

CIMMYT's maize interventions & innovations under AIP-Pakistan & NSAF-Nepal

AbduRahman Beshir (PhD)

CIMMYT-South Asia Regional Office, Nepal

a.issa@cgiar.org

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Outline

- **Maize activities under Agricultural Innovation Program for Pakistan**
 - Introduction
 - AIP's focus areas (under maize)
 - Key achievements
 - HTMA activities
- **Maize activities under Nepal Seed and Fertilizer Project (NSAF)**
 - Introduction
 - AIP's focus areas
 - Key achievements
 - HTMA activities



**Unlike wheat, large scale
maize interventions in
Pakistan is very recent**



N. E. Borlaug in Pakistan



Maize in Pakistan

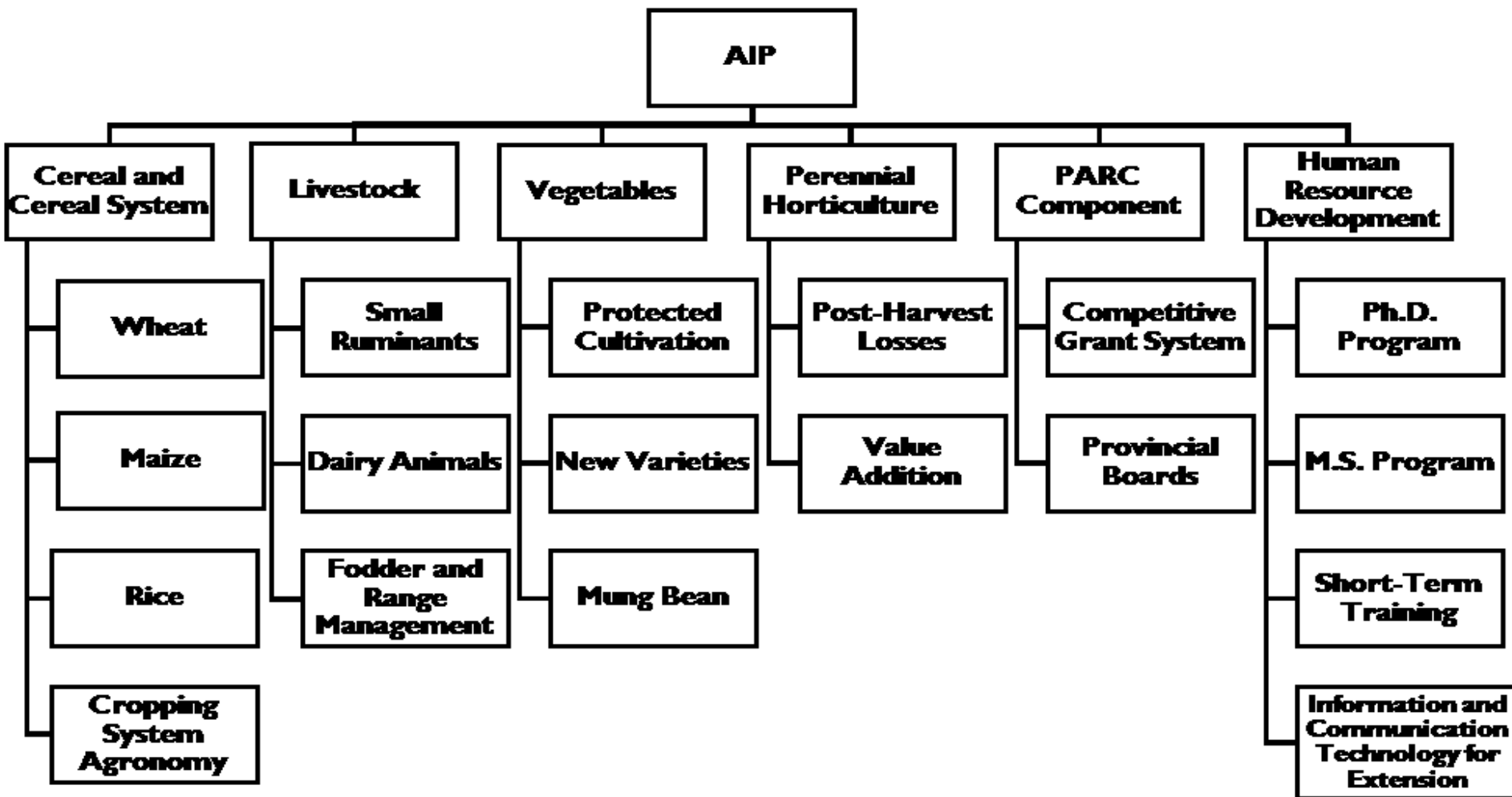
- Third most important cereal and first in productivity
- Among the highest in productivity in SA (4.6 tha^{-1})
- Covers about 1.2 million hectare (PBS, 2018)
- A record high of 6.13 million tones during 2016/17 (PES, 2016/17)
- Poultry is the pull factor for the change in area and production
- About 80million USD for maize seed import during 2018

(Undata.org)









