Increased Productivity and Profitability of Wheat-based Cropping Systems to Reduce Reliance on Opium Poppy in Northern Afghanistan (RALF02-05)

Joint Development Associates (JDA)
Aga Khan Foundation (AKF)
International Maize and Wheat Improvement Center (CIMMYT)
Balkh University Faculty of Agriculture (BUFA)
Cornell University
Balkh Savings & Credit Union (BSCU)

Jan. 2005 – Jan. 2007

Purpose:

- **To engage farmers in diversification of their farming systems with alternative high value livelihood options that improve productivity and profitability in wheat-based cropping systems.**

Project Activity Areas - Outputs

- Crop & appropriate mechanization research
- Markets
- Capacity building

Location & Target Groups

- Balkh, Baghlan & Badakhshan
  - Kunduz, Jawzjan
- Farmers in each province
- Relevant government agencies and NGOs

Crop Research - Oilseeds

- Oilseeds:
  - Soybean- 10-20 varieties
    - 1 – 2.5 t/ha
  - Canola (rapeseed)- 3 varieties
    - 1.8 mt/ha, plant in Oct/Nov
  - Safflower- 101 varieties/germplasm
  - Peanut- 4 varieties
  - Sesame- 78 varieties/germplasm
  - Flax- 5 varieties
  - Sunflower- 113 varieties/germplasm

Planted Nov. 1, 2004

Planted Oct. 1, 2004

Canola on March 24, 2005

Safflower

Evaluating thornless types

Crop Research – Grains, Legumes

- Maize – 6 - 8 t/ha
- Pearl millet
- Sorghum
- Mungbean – 16 varieties
- Cold tolerant chickpea- 50 varieties
- Triticale
- Wheat

Triticale

Appropriate Mechanization

- Why mechanization?
  - Necessary for adoption of conservation agriculture
    - Soil physical & biological health
    - More sustainable
    - Increased efficiency, yields, and reduced costs
- 4WT 0-till seed drill
- Chinese 2 wheel tractor (C2WT)

Soil Health a Problem

Gains in Efficiency Needed

New Machinery, New Seeding Systems

Planting soybeans on raised beds with incline plate seeder.

