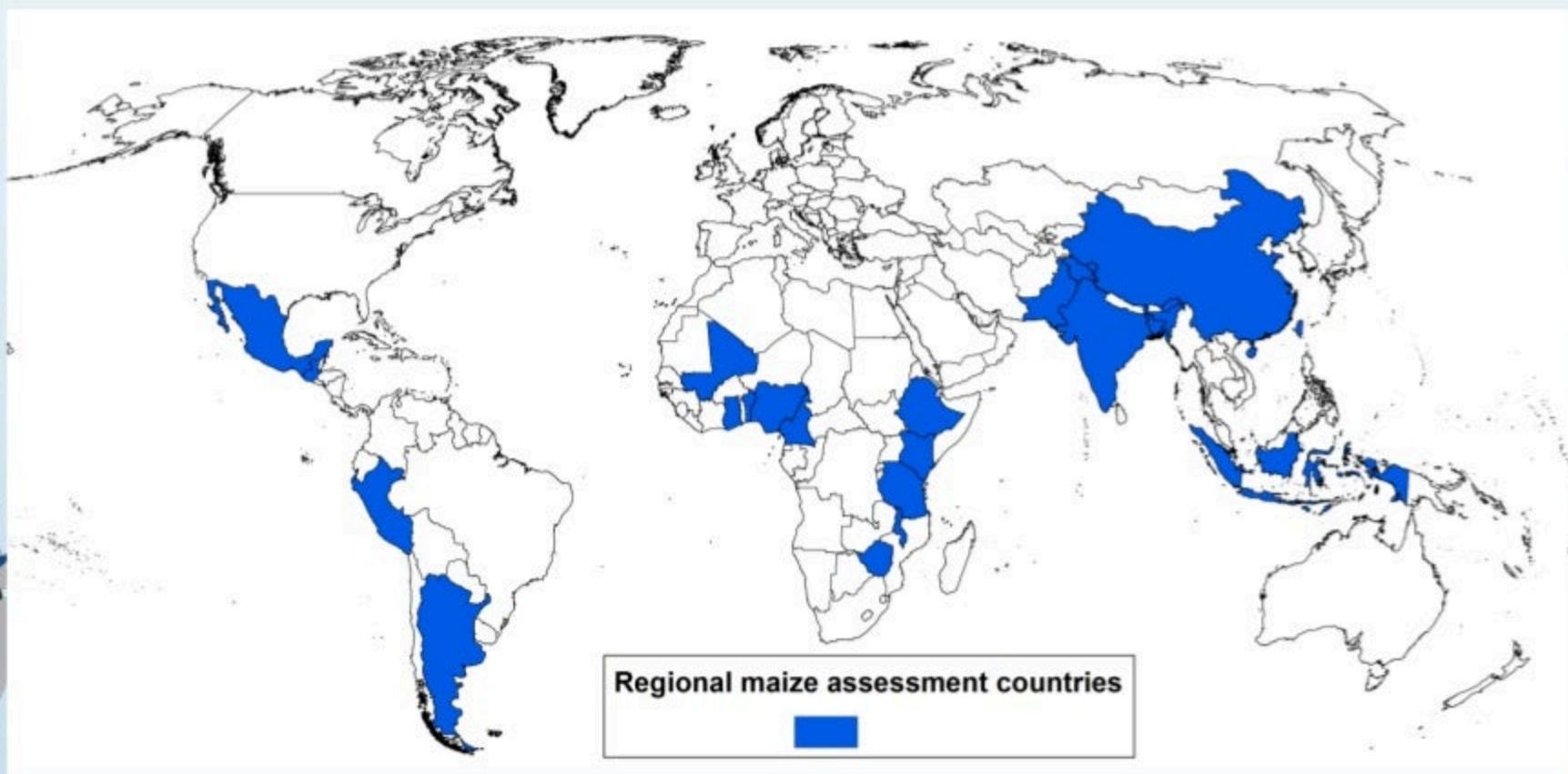
Asia



Latin America



Regional assessments of the maize situation and outlook and investment opportunities to ensure regional food security



