

Conservation Agriculture Adoption in Kazakhstan

Prof. M.Karabayev (CIMMYT)
Prof. V.Dvurechenskii (NARS, Kaz)
Dr.P.Wall (CIMMYT)
Dr.K.Sayre (CIMMYT)
Dr.T.Friedrich (FAO)
Dr.N.Yushenko (NARS, Kaz)
Dr.Zh.Ospanbayev (NARS, Kaz)
Dr.R.Zhapayev (CIMMYT)
Dr.A.Morgounov (CIMMYT)
Mr. A.K.Darinov (Union of Farmers, Kazakhstan)
Mr.A.Nazarenko (Union of Farmers, Kazakhstan)
Prof. E.Gossen (Kazakhstan)
Dr.T.Filecia (FAO)
Dr.M.Guadagni (World Bank)

+

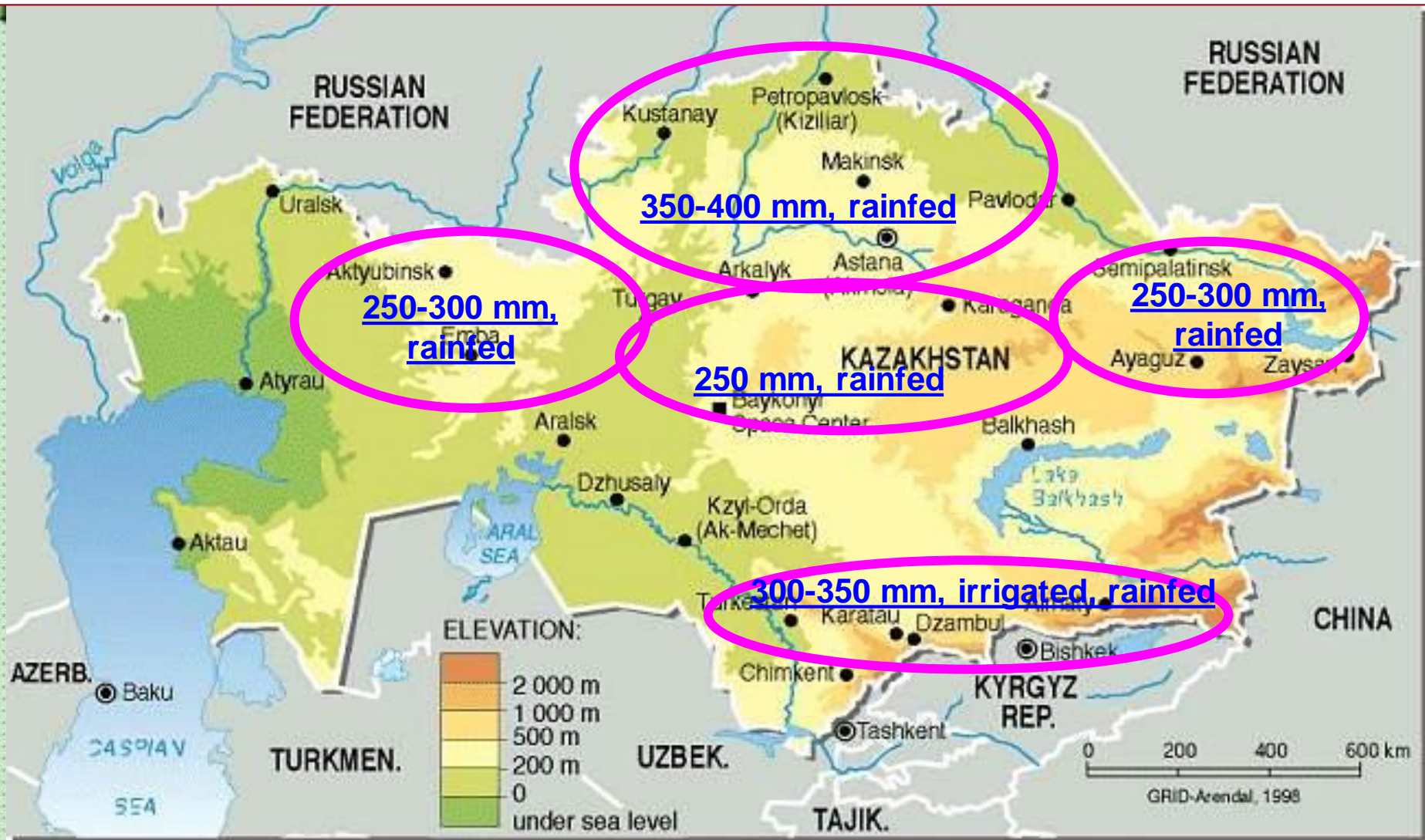


The Challenge

By 2025, farmers will need to produce 3 billion tons of cereals to feed a human population of 8 billion (Dyson, 1999) against a backdrop of:

- Declining water availability for agriculture
- Increasing temperature
- Degraded lands in much of the developing world
- New very virulent rust races
- Use: Food vs Feed vs Biofuel

Wheat Growing Regions in Kazakhstan



The territory of Kazakhstan is of **270 mln ha**.

Ranks **9 place** all over the world in the area extent.