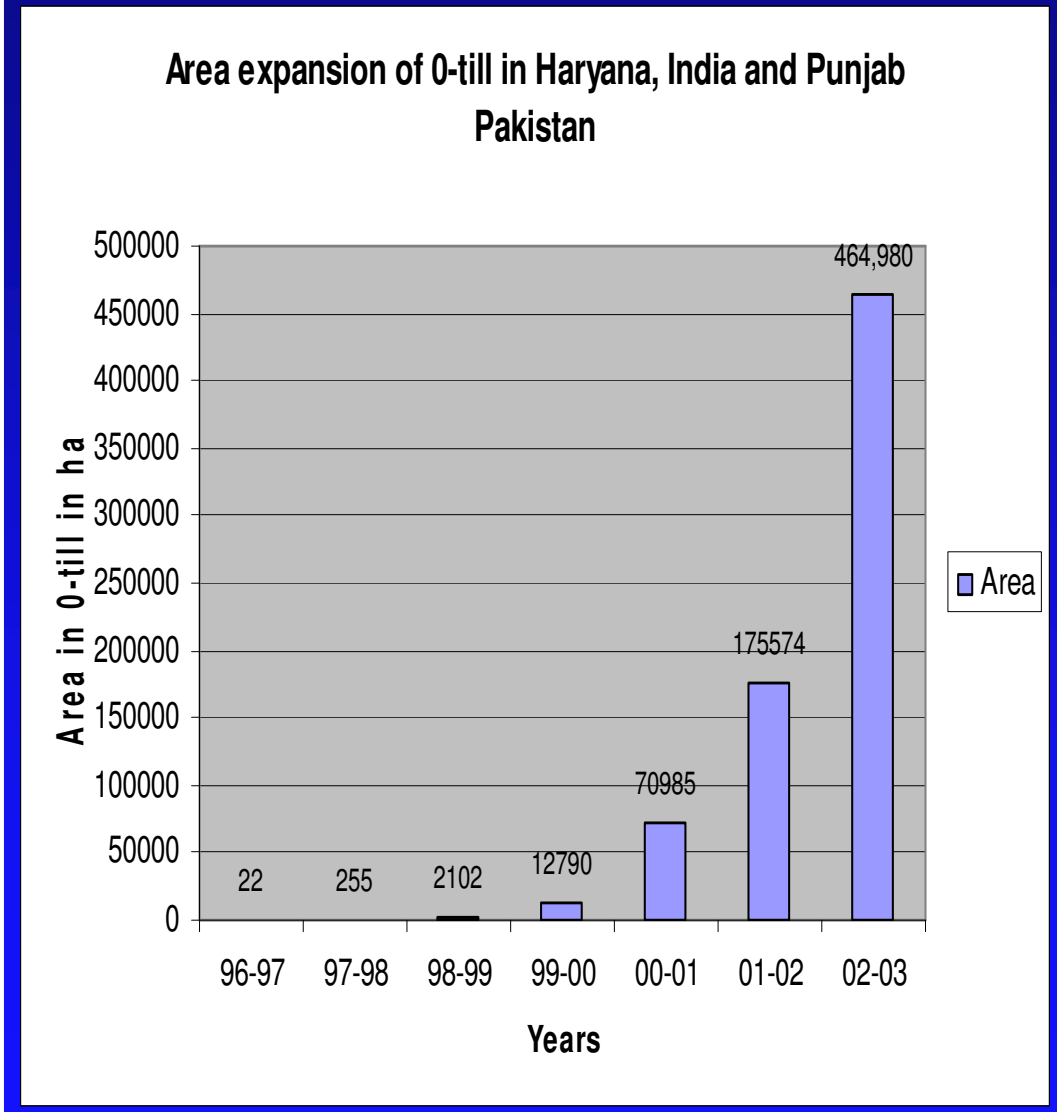
Improved water use efficiency (25% – 50%)