Institutional commitment



Institución	No. Técnicos	No. Módulos	No. Áreas de extensión	Superficie áreas de extensión (ha)	Superficie módulos (ha)
CIMMYT	81 *	35 *	21 *	85.47 *	135.58 *
IASA	33 *	*	*	*	*
PESA	11 *	6 *	*	*	4.5 *
PROMAF	1,649	2,537	9,569	29,751	7708
Total	1,774	2,578	9,590	29,836.47	7,848.08

Experimental Platforms



Cell phone based M&E

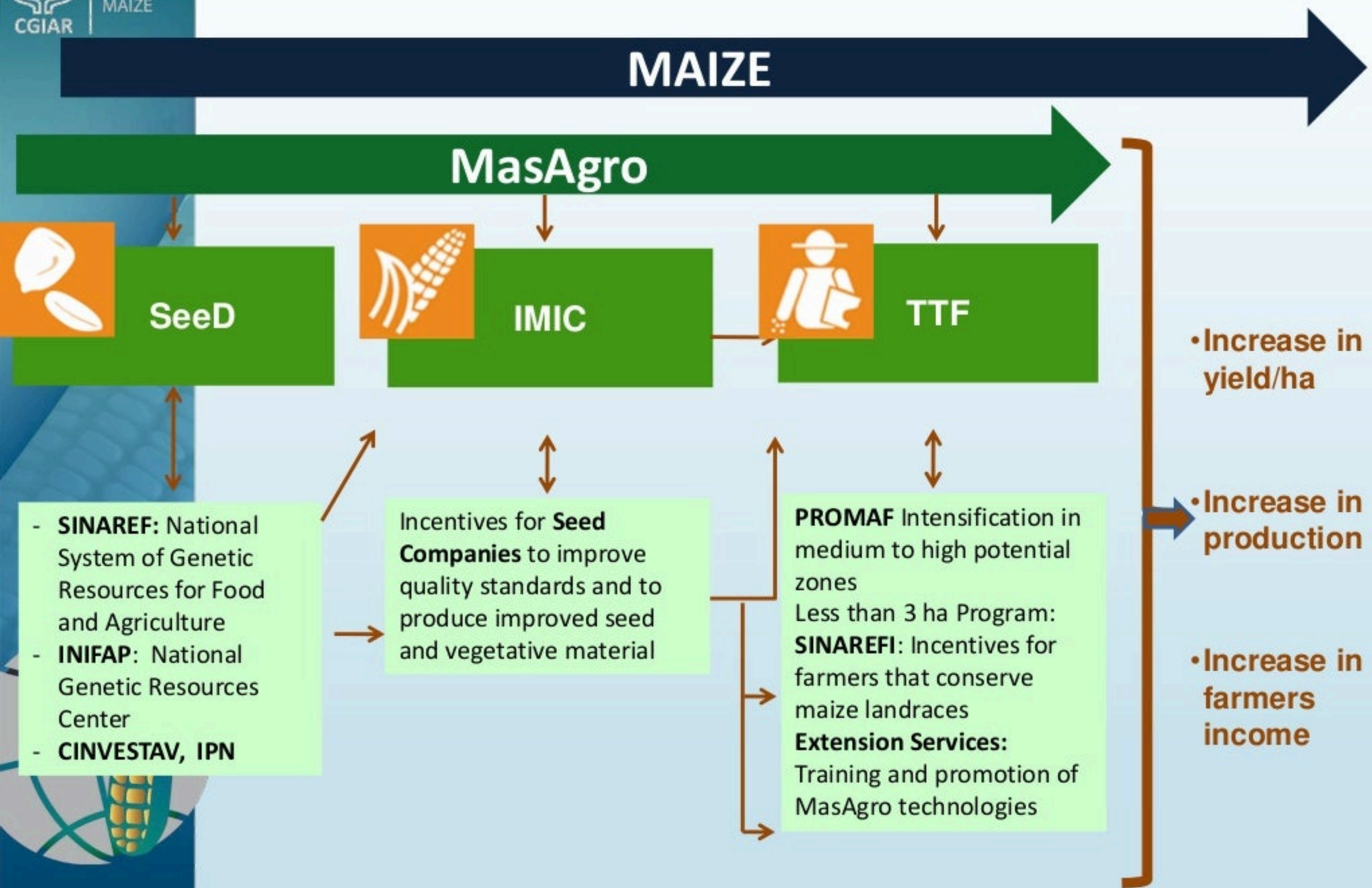
Transfer of Technologies:



Conservation Agriculture Extension Modules:



Policy commitment: Linking maize R & D



Sustainable intensification of maize-legume systems in E&S Africa

Ethiopia, Kenya, Tanzania, Malawi and Mozambique

>> Botswana, Rwanda, South Sudan, Uganda, Zambia, Zimbabwe.

Partners include: NARS, CIMMYT, ICRISAT, Australian organizations, **ASARECA**

Target: > **500,000** farm families



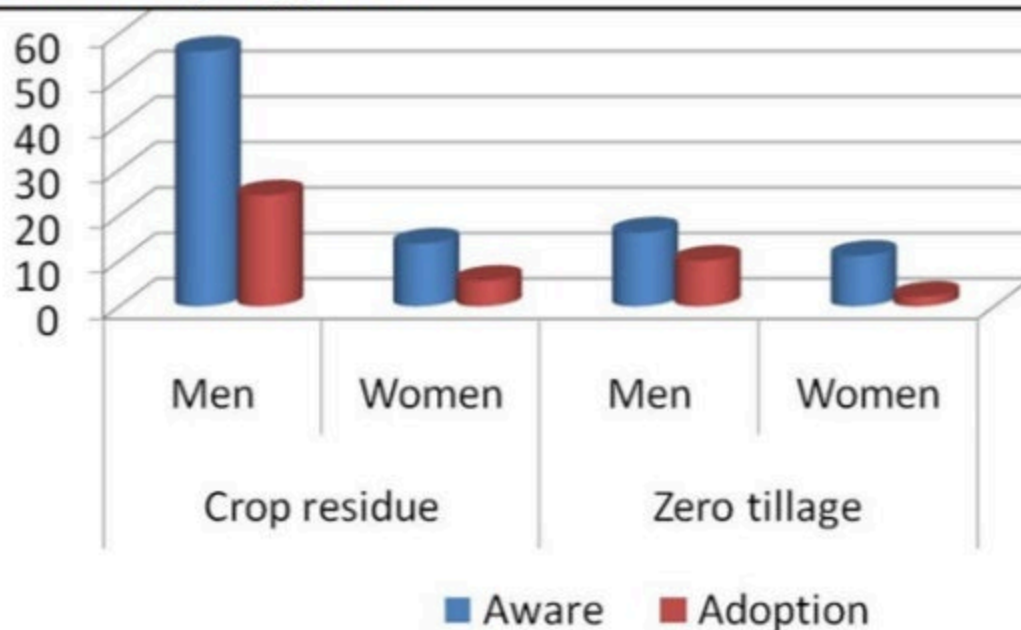
Need and opportunities for gender mainstreaming

Interventions Mozambique 2012

- Training and capacity building
- Action plan
- Case studies



Awareness and adoption of CA management practices 2012- Western Kenya by gender



Research Strategy 2:

**Maize varieties – stress
tolerant, nutritious, safe**



Drought Tolerant Maize for Africa



Community Seed Production of
ZM309 in Zimbabwe, 2009



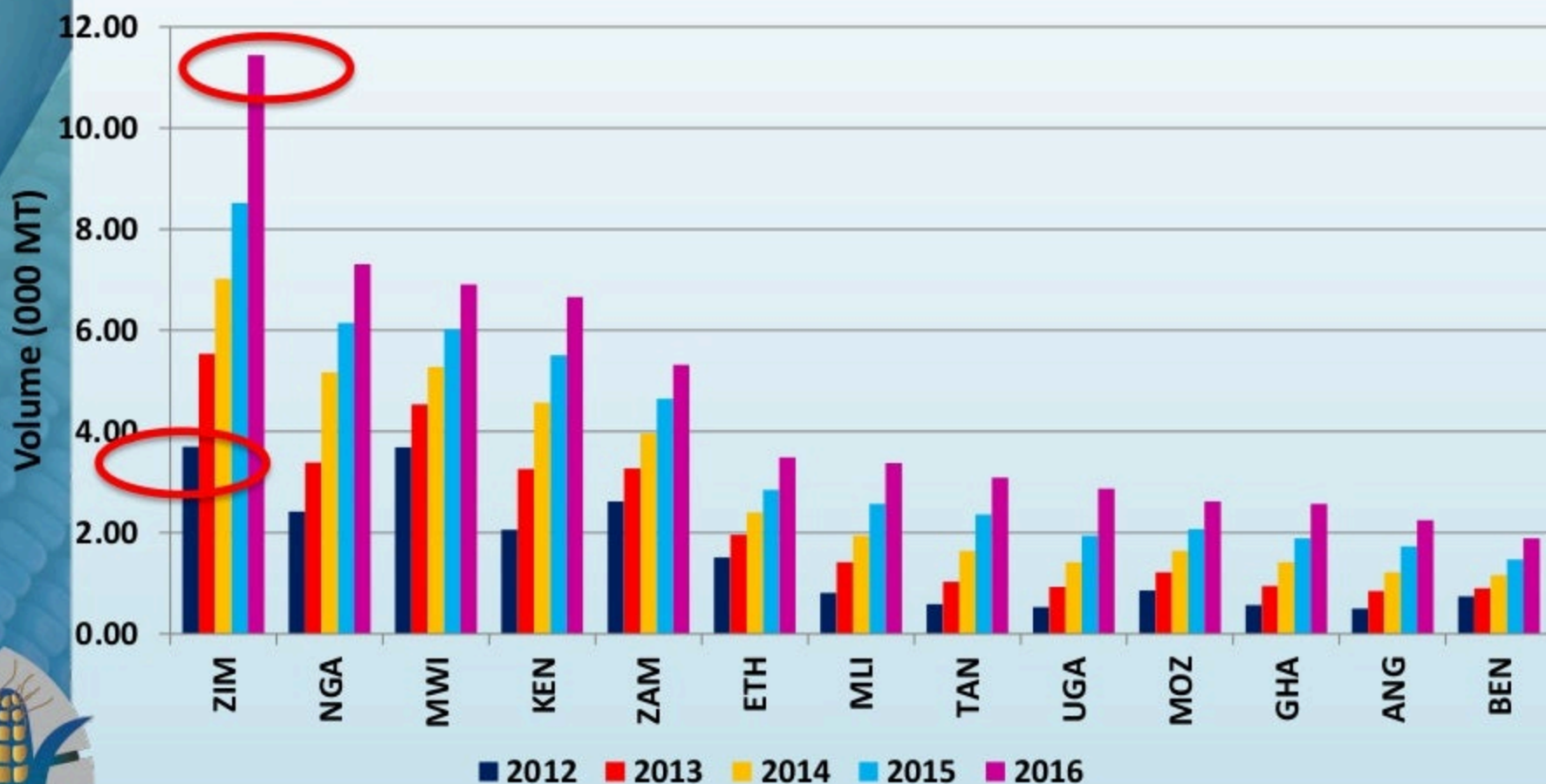
Agriseeds stock of ZM401 in
Zimbabwe, 2010