Agricultural Innovation Program (AIP) for Pakistan

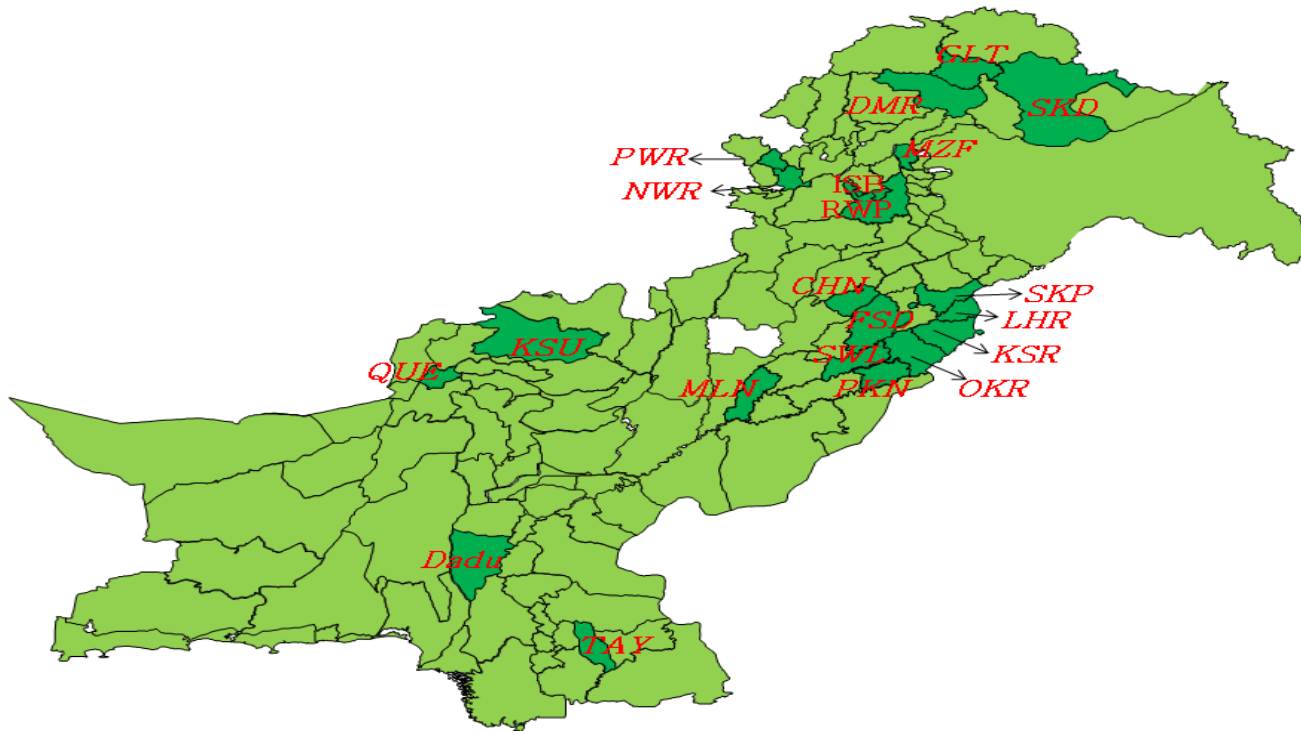


Focus areas of AIP-maize

-  **Climate resilient maize**
-  **Biofortified maize**
-  **Maize tolerant to biotic stresses**
-  **Enhancing the maize seed sector**

Major maize growing areas of Pakistan

TAY	Tando Alla Yar
QUE	Quetta
KSU	Killa Saif Ullah
MLN	Multan
PKN	Pakpattan
SWL	Sahiwal
FSD	Faisalabad
CHN	Chiniot
OKR	Okara
KSR	Kasur
LHR	Lahore
SKP	Sheikhupura
RWP	Rawalpindi
MZF	Muzafarabad
PWR	Peshawar
NWR	Nowshera
DMR	Diamer
GLT	Gilgit
SKD	Sakardu



Key areas of achievement

- **Fostering partnership**
 - Network of 22 public and private partners across the country
(Maize working group)
 - Promote private sector engagement for self reliance
 - Catalyst role in coordination and integration of maize stakeholders
- **New maize germplasm (diversified products)**
 - Products allocation
 - Hand over of inbred lines
- **Nutrition intervention**
 - QPM, PVA, High kernel zinc
- **Enhance inclusive seed business model**
 - All provinces
 - Diverse approach
- **Capacity building across the maize seed value chain**

Germplasm Evaluation

Year	# Trials sets	# Entries
2014	54	277
2015	79	790
2016	75	443
2017	89	746
2018	20	153
2019	23	348
Total	340	2757