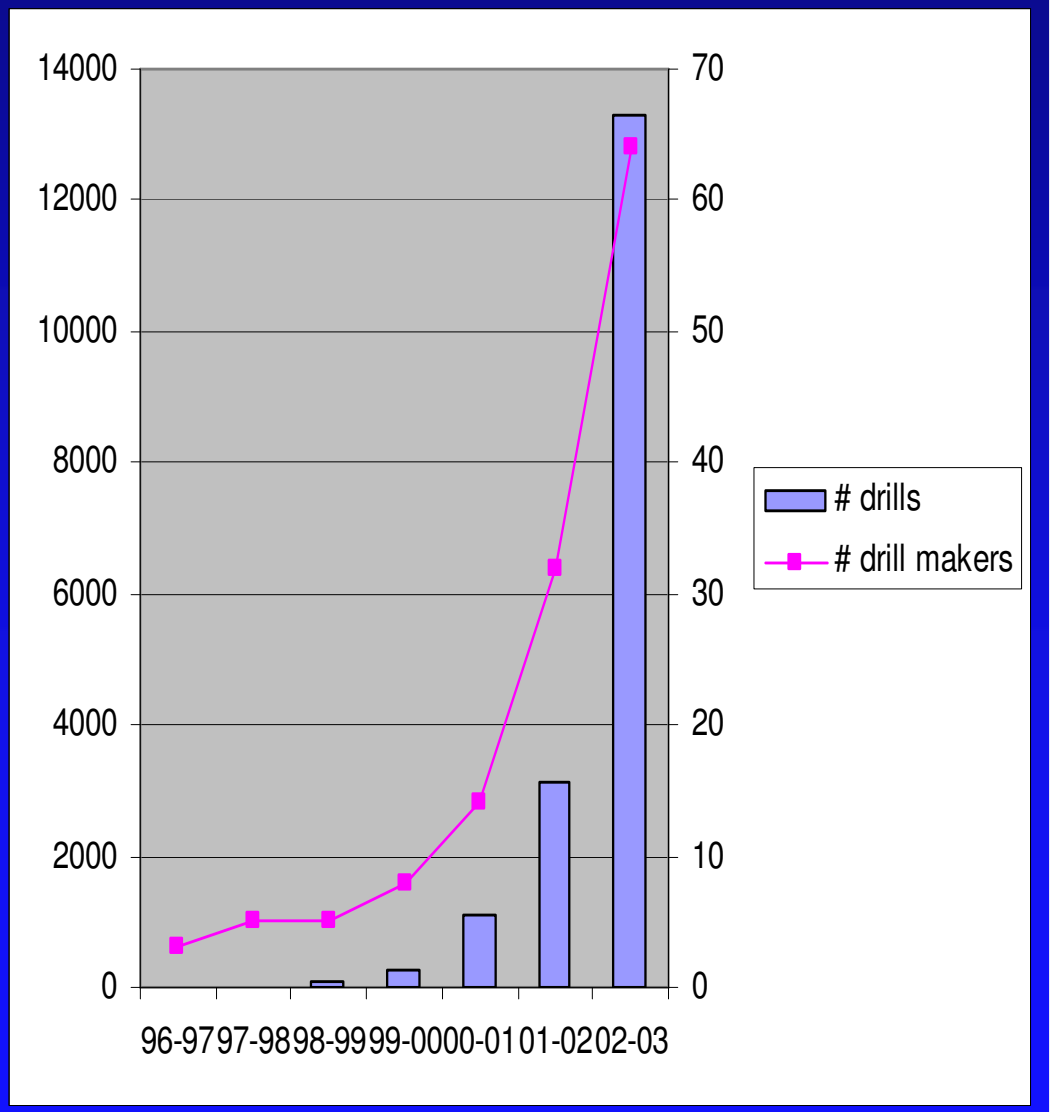
Bed planting (right) compared to conventional planting (left) in India