Seed Road Map – 2nd generation DT maize



Seed Production Projections

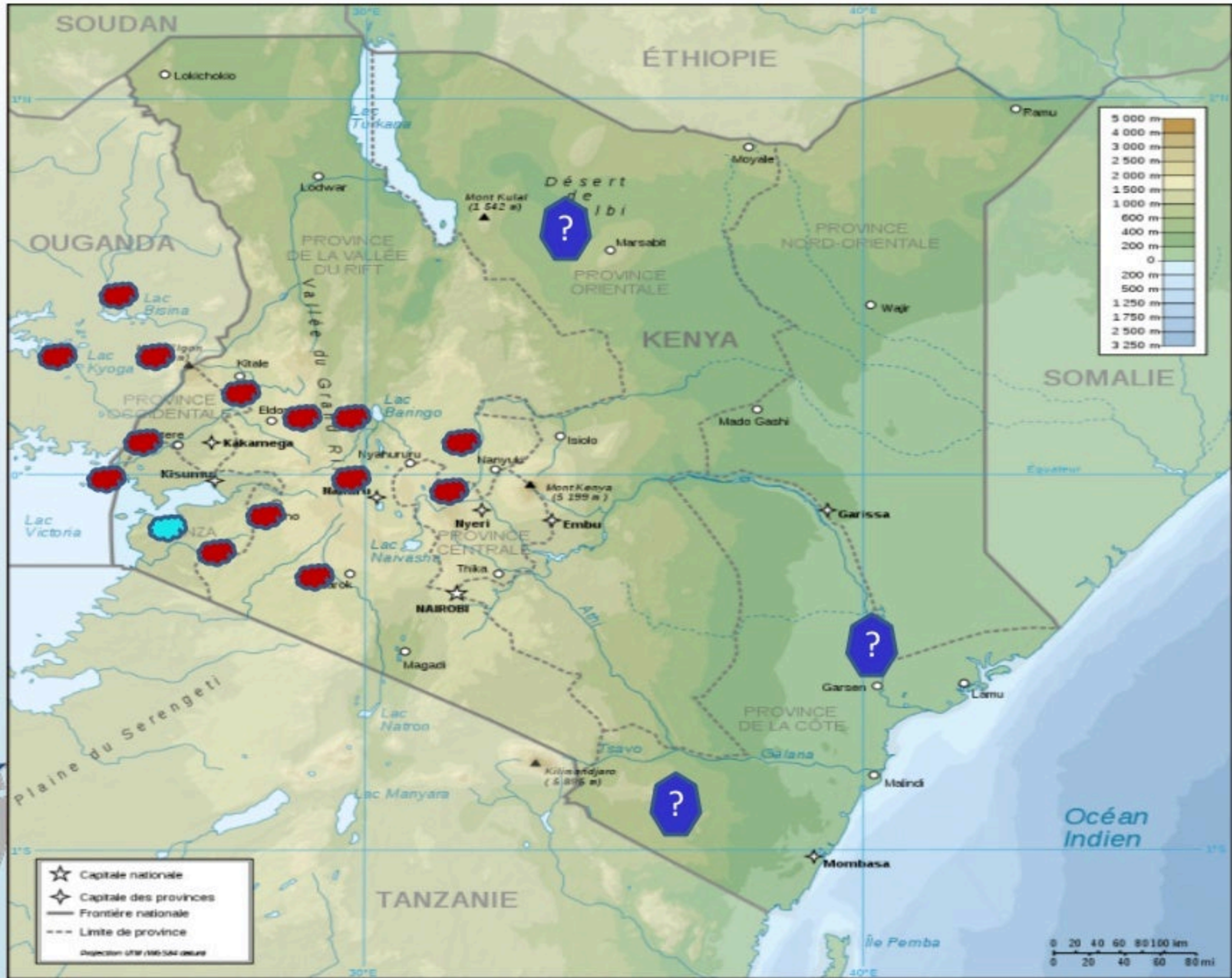




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Rapid Response to Maize Lethal Necrosis Disease in Eastern





MLN Facts and Actions

Maize lethal necrosis (MLN) disease in Kenya and Tanzania: Facts and actions

A serious new disease of maize appeared in the farmers' fields in eastern Africa in 2011. Called maize lethal necrosis (MLN), or corn lethal necrosis, CLN, it can devastate maize crops. The disease is difficult to control for two reasons:

1. It is caused by a combination of two viruses that are difficult to differentiate individually based on visual symptoms.
2. The insects that transmit the disease-causing viruses may be carried by wind over long distances.