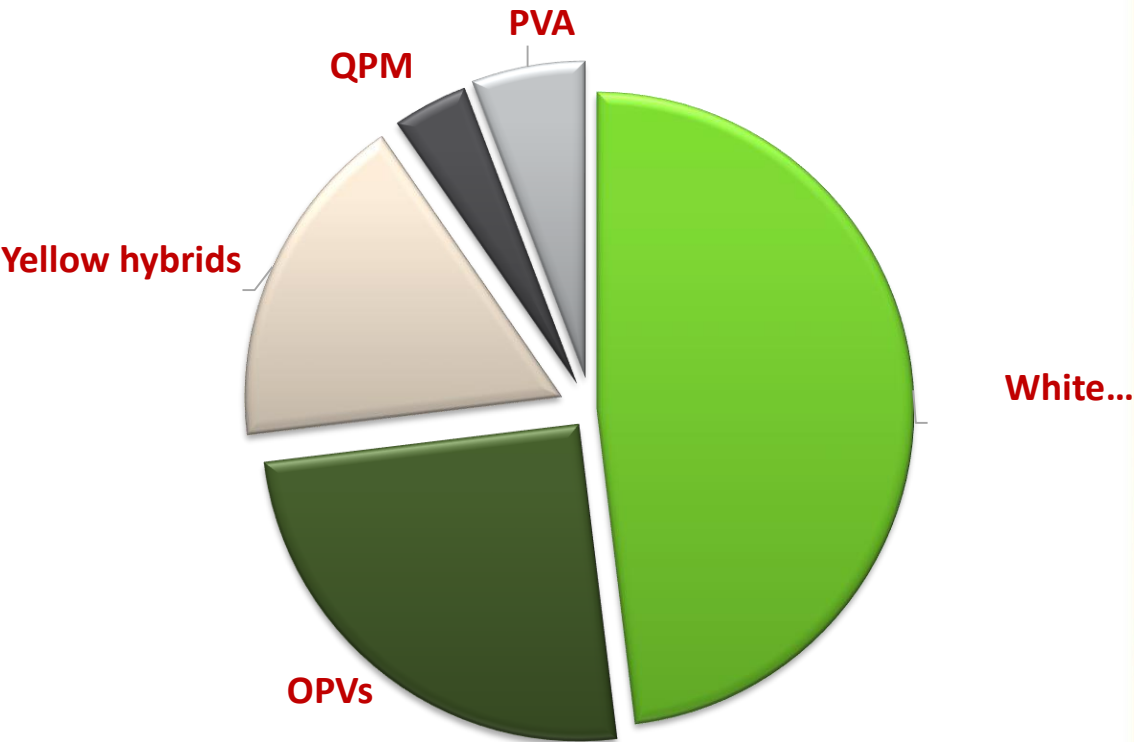


- Diverse germplasm
- From various breeding hubs of CIMMYT and IITA

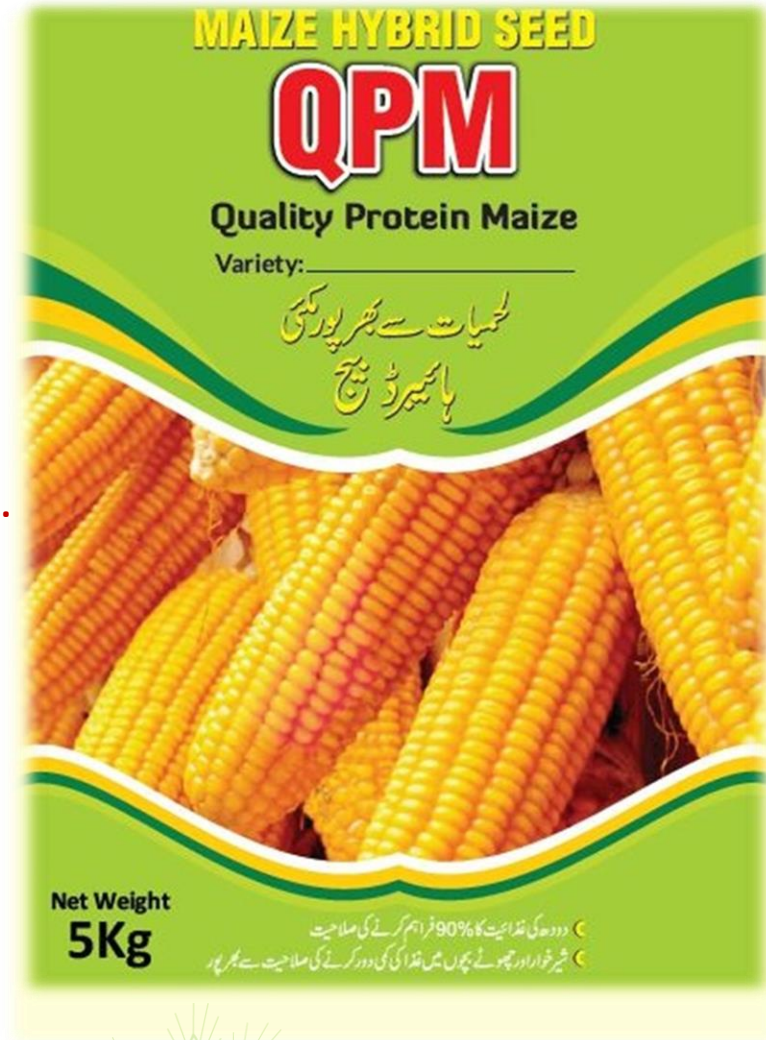


CIMMYT maize products licensed under AIP until 2018

Total Allocations: 52



■ White Hybrids: 25
 ■ OPVs: 13
 ■ Yellow Hybrids: 9
 ■ QPM: 2
 ■ PVA: 3



Handover of inbred lines

100

Set of inbreds
to produce 36
hybrids

75

Set of white
kernel
inbreds

25

Set of yellow
kernel
inbreds

13

Breeder
seeds

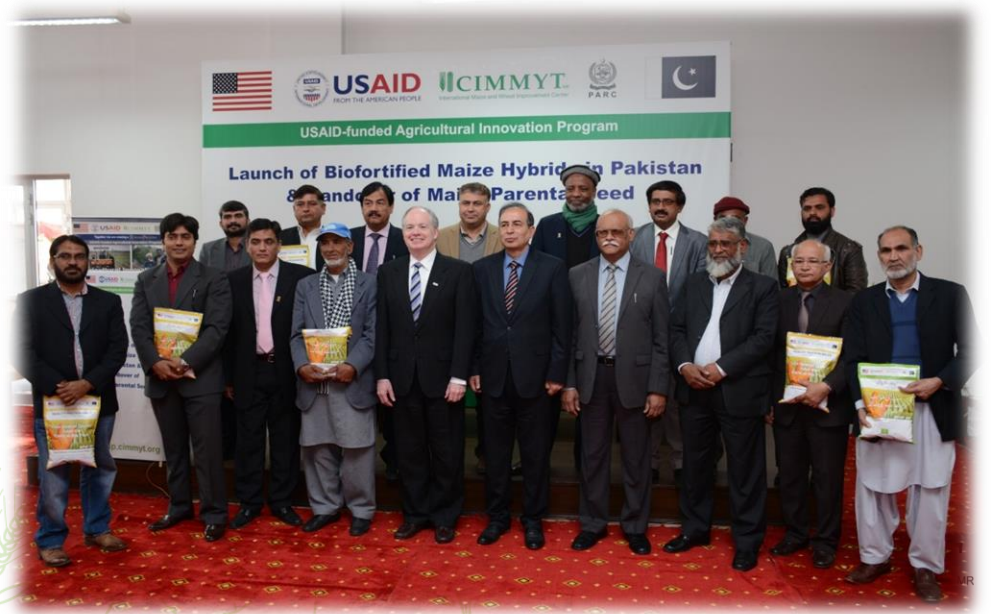


During 2018-19

- Over 500 maize entries, 20 types of trials
- Three new varieties released (more in pipeline), 48 products requested
- 22.55 MT, parental and breeder seed produced in
- Drought, low N stress, Stem Borer Tolerant, Pro A OPVs received from IITA (10 products to three partners)