- 0-till wheat
- Made in Afghanistan
- Approx. $700 imported from India

Bands fertilizer with seed

Trends in O-till in Haryana, India and Pakistan's Punjab





India-Pakistan Case Studies

- **India – 0-till**
  - Started work in 1990
  - 1st 0-till drills made in 1992
  - Widespread adoption in 1999
  - 2004 – 2 million ha in 0-till
  - >100 manufacturers of 0-till implements
    - 10,000 drills
- **Pakistan – 0-till**
  - Started work in 1984
  - Widespread adoption in 1999
  - 2004 – ¾ million ha in 0-till

Chinese 2WT - Direct seeded wheat after rice in Kunduz

Direct seeded wheat with C2WT in Kunduz

3.6 t/ha

Raised Beds with Chinese Tractor

Planting Soybeans on Beds

Safflower on Beds – C2WT

Intercropping Safflower & Chickpea

Peanuts on Raised Beds- C2WT

Multiple Uses of C2WT

Multiple Uses of C2WT

Multiple Uses of C2WT

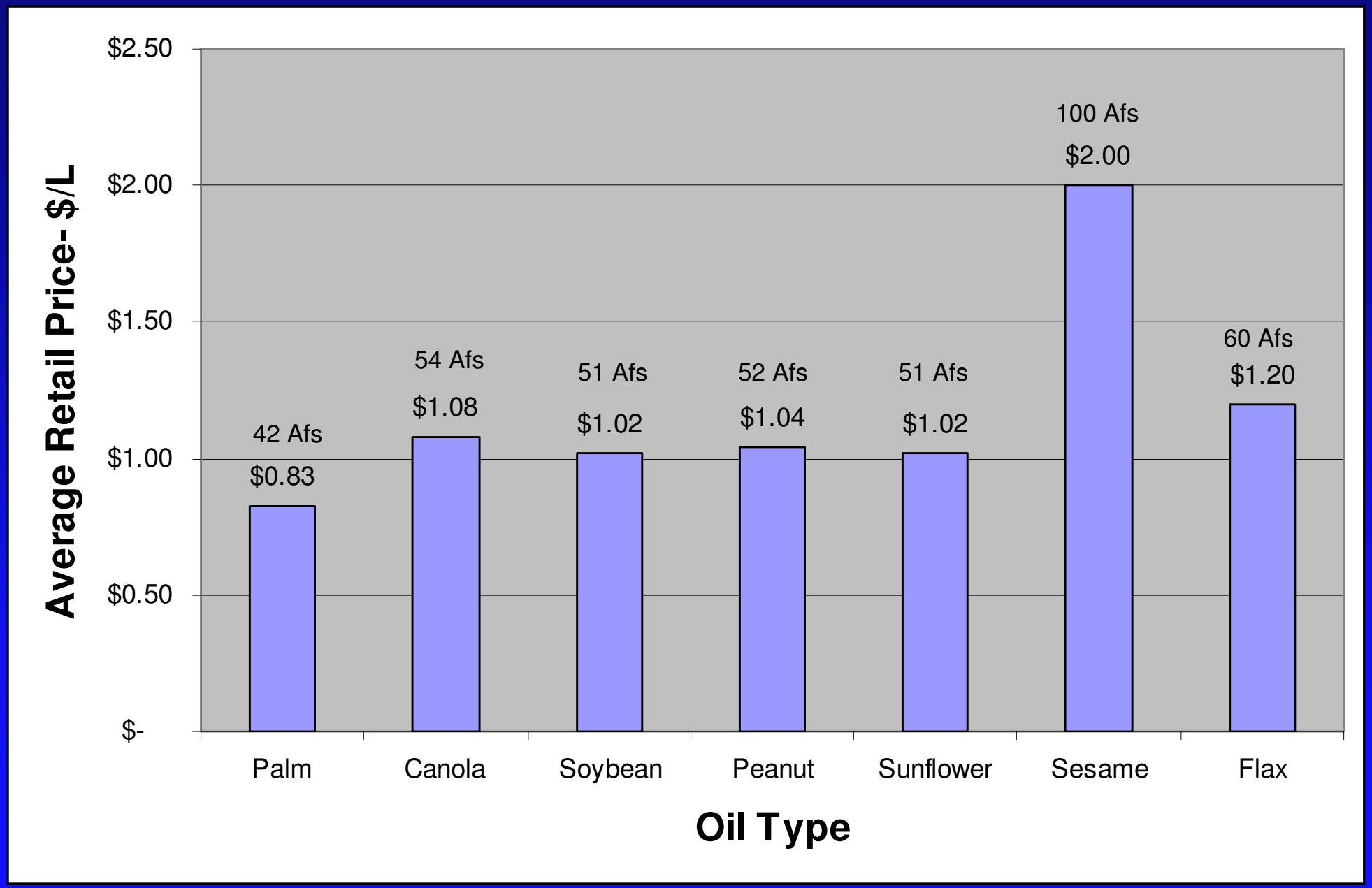
Working with Farmers

- On-farm trials and demonstrations
- Farmer-to-farmer extension/PTD
  - Farmer visits to other research sites- from Baghlan, Bamyan

Edible Oil Market

- Demand for edible oils
  - Local production very small (flax, sesame, cotton)
- About 90% of oil is imported
  - Mostly Malaysian palm oil (cheapest)
    - Not healthy
    - Quality is sometimes questionable

Prices of Cooking Oil in Afghanistan



Capacity Building

- AKF building up BDK research station
  - Training Ministry people in BDK to take over research activities
  - Building up research infrastructure, capacity, mobility
  - Goal- 2006 winter wheat trials be done by govt. staff
- Collaboration with Balkh University Faculty of Agriculture (BUFA)

Collaboration with BUFA

- Why work with universities?
  - **They are training the next generation!**
- Work with BUFA staff & students to give them practical experience in agricultural research
- BUFA's work has contributed to agricultural development in Afghanistan
- Maize, soybeans, canola, flax, safflower, vegetables

Simple Mass Selection Procedure

1. Selection for healthy plants and stalk strength. Selected plants tagged.

2. Selection for ear quality.

Simple Mass Selection Procedure

3. Bags of selected ears further selected- ears with best quality (length, uniformity, ‘flint’type, health) separated out from bags.