National and global research and extension organizations, laboratories, and seed companies are working together to control the spread of the disease and to develop and deploy disease-resistant maize varieties for the farmers as soon as possible.

What causes MLN?

The disease was first identified in the USA in 1995 (Niblett and Claflin 1978). MLN is caused by the double infection of maize plants with Maize chlorotic mottle virus (MCMV) and any of the cereal viruses in the Potyvirus group, such as Sugarcane mosaic virus (SCMV), Maize dwarf mosaic virus (MDMV), or Wheat streak mosaic virus (WSMV). MCMV or SCMV typically produce milder symptoms when they infect maize alone; in combination, these two viruses rapidly produce a synergistic reaction that seriously damages or kills infected plants.

Where has MLN appeared?

Kenya: Initial reports of an unknown disease outbreak surfaced in September 2011 in the Bomet county in the South Rift Region; further reports appeared in early 2012 in Naivasha, Narok North, Narok South, Chepalungu, and Sotik, as well as parts of the Eastern Province (Limu and Meru) and the Central Province (Marang'a, Kirinyaga, and Nyeri). MLN has also been reported recently in Trans-Nzara, Uasin Gishu, and Busia.

A scientific team from the Kenya Agricultural Research Institute (KARI) and the International Maize and Wheat Improvement Center (CIMMYT) sampled infected maize plants in Bomet and Naivasha in February–March 2012. The samples were tested by serology and molecular methods for the presence of MCMV and SCMV at USDA-AIS/Ohio State University (Peg Redinbaugh's Laboratory), Wooster, Ohio, USA, as well as at the Food and Environment Research Agency, Sand Hutton, York, using next-generation sequencing with results and clearly indicating the presence of MLN (Wangai et al. 2012; Adams et al. 2012).

Tanzania: In August 2012, reports of an unknown maize disease emerged from Mwanza, near Lake Victoria, and Arusha. CIMMYT was invited by the government of Tanzania to survey the affected regions and identify the disease. Infected plant samples from the Mwanza and Arusha regions were serologically positive for MCMV and SCMV, confirming the presence of MLN.

Is MLN a new disease?

Yes, although one of its component viruses, SCMV, was reported in Kenya many years ago (Louie 1980). MCMV is a new virus for Africa; it had not been reported previously in Kenya, but was first identified in Peru in 1973 (Castillo and Hebert 1974) and subsequently reported in the USA, parts of Latin America, and China (Niblett and Claflin 1978; Uyemoto 1983; Xie et al. 2011). Wangai et al. (2012) reported MCMV and MLN in Kenya for the first time.

What are the typical symptoms?

- Mild to severe mottling on the leaves, usually starting from the base of young leaves in the whorl and extending upwards toward the leaf tips.
- Stunting and premature aging of the plants.
- Dying (known as "necrosis") of the leaf margins that progresses to the mid-rib and eventually the entire leaf.
- Necrosis of young leaves in the whorl before expansion, leading to a symptom known as "dead heart" and eventually plant death.



How severe are farm-level crop losses?

Infection rates and damage can be very high, seriously affecting yields and sometimes causing complete loss of the crop (Wangai et al. 2012; Adams et al. 2012). Infected plants are frequently barren; ears formed may be small or deformed and set little or no seed.

When and how are maize plants infected?

Maize plants are susceptible to MLN at all stages in their growth, from seedling to maturity. As with all viral diseases in plants, a carrier—known as a "vector"—transmits the MLN-causing viruses from plant to plant and field to field. MCMV is carried by thrips and beetles (Nault et al. 1978; Jiang et al. 1992) and SCMV by aphids (Brandes 1920; Pemberton and Charpentier 1969). Transmission of MCMV via seed from infected plants is normally very low (0.04%; Jensen et al. 1991).



How can MLN be controlled?

Based on CLN/MLN management experiences in the USA, rigorous disease management practices in seed production plots, including use of resistant varieties, controlling weeds/alternate hosts, keeping unnecessary machines/people out of the field, controlling insect-vectors using appropriate insecticide (at weekly intervals), and having adequate isolation from MLN-infected fields, can prevent the spread of the disease. Because individual plants with MCMV or SCMV alone show milder symptoms, seed production fields must be carefully inspected and plants that appear infected removed immediately.