Around **20 mln ha** is used for crop production, mainly for wheat – **15 mln ha**

Kazakhstan. Country Statistics

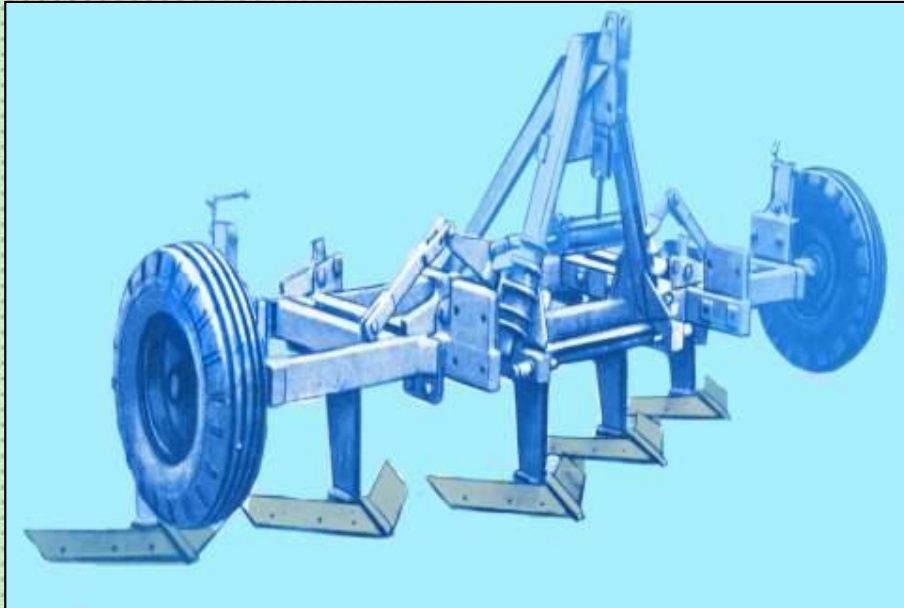


	<i><u>Rainfed</u></i>	<i><u>Irrigated</u></i>
Wheat area, ha	14.1 mln	0.8 mln
Yield, t/ha	1.2	2.2
Major diseases	Leaf rust, Stem rust, Septoriosis	Yellow rust, Leaf rust
Major abiotic stresses	Drought	Low temperatures, Drought
Major varieties	Omskaya 18, Pamyati Aziyeva, Akmola 2	Steklovidnaya 24, Almaly, Progress

Ploughing up of the virgin lands in the mid of 1950s had led to the dramatic loss of soil fertility in Kazakhstan



Conservation tillage practice developed in 1960s reduced soil erosion in Kazakhstan but failed to control it efficiently



Conventional Tillage Practices and Rotation :

- Multiple tillage trips with blades and sweeps, at 15-25 cm depth.
- 3 years spring wheat, 1 year spring barley and 1 year summer fallow.
- Most erosion occurs during the fallow period.