- Market share of local maize seed companies increased from its negligible level in 2010/11.
- Capacity building to enhance hybrid seed production and internal QA



Traveling Seminars/Exhibition





Other interventions

- Established the first maize stem borer mass rearing facility
- Promotes hermetic storage technologies
- DH inducer lines shared
- Training across the maize seed value chain



AIP & HTMA

AIP coordinated the trial evaluation in Pakistan, developed under HTMA

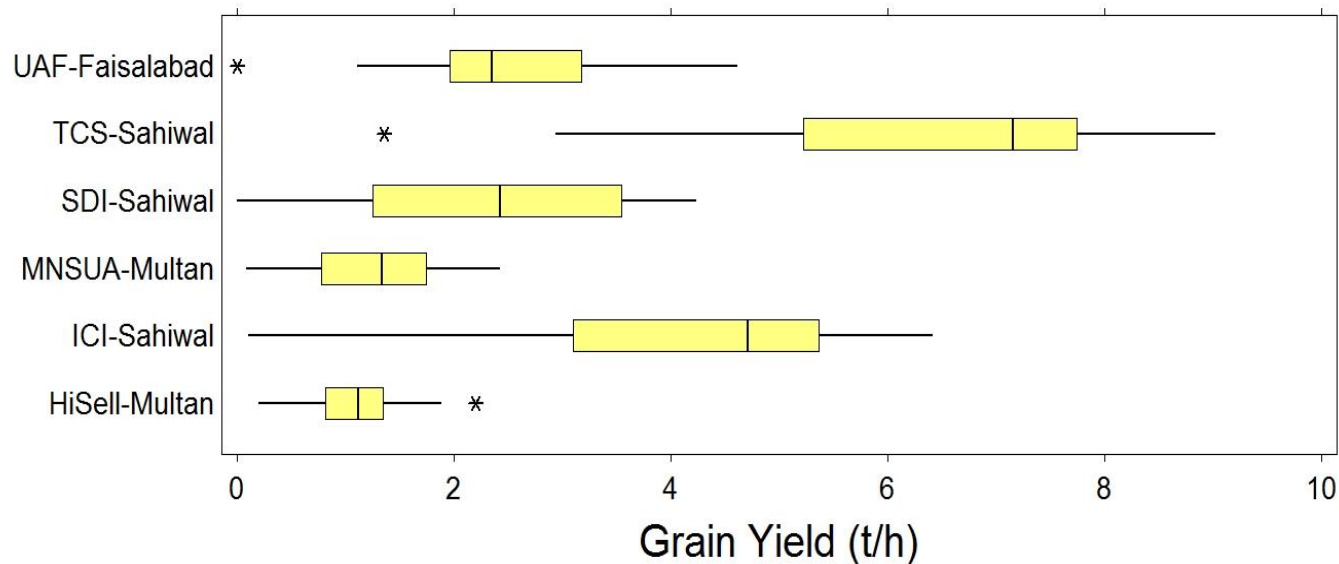
Year	Trial	Entries	Locations
2016	HTMA-MLT	20	10
2017	HTMA-MLTPK	20	06
2018	MLT-PAK	25	10
2019	MLT	20	10
2019	CRT	25	10



Requests for Product Allocations from HTMA trials

- **Products Requested = 08**
 - CAH153, CAH151, CAH1521, ZH1621, ZH1610, ZH15381, ZH138088, VH12333
- **Interested Partners: 04**
 - Sohni Dharti International (SDI), Tara Crop Sciences, MNS-University of Agriculture Multan, HiSell Seed Company

Grain Yield (t/h) across the locations



Box Plot for Grain Yield of HTMA hybrids (t/h) tested under AIP across different locations, spring 2016



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Nepal Seed and Fertilizer Project (NSAF)



Photo credit: Khagendra Baral, CIMMYT



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International Maize and Wheat Improvement Center

