Closing wheat yield gaps in Pakistan: Learning from past initiatives & innovations

On behalf of 29 AIP project partners and CIMMYT team
“In the next 50 years we will need to produce as much food as has been consumed over our entire human history.”

Megan Clark
CEO of the Commonwealth Scientific and Industrial Research Organization (CSIRO)
Australia
Pakistan ranks 7th in wheat production, 8th in area yet 59th in yield.

- Closing wheat yield gaps is vital for overall food security in Pakistan.
- 60% of carbohydrate & protein
- Most important commodity for food security

Do we know about the sources of wheat yield gap? Yes & No

- 50% yield gain in last century is attributed to varieties alone (Tanksley et al., 1989)

- Variety is cheapest and easiest means of increasing productivity— for smallholders

- Seed is engine for agricultural growth

Try & find gaps & opportunities around variety & seeds;
Highest farm yield gaps in sub-Saharan Africa and South Asia.

Pakistan: National yield = 3.0 t/ha, Potential yield 6.7 t/ha; ~120% yield gap

BUT, addressing gaps = **real opportunities** for raising yield in farmers' fields
Wheat average yield (t ha⁻¹)

Rainfed area
Punjab: 0.83 t/ha

95% farm saved seeds of obsolete varieties = poor crop stand = poor yield

Source: BARI, 2014
Findings from 3 wheat seed value chain workshops:

- Seed replacement rate is low in KP & Pothwar region of Punjab
- Few mega varieties predominate in Sindh

Khan et. al., 2013, FSC&RD unpublished data, Akhlaq Hussain, pers. com
What did we do to close the yield gap?

Identified districts with food insecurity Phase 2 or 3

2 UC in remote parts of selected districts

smallholders (<5 acre), women headed households, tenants, vulnerable people including 3,600 families affected by floods in Punjab

Moderately & highly food insecure
Coverage: parts of 63 districts through 16 public & 13 private sector partners

Few partners collaborating without funding (except source seeds in some cases)

Number of districts
Balochistan: 12
Gilgit-Baltistan: 6
ICT: 1
KP: 14
Punjab: 18
Sindh: 12

- Commissioned projects: 21
- Total fund allocated: $342,683
On station collaborative research

Yield loss assessment of wheat due to rust using fungicides

Trials in 6 hotspots of yellow, leaf & stem rusts using 6 proven fungicides

Durum wheat value chain development

First national durum wheat workshop, NUYT in 9 locations

Diamond trial (2x2 factorial experiment)

Comparing new & old varieties with their certified & farm saved seeds

Improving wheat grain quality

Capacity building of food technologists/cereal chemists of 3 labs for incorporating grain quality traits through breeding
On farm participatory R4D

Paired plot Demos

PVS MB trials

Variety & agronomic trials

Basic seed production

Village-base seed production & provisioning

♀ 1029 3 6 0 0
♂ 7675 422 229 27§ 206

S: basic seed was produced mostly at private seed company farms & with few farmers

10.8% Female
89.2% Male

17 varieties
300 t seeds
87% of the respondents (n=603) on average saved 6.62 manuds (=265 kg) per household = sufficient to cover around 20,000 ha next year

Findings: Acceptance & uptake of new wheat varieties by collaborating farmers

1~3 HH = 30,000
Closing yield gaps through varietal deployment in far flung areas, rainfed ecologies with smallholder farmers in KP (n = 569), Punjab (n = 85) and Sindh (n = 21)

Source: Punjab Development Statistics 2013
Recent genetic gains not transferred quickly to farmers: One of the major sources of yield gap.
Performance of durum wheat lines across 9 locations in four Provinces in NUYT; 3.1±0.076***
Seed production through public-private partnership & village-based seed production

- Seed quantity (t)
  - Sindh: 50.3
  - KP Certified: 99
  - KP Basic: 305
  - Punjab: 375
Wheat Quality Training Program

Trained >50 Scientists
Farmers Field Days & exposure visit
Important Achievement

New innovation platform and network of partners
- Public sector partners
- Private sector partner
- Public-private partnerships
- Also important for sustainability

- One of the achievements of AIP wheat is developing partnership with NRSP- has a direct contact with a large grassroots organizations and vast number of smallholders families with 30% women
- Largest network for creating quick impacts

www.nrsp.org.pk
Lesson's learnt

- New varieties offer ample opportunities to close the yield gaps from 23 to 113%.
- Substantial seed production & provisioning of high yielding & rust resistant wheat in the grassroots level (including farmers-to-farmers seed flow).
- Varietal popularization as important as variety development.
- Focus on varietal replacement rather than merely seed replacement.
- Capacity building is vital for improving uptake and adoption of new technologies & innovations.
long technology pipeline: major cause for yield gap still remains but do not know how to address!!!

Takes a number of years to fill

“if the misery of the poor be caused not by the laws of nature but by our institutions, great is our sin”

Charles Darwin

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A glimpse of AIPs’ activities

Thank you for your interest!