Conservation Agriculture for Wheat Production in Kazakhstan

In the beginning of 2000s large-scale Conservation Agriculture activities was initiated in the North Kazakhstan. Due to these efforts, the area under CA-based practices has been increasing

from: 0 ha in 2001

to:

500,000 ha in 2007

1,200,000 ha in 2008

1,600,000 ha in 2011

2,000,000 ha in 2012

with continued rapid increases in area. The utilization of CA-based technologies has become an official state policy in agriculture in Kazakhstan.

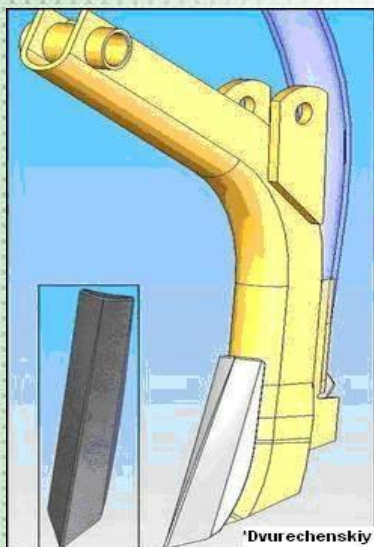
With this Kazakhstan is now included among the top 10 countries with the largest areas under No-tillage in the world (Source: R.Derpsch & T.Friedrich. *Global Overview of Conservation Agriculture Adoption*. 2009, FAO)



CA equipment used in Kazakhstan



The local seeder SZS-2,1 with the Brazilian disk furrow openers and cutting discs

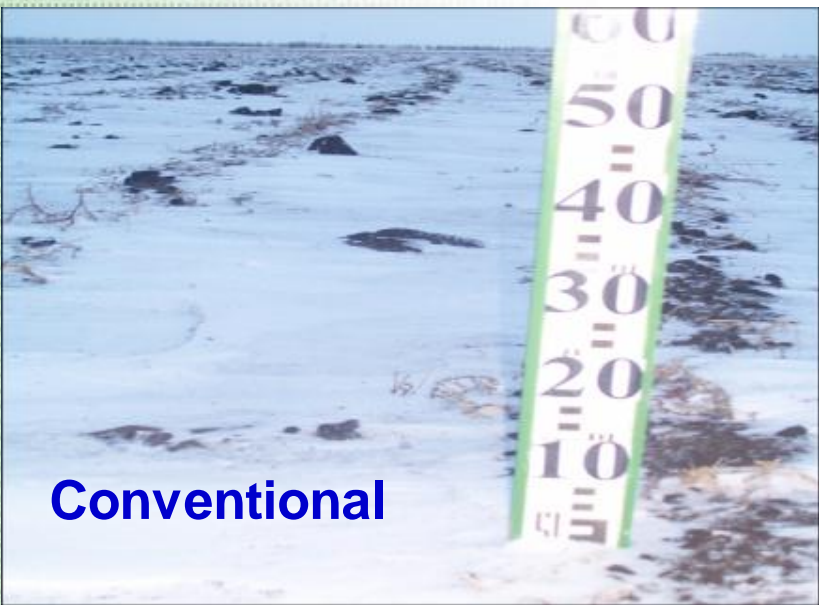


Direct seeders locally developed in Kazakhstan

CA equipment used in Kazakhstan



CA in Kazakhstan - the way to improve soil moisture storage in the field due to high stubble.
Snow capturing differences between conventional and no-till technologies



Накопление снега по стерне, $h=51$ см, запасы воды в снеге 117,3 мм



Winter Wheat in North Kazakhstan

The cold and severe climate of Northern Kazakhstan is not favorable for growing winter wheat. However, breeding wheat varieties adapted for these conditions, in combination with zero tillage technologies (including leaving the straw and crop residue on the field, direct sowing) can be a good alternative for wheat production and diversification in the northern parts of the country. In the recent years, the global climate change leads to softer winters, and the option to grow winter wheat in the Northern Kazakhstan is being more realistic and reachable objective.