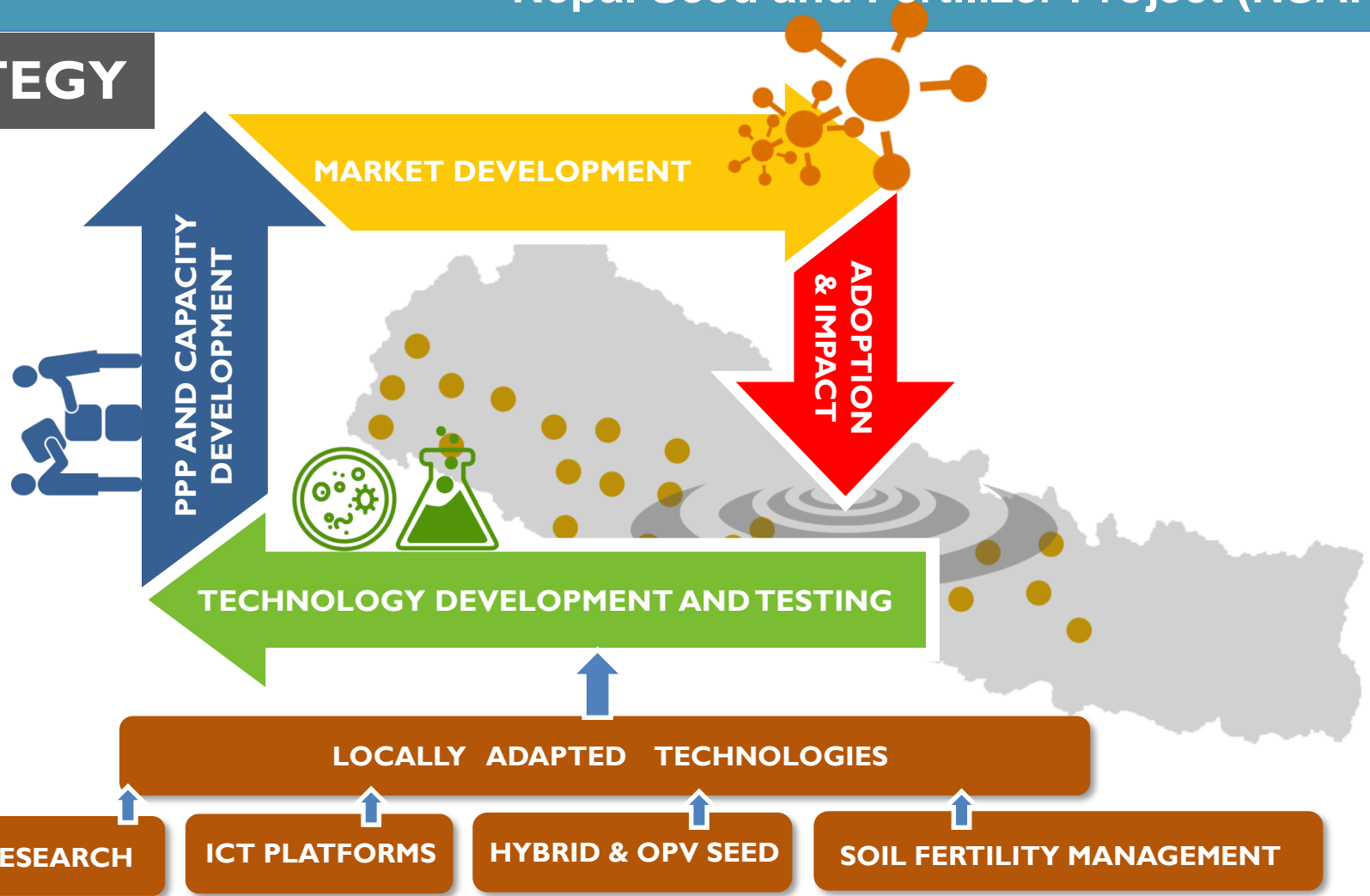


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Nepal Seed and Fertilizer Project (NSAF)

STRATEGY



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Nepal Seed and Fertilizer Project (NSAF)

NSAF-SEED COMPONENT OUTCOMES

- **Enhancing yield gains through rapid diffusion and adoption of newly-developed varieties/hybrids**
- **Strengthening local seed partners in the evaluation and validation of new and market-ready hybrids and OPVs**
- **Introduction and validation of bio-fortified crop varieties for human consumption and poultry feed**



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SEED COMPONENT OUTCOMES...

- **Viable, competitive and sustainable seed business entities for quality seed delivery to smallholder farmers**
- **Production and distribution of quality seeds through public-private partnership**
- **Capacity of SEAN enhanced for delivering business development services as well as for representing the seed sector**



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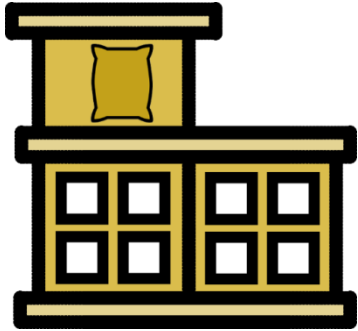
Maize in Nepal

- **Second most important cereal and first in productivity**
- **National Ave. (2.5 tha⁻¹)**
- **Covers about 0.9 million hectare**
- **Majority RF on the hills and Mid-hills**
- **Demand for Food and feed is the pull factor for the change in area and production**
- **Net importer for hybrid maize seed. Local initiatives started**





PROMOTING PRIVATE SECTOR ENGAGEMENT FOR SELF RELIANCE



- Business mentoring
- Staffing with required personnel
- Diversified products portfolio

- Business plan development
- Access to finance
- Value chain approach

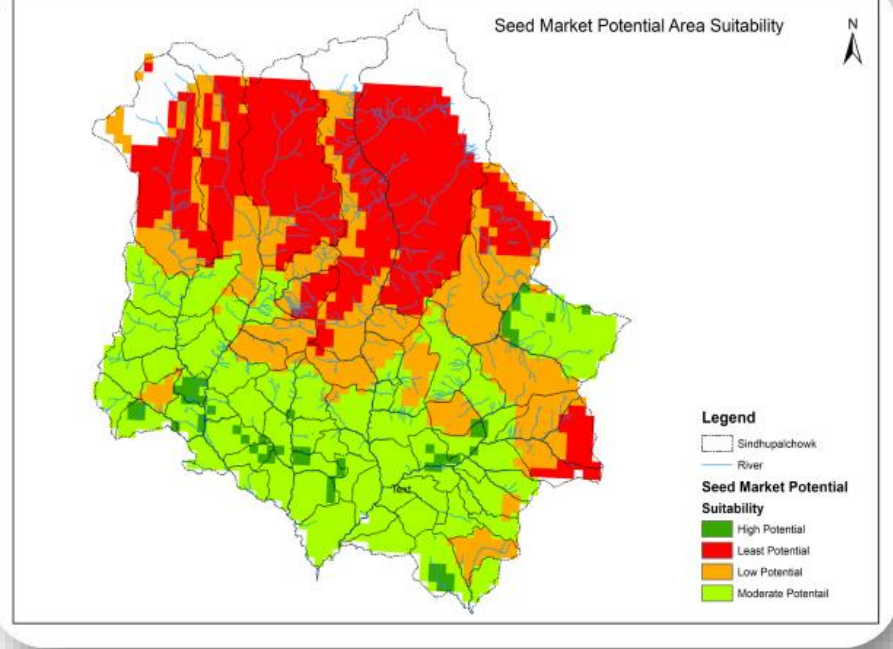
- Increased sales volume
- Increased seed quality
- Increased business literacy



- **Eight local seed companies engaged in product testing and identification (R&D)**
- **Over 700 new maize products tested, 31 requested for allocation (white, yellow, PVA, QPM, HTMA)**
- **Over 300 MT improved maize seeds sales annually**



- Digitally Enabled Seed Information System
- Real time field data collection on ODK (trials, demos, seed increase)
- Agro-ecological based market segmentation for maize
- Seed information portal, seed data warehouse, machine learning (AI) in linking varieties and ISFM practices