Very best seed saved for planting in 2006.

Wheat-Based Productivity Improvement in Afghanistan

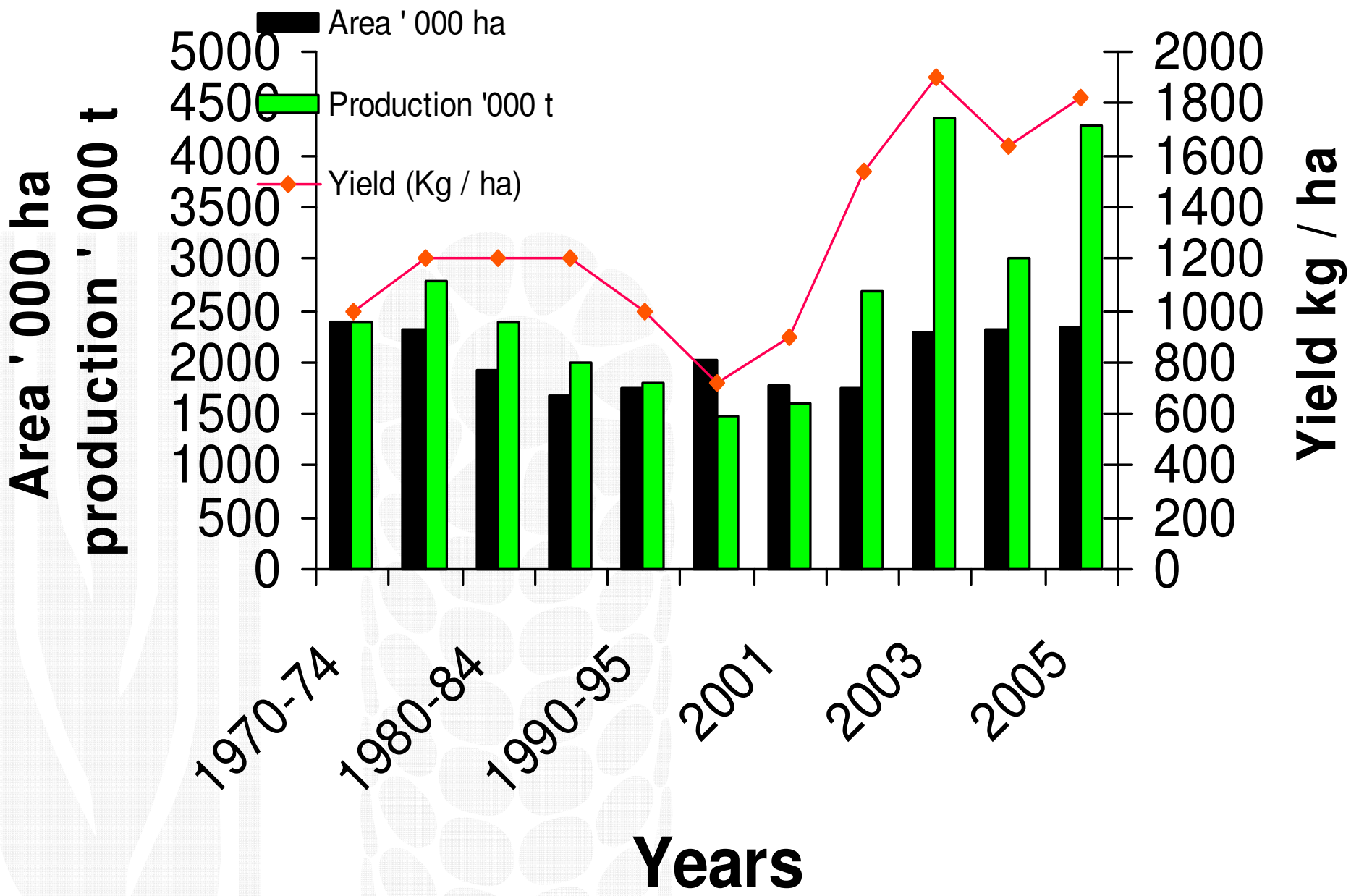
Mahmood Osmanzai
CIMMYT- Afghanistan

CIMMYT

CIMMYT Mission

CIMMYT acts as a catalyst and leader in a global maize and wheat innovation network that serves the poor in developing countries. Drawing on strong science and effective partnerships, we create, share, and use knowledge and technology to increase food security, improve the productivity and profitability of farming systems, and sustain natural resources.