How can farmers prevent MLN in their fields?

- MLN does not occur on crops other than maize; so avoid growing maize after maize. Diversify your farm enterprise by planting different crops each season.
- Do not plant a new maize crop near an infected field. Wind-blown insect vectors can transmit the disease from the infected field to the new crop.
- Plant maize at the onset of the main rainy season, rather than during the short rain season; this creates a break between maize crops and interrupts the disease cycle.

- Weed fields regularly to eliminate alternate hosts for insect vectors.
- Use maize varieties that are resistant to MLN.

What should farmers do if they find MLN in their fields?

- Immediately remove diseased plants from your fields. You can feed the leaves to livestock.
- Do not allow humans or animals to eat infected ears or grains, which may contain secondary fungal infections and harmful mycotoxins. Burn infected ears and grains.

Can MLN resistant maize varieties be developed soon?

Preliminary data from one season of screening under natural disease pressure of 43 pre-commercial maize hybrids and 7 commercial hybrids at Bomet, Chepkitwal and Naivasha (Table 1), and of 200 elite inbred lines at Naivasha (Table 2) suggest that MLN-resistant maize germplasm can be identified and developed quickly. KARI, CIMMYT, and other partners will reconfirm the potential resistance of pre-commercial hybrids and inbreds that showed the least susceptibility to MLN and work urgently to develop resistant varieties.

Are there potential sources of SCMV resistance?

Because MLN requires simultaneous infection by two viruses, resistance against any one of the causal viruses could significantly reduce crop damage. Results of a trial of elite CIMMYT inbred lines under artificial SCMV inoculation showed several highly-resistant lines (Table 3).

Table 1. MLN incidence on selected pre-commercial CIMMYT hybrids with least susceptibility under natural disease pressure (Kenya 2012 trials).

Entry	Naivasha			Bomet			Chepkitwal		
	DS	% DPLT	Rating	DS	% DPLT	Rating	DS	% DPLT	Rating
CGR30942	2.0	0	MR	2.6	26.2	MR	2.3	0	MR
CGT14272	2.0	8.9	MR	2.3	19.5	MR	2.1	15.2	MR
CGT101509	2.5	16.0	MR	1.9	13.3	MR	2.5	17.8	MR
Mean of three most susceptible commercial hybrids (checks)	2.9	44.5		3.4	34.7		2.8	23.4	
Max (across trial)	1.5	0		1.1	9.3		2.1	0.0	
Min (across trial)	4.0	42.8		4.2	67.1		3.9	51.5	
LSI (0.05)	1.2	79.1		1.2	11.8		0.62	10.8	