Government of Nepal
Ministry of Agricultural and Livestock Development
Seed Quality Control Centre

Call Us Now +977-01-552939 / 5534258 | Send Us Email sqccnepa@gmail.com

Register | Login | Language: English

Seed Catalog

Rice | Wheat | Maize | Lentils | Oil Seed | Vegetables

RICE

There are 30 varieties of rice available in the catalog

WHEAT

There are 21 varieties of wheat available in the catalog

MAIZE

There are 16 varieties of maize available in the catalog

LENTILS

There are 36 varieties of lentils available in the catalog

Recent Varieties

RADHA-13 RICE Resistant to drought, 124 days to harvest, 4.5 per hectare	HARDINATH-4 RICE Resistant to drought, 124 days to harvest, 4.5 per hectare	SUKKHA-5 MAIZE Resistant to drought, 124 days to harvest, 4.5 per hectare
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Seed Suppliers/Providers

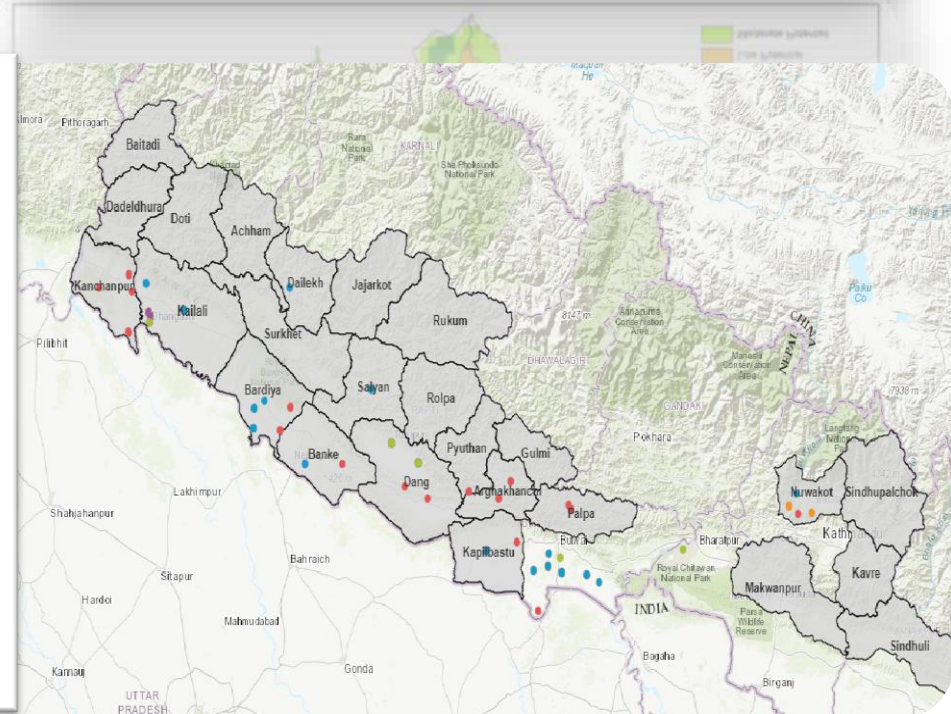
SEED TYPE: Breeder Seed

20 RICE	14 MAIZE	34 WHEAT
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Recent Supplies

NARC	2 Hr ago
Added 3000 KG of RADHA-13 (RICE) Breeding Seed	
RICE RESEARCH CENTER	3 days ago
Added 2000 KG of RADHA-13 (RICE) Foundation Seed	
UNIQUE SEED	2 weeks ago
Added 3000 KG of RADHA-13 (RICE) Certified Seed	

Seed Balance Sheet



Policy interventions

- Tripartite agreement to fast track variety release and registration
- Development of hybrid maize seed production and certification guidelines and licensing
- Enhance private sector engagement- SEAN
- Seed sector financing
- Nepal Seed Vision review (2013-25)