CIMMYT MR


Area ' 000 ha
Production '000 t
Yield (Kg / ha)
Area ' 000 ha
production ' 000 t
Yield kg / ha
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1970-74
1980-84
1990-95
2001
2003
2005
Years

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PRODUCTION PARADIGM

G x E x M x P

G	=	Genotype
E	=	Environment
M	=	Management
P	=	Policy / People

Yield = G x E x M

Yield Gap = Attainable Yield – Ave. Yield

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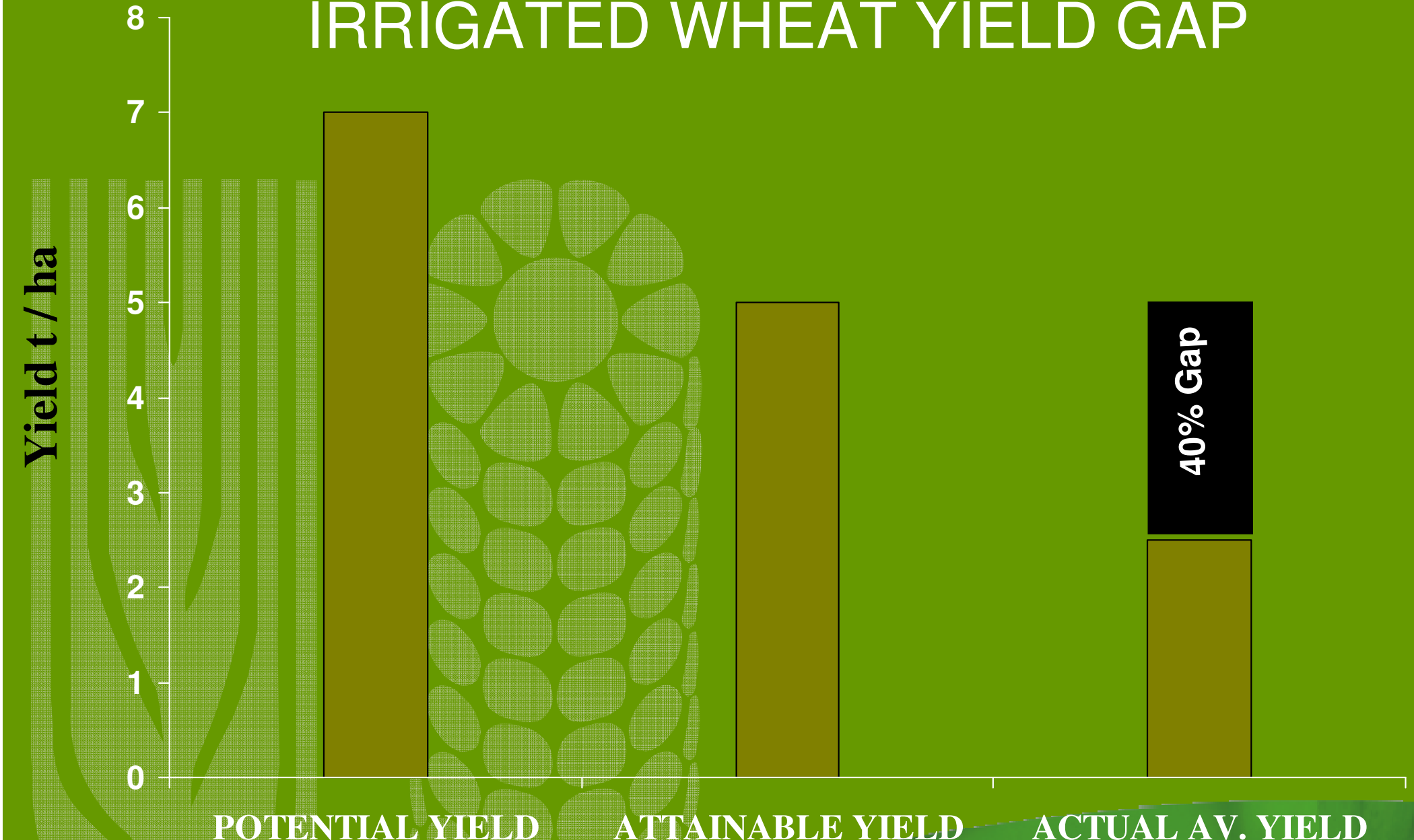
IRRIGATED WHEAT YIELD GAP