Direct Seeded Winter Wheat. North Kazakhstan province. May, 2004



CIMMYT_{MR}

Maize, Sorghum, and Wheat Improvement Center

Conservation Agriculture for Irrigated Area of Kazakhstan and Central Asia

PERMANENT BEDS PLANTING SYSTEMS FOR CROP PRODUCTION



**FAO-TIIM Project on CA,
Tashkent province,
Uzbekistan,
2005-2006**

CA practices for irrigated agricultural systems

FAO-TIIM Project on CA,
Tashkent province, Uzbekistan, 2005-2006

Average yields of conventionally
and directly seeded winter
wheat into cotton.

Tashkent province, Uzbekistan,
2005-2006



*Direct seeding of winter wheat into cotton.
Autumn*



Direct seeded winter wheat into cotton. Spring

#	Technology	Number of rows	Yield, t/ha
1	Conventional	Continuous/dense	3.1
2	No-till direct seeding	8 rows on the beds	4.0
3	No-till direct seeding	4 rows on the beds	4.5

CA practices for irrigated agricultural systems. South Kazakhstan



Locally developed direct seeder for bed-planting



Direct seeded soybean on permanent beds



Direct seeded wheat on permanent beds



Direct seeded winter wheat on permanent beds

CA technologies enable to grow two crops in one year in South Kazakhstan!

In 2008 Kazakhstan was included among the top 10 countries with the largest areas under No-till in the world (General overview of CA/No-till adoption, 2008)

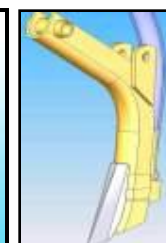
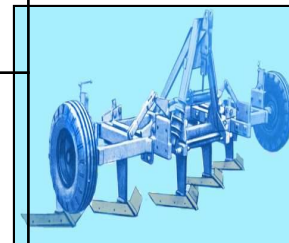
Country	Area under No-tillage (ha) 2007/2008
1 USA	26.593.000
2 BRAZIL	25.502.000
3 ARGENTINA	19.719.000
4 CANADA	13.481.000
5 AUSTRALIA	12.000.000
6 PARAGUAY	2.400.000
7 CHINA	1.330.000
8 KAZAKHSTAN	1.200.000
9 BOLIVIA	706.000
10 URUGUAY	672.000
11 SPAIN	650.000
12 SOUTH AFRICA	368.000
13 VENEZUELA	300.000
14 FRANCE	200.000
15 FINLAND	200.000
16 CHILE	180.000
17 NEW ZEALAND	162.000
18 COLOMBIA	100.000
19 UKRAINE	100.000
20 RUSSIA	?
Others (Estimate)	1.000.000
Total	105.863.000

Source: Derpsch, R. and Friedrich, T., 2008

Crops lands areas under different technologies in Kazakhstan

(World Bank & Kazakhstan “Agricultural Competitiveness Project”,
CIMMYT-Kaz subproject “CA areas assessment in North Kazakhstan”, 2011-2012)

Techno- logy	Area, mln ha				Operations
	2007	2008	2011	2012	
Conven- tional	13.7	11.6	8.5	7.7	Multiple tillage trips with blades and sweeps, (mostly monocropping system)
Minimal- tillage	4.6	6.2	8.9	9.5	Direct seeding with V-shaped openers or with narrow chisels regularly combined with shallow harrowing/cultivation, (few diversification)
No-tillage	0.6	1.2	1.6	1.9	Direct seeding with narrow chisels or double discs openers (diversification)



Main Characteristics of Conservation Agriculture

- Minimal soil movement
- Surface crop residue retention
- Crop rotation



Dr.P.Wall (CIMMYT):

“...Increasingly I believe we should change the way we look at and talk about CA...