NSAF's hybrid maize seed scaling pathway

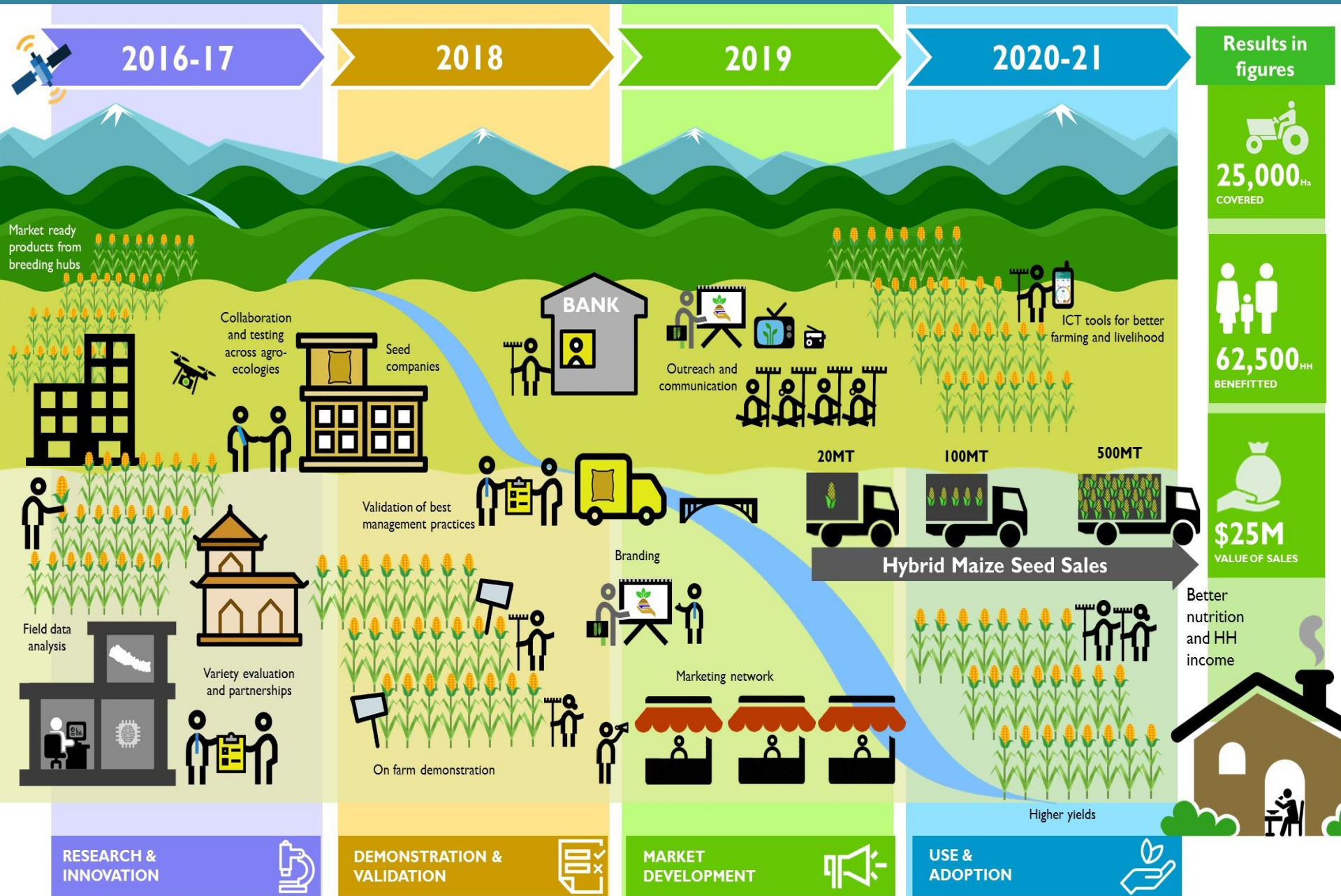


TABLE SX.1: This table presents the minimum quantities and areas of breeders and basic seed required to produce the certified seed production goals of single cross hybrid in the following year

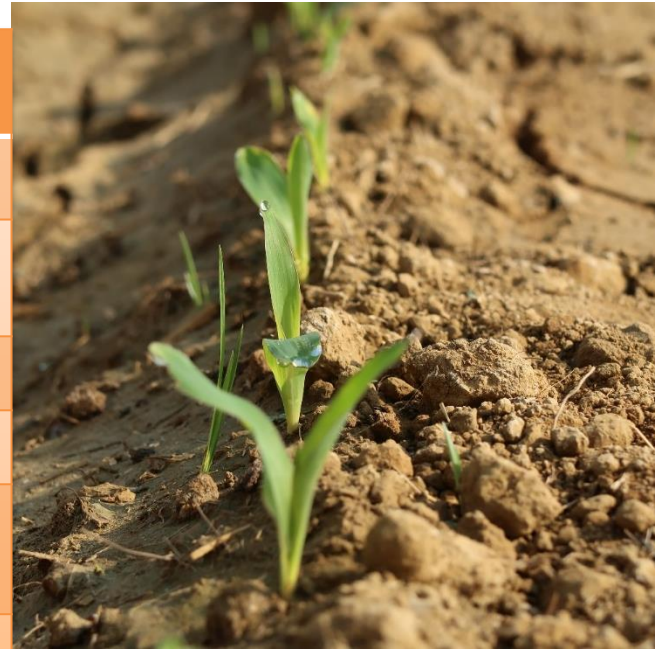
			2019	2020	2021	2022	2023
Certified	CZH0803	Sales Target	2 t	10 t	50 t	150 t	2 000 t
		Production	2 t	11 t	56 t	167 t	2 222 t
		Area required	1 ha	6 ha	28 ha	83 ha	1 111 ha
Basic	CML444	Production	0.13 t	0.6 t	1.9 t	25.2 t	
	(Female)	Area required	0.1 ha	0.4 ha	1.3 ha	16.8 ha	
	CML395	Production	0.05 t	0.3 t	0.8 t	10.4 t	
	(Male)	Area reqd.	0.0 ha	0.2 ha	0.5 ha	6.9 ha	
Pre-basic	CML444	Production	14 kg	42 kg	560 kg		
	(Female)	Area required	0.009 ha	0.028 ha	0.373 ha		
	CML395	Production	6 kg	17 kg	230 kg		
	(Male)	Area required	0.004 ha	0.012 ha	0.154 ha		
Breeders	CML444	Production	.8 kg	10.4 kg			
	(Female)	Area required	8 m2	104 m2			
	CML395	Production	0.3 kg	4.3 kg			
	(Male)	Area required	3 m2	43 m2			

ASSUMPTIONS	Certified	Basic	Pre-basic	Breeders
Reserve Factor	10%	25%	25%	10%
Seed Rates	kg/ha	kg/ha	kg/ha	kg/ha
Female	17			
Male	7			
Sole crop		25	25	25
Seed Yields	t/ha	t/ha	t/ha	t/ha
Female alone		1.5	1.5	1.0
Male alone		1.5	1.5	1.0
A/B (SX Hybrid)	2.0			

Seed scaling plan based on an example of a single cross hybrid (source: John Mac Robert)

NSAF and HTMA

SN	Name	Locations	Geography
1	Unique Seed company	Dhangadhi, Kailali	Terai
2	Panchashakti Seed Company	Dhangadhi, Kailali	Terai
3	GATE Nepal	Baijanath, Banke	Terai
4	RARS Khajura	Khajura, Banke	Terai
5	Lumbini Seed Company	Bhairahawa, Rupendehi	Terai
6	Agri-Botany Division, NARC	Khumaltar, Lalitpur	Mid-Hill



HTMA trials under NSAF

Source	Trial name	trial code	no of sets		Entry #	Check #
			2018	2019		
India	Evaluation of heat tolerance maize hybrids	HTMA-MLT-NEP-1	6	3	28	2



Potential hybrids in Nepal

Entry	Code	Yield
1	ZH138098	10.45
11	ZH111755	10.06
18	VH131167	11.1
22	ZH1736	11.10
27	ZH137413	10.91
28	ZH15440	11.53