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Approaches to Increase Productivity

- Increase Yield
  - Genetic improvement of yield
  - Enhance double cropping by early maturity and new crops
- Reduce Cost
  - Test, verify and modify CA with farmers participation
  - Improve crop, water and nutrient management

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CIMMYT / ARIA
International and National Trials
And Nurseries Wheat, Durum Triticale
And Barley.
تجارب بین المللی و ملی انواع گندم، دیورم تریتیکلی و جو

DOC TRONG

CIMMYT

GERMPLASM OBTAINED AND DISTRIBUTED DURING 2002- 03 , 2003-04 , 2004-05 & 2005-06

SOURCE	**No. OF TRIALS / NURSERIES**			
CIMMYT	24	34	58	41
TURKEY/CIMMYT/ICARDA	12	9	18	15
TURKEY (NATIONAL)	2	-	-	-
IRAN (selected elite lines)	3	3	4	-
TOTAL	**41**	**46**	**80**	**56**

CIMMYT MR

GERMPLASM OBTAINED AND DISTRIBUTED 2005 & 2006

SOURCE	No. OF TRIALS / NURSERIES	
CIMMYT- HQ	13	12
IRAN (selected maize hybrids)		1
CHINA (hybrid maize)		1
CIMMYT- Zimbabwe		
ICRISAT (sorghum/pearl millet)	3	-
ICRISAT (pigeon pea)		5
MEXICO (sesame) INIFAP		3

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WHEAT BASED CROPPING PATTERNS

Practiced

- **WHEAT / RICE**
- **WHEAT / COTTON**
- **WHEAT / MAIZE**
- **WHEAT / PULSES**
- **WHEAT / MELON**

New

- **WHEAT / PIGEONPEA**
- **WHEAT / PEARL MILLET**
- **WHEAT / SORGHUM**
- **WHEAT / PEANUT**
- **WHEAT / SOYBEAN**
- **WHEAT / SEASAME**
- **WHEAT / VEGETABLE**
- **WHEAT / FODDER**

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Achievements

- Established well coordinated wheat improvement activity
- Released new wheat varieties and more are in the pipeline
- Improved wheat based cropping system with HYV contributed to productivity
- CA is being tested, verified and adapted in close participation with partners and farmers
- Trained national staff abroad and in country on-the-job

CIMMYT MR

Thank You

CIMMYT

Successes

- Introduction of Chinese 2 wheel tractor with seed drill/rotovator
  - Farmers are ready to buy
- Introduction of 4WT 0-till seed drill, bed planting
- Linking with other NGOs/agencies
  - SMEC, IAM, FAO, Land O Lakes
- Partnering with MAAHF, BUFA
- Expanding to Kunduz, Bamyan
- ID of planting info. for new crops
- ID promising crops & new machinery for CA
  - On-farm, on-station
- Workshops & field days

Challenges

- Timeframe not adequate for impact with farmer adoption
  - Need 5 – 10 years for research & adoption/impact
  - Lag time for seed production – minimum 2 years
- Technical challenges
  - Machinery problems & availability
  - Crop establishment
  - Variety adaptation
- Mindsets on new management practices
- Project activities not as simple as seed replacement
- Security
- Developing markets takes time for alternative crops