...Instead of trying to introduce something new, we should try to remove the negative components from productive conventional systems...

CA results if we remove these Negative Components:

We need to stop doing the unsustainable parts of conventional agriculture:

- **Ploughing/tilling the soil**
- **Removing all organic material**
- **Monoculture**

CA includes all of the other principles of sound crop management – we just need to remove the ills of the past...”



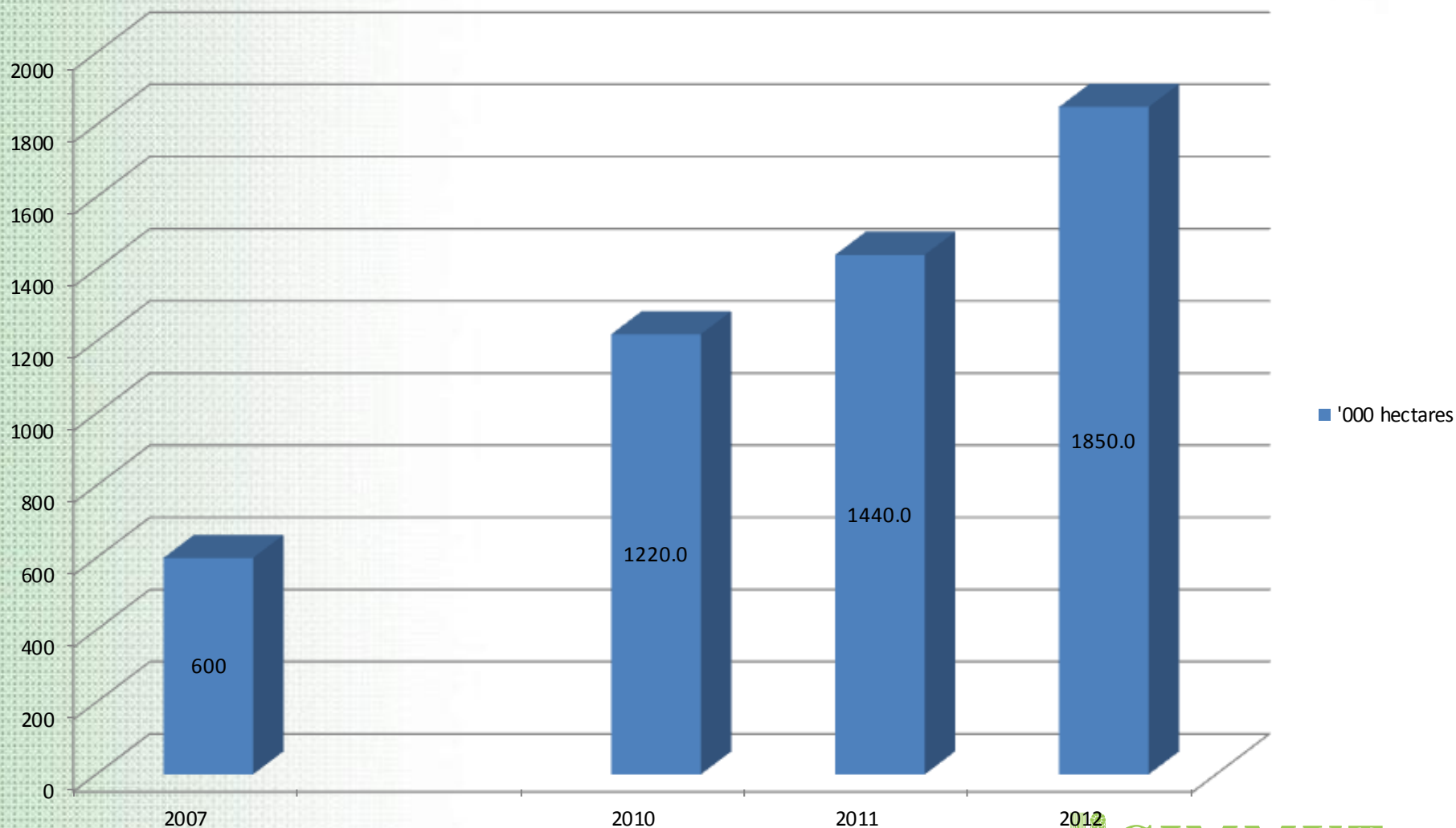
Conservation Agriculture/No-till Kazakhstan