Seed systems for “last mile”



Our intervention

- Inclusive seed business model
 - Women seed growers groups –Nepal- **Market access**
 - Lead women cooperative farmers- Hariali Seed Co. Mid hills of Nepal- **Skill and technology transfer**
 - Agrovets network in the remote areas of Nepal- **Enhance availability**
 - Department of agriculture and extension-Gilgit Baltistan in Norther Pakistan (near Chinese border)- **new maize varieties and seeds replacement (SRR)**
 - Maize seeds to the newly merged districts of Pakistan-bordering Afghanistan- **Seed mini kits**





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परियोजना कार्यान्वयन इकाई, सिन्धुपाल्चोक

खाद्यान्न तथा तरकारी बालीहरूको गुणस्तरीय बीउ
उत्पादन सम्बन्धी अगुवा महिला कृषकहरूको
क्षमता अभिवृद्धि तालिम

मिति : २०७६ असोज ८ र ९ गते

स्थान : बलेफी गा.पा.-५, सिन्धुपाल्चोक



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Collaborations and networking





International Maize Improvement Consortium for Asia Phase II (IMIC-Asia II) - India Chapter

A Partnership for Targeted Impacts



IMIC-Asia II Launch; 8 June 2017

- A model for intensive engagement, especially with private seed companies
- Partners: maize R&D institutions including Indian Maize Program
- Annual membership fee
 - ▶ Commitment, Accountability, Focus, Impact Tracking



IMIC-Asia II -- Field Day



Participants at the IMIC-Asia II Field Demonstration and General Body Meeting, ICRISAT Campus, 24th March 2018

IMIC-Asia II Demonstration				
Spacing: 0.75m x 0.20m		Row length: 2m		Rows Per Plot: 2
Experiment	Genes	Germplasm Background		Entries
Segment 1: Central & West India Khairi				
D71A-CWK	S7	Tropical Asia DT		29
D61A-CWK	S6	E & S Africa Mid-Altitude DT x Tropical Asia		39
D52A-CWK	S5	E & S Africa Mid-Altitude DT x Tropical Asia [Set 1]		48
D51A-CWK	S5	E & S Africa Mid-Altitude DT x Tropical Asia [Set 2]		52
D41A-CWK	S4	Mexican Lowland Tropical, E & S Africa Mid-Altitude DT crossed to Tropical Asia		54
D43A-CWK	S4	E & S Africa Mid-Altitude DT x Tropical Asia		36
D32A-CWK	S3	Temperate US Corn Belt, US GEM, E & S Africa Mid-Altitude DT crossed to Tropical Asia		30
D31A-CWK	S3	Cuba, E & S Africa Mid-Altitude DT x Tropical Asia		73
Segment 2: South India Khairi				
Y81A-SIK	S7+	Tropical Asia Elite lines		13
Y71A-SIK	S7+	South America Lowland Tropical (Acid Soil Tolerant), Suwan1 & Latin American Calletto		39
Y51A-SIK	S6	Temperate US Corn Belt x Tropical Asia		37
Y31A-SIK	S5	Suwan, Mexican Lowland Tropical x Tropical Asia		9
Y41A-SIK	S4	Brazil, South America Lowland Tropical (Acid Soil Tolerant) x Tropical Asia		30
Y33A-SIK	S3	Latin America Lowland Tropical, Mexican Lowland Tropical x Tropical Asia		17
Y32A-SIK	S3	Mexican Tropical Highland, West Africa Tropical (ITA) crossed to Tropical Asia		36
Y31A-SIK	S3	Tropical Asia & Mexican Lowland Tropical		40
Segment 3: North & East India Khairi				
HY1202	S7+	Suacarra, Tropical Asia Drought & Water Logging Tolerant		21
D62A-NEX	S6	Kassartart University (Thailand) & Tropical Asia origin		11
D53A-NEX	S5	Temperate US Corn Belt x Tropical Asia		16
D42A-NEX	S4	E & S Africa Mid-Altitude DT x Tropical Asia		36
HY1203	S3	Tropical Asia Drought & Water Logging Tolerant		16
Segment 4: Spring Maize				
HY1201	S7+	Tropical Asia Heat Stress Tolerant		19
H81A	S7+	Tropical Asia Heat Stress Tolerant		32
H41A	S4	Mexican Lowland Tropical x Tropical Asia		10
Segment 5: South India Rabi				
Y72A-SIR	S7+	US GEM, Mexican Sub-Tropical, Temperate US Corn Belt		39
Y42A-SIR	S4	Temperate US Corn Belt x Tropical Asia		13
Across Indian Maize Market Segments				
Y82A-AC	S7+	Elite lines of various background		17
Y83	S7+	Elite lines of various background		10*
FSR-IMC	S7+	Fusarium Stalk Rot Resistant		17
MSR-IMC	S7+	Macrophomina Stalk Rot Resistant		19
FSR-Early Gen.	S2	Fusarium Stalk Rot Resistant		24
* Available row number				Total: 1027



19 National Partners & 48 Seed Company Participants; 1027 lines displayed; 2253 packets of inbred seed packets despatched

IMIC Site Nepalgunj



Over 2000 entries of various stages

Plan to make Nepal as a regional nursery



FAW challenges and intervention



Collaboration with partners

- Awareness creation, video, fact sheets...
- Protocol, monitoring, surveillance development
- Engagement with partners federal and provincial level



Future priorities

- **Promote market systems approach-including linkages with output market to ensure sustainability**
- **Adopt various seed marketing/promotion approaches**
 - Loyalty programs- seed companies with growers
 - Best seed farmer prestige rewards
 - Branding- image building (long process)
 - Seed market day/fair
 - Buyers/producers clubs
- **Digital seed information system**
 - Electronic inventory, seed catalogue, seed data base
 - Seed and varietal tracking systems (SRR)
- **Building competitiveness of local partners**
- **Policy intervention-voluntary variety registration, harmonization of release process in the region**





**Thank you
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