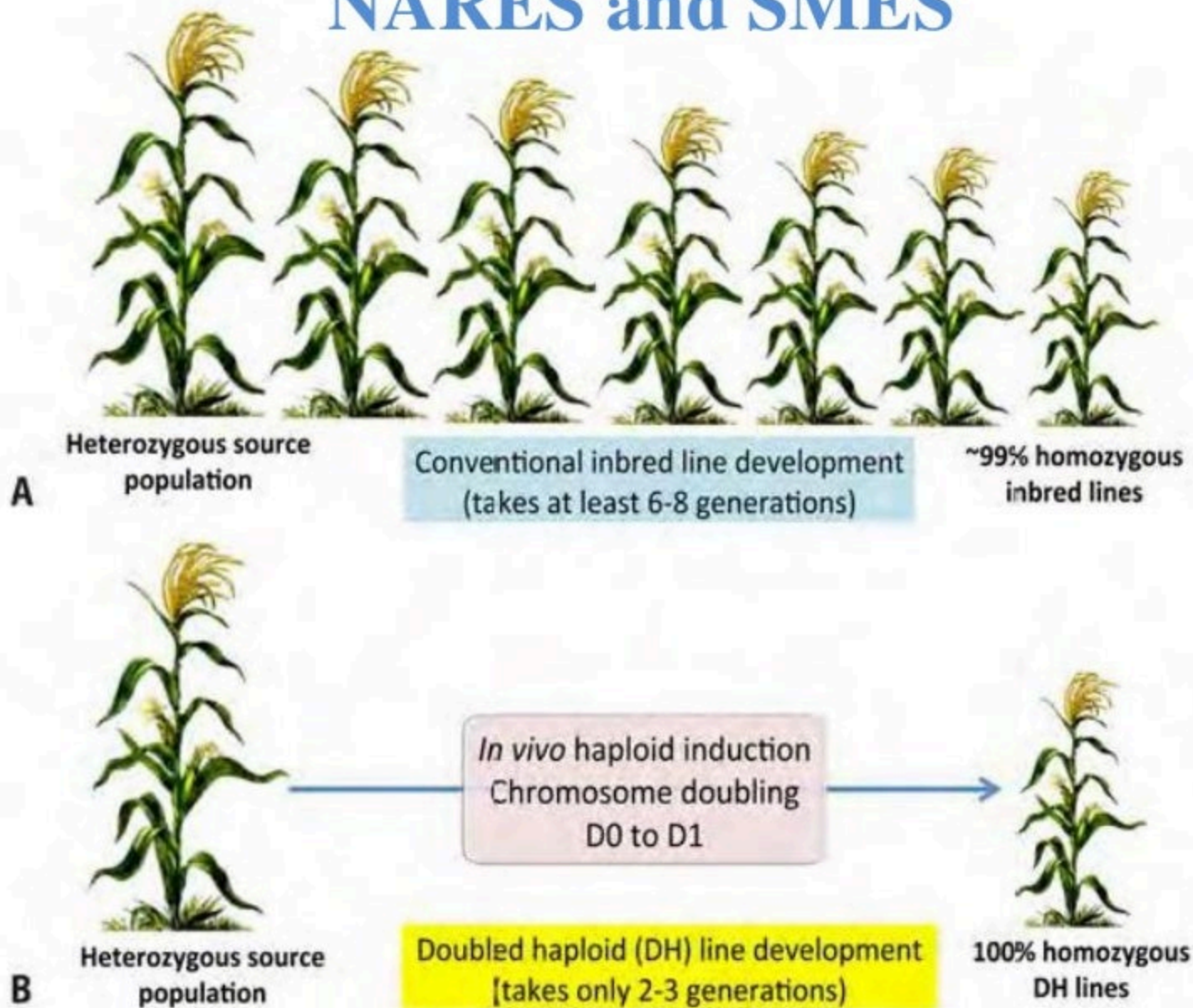
The trials were undertaken under natural disease (MLN) pressure at all the locations, using an alpha-lattice design with two replications per location, following standard agronomic management. They received no insecticide application.
DS: Disease Severity score (on 1–5 scale, with 1 = no symptoms; 5 = highly diseased) at different stages; %DPLT: % Dead Plants; MR: Moderately Resistant; MS: Moderately Susceptible; S: Susceptible.

Promising CIMMYT inbreds and pre-release hybrids identified



MLN-resistant line

Doubled Haploids: The Number 1 MAIZE technology demanded by NARES and SMES



Research Strategy 3:

Integrated post-harvest management



Aflasafe™

- Development and field testing of aflasafe™ 2009 to 2012
- Significantly reduces aflatoxin contamination of maize
- Adoption of aflasafe™ by extension agencies in Nigeria
- Low-cost manufacturing facility



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The Way Forward

- Strong impact & delivery orientation in many MAIZE projects
- Streamlining: ToC, IDOs, KPIs ... across diverse regions, projects
- More realism is needed:
 - “Assessing germplasm impact annually at a global level”
 - Role of IAR and CRPs versus role of partners – They are at the interface of farm level impact
- Test robustness of impact pathways, ToC, IDOs, KPIs – consultancies in 2nd half of 2013
- Develop Partnership and Capacity-Building Strategy
- Invest in performance partnerships (i.e., those that deliver)





Thanks!

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