CIMMYT - FAO - World Bank
(assessment and analysis)

October 2012

CA/No-till Adoption

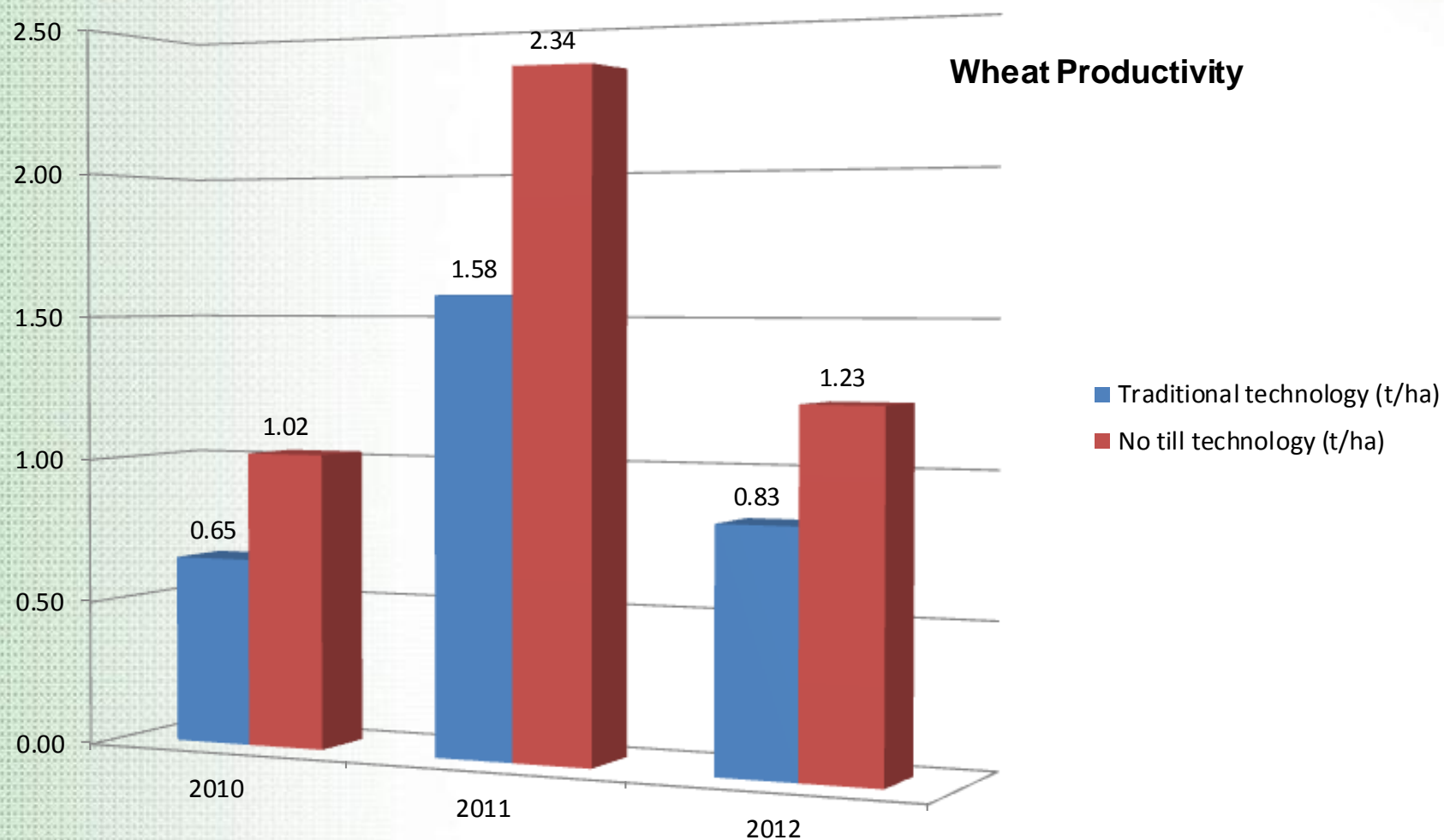
No-till Area in Kazakhstan



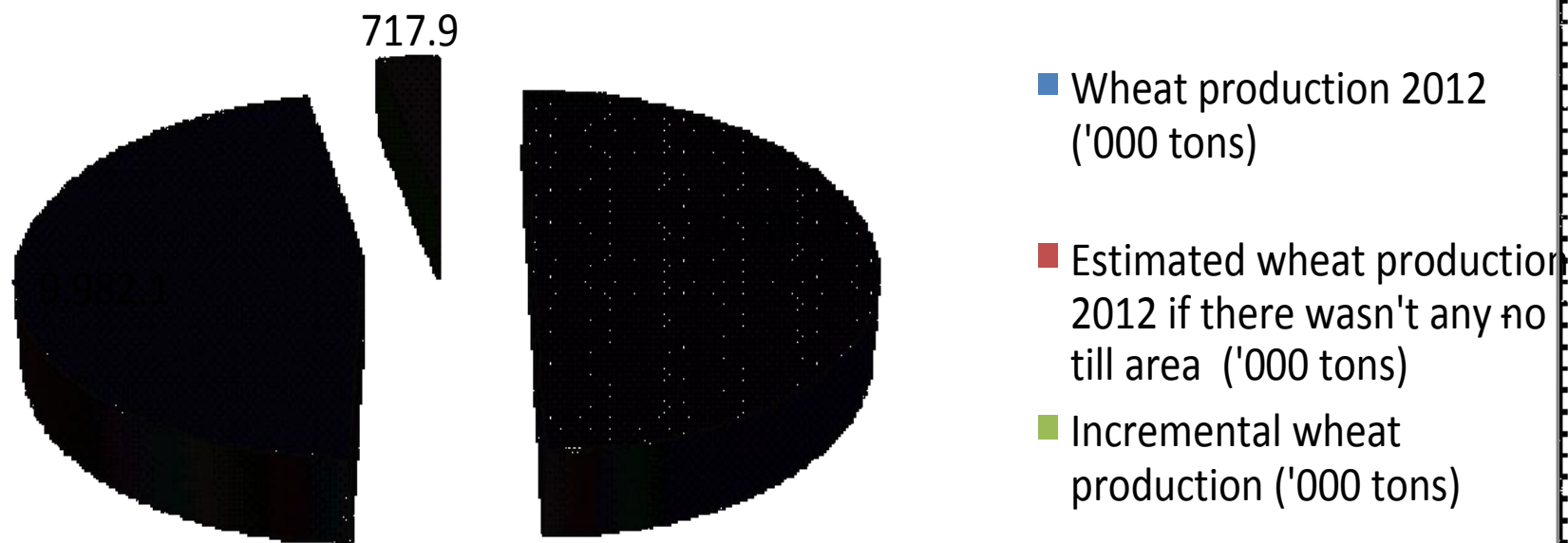
CA/No-till Adoption

- Kazakhstan was ranked **first in ECA region**, and 8th in the world for No-till adoption (2008).
- It has **now** gained another position climbing at the 7th (**before China**) in the world.
- In terms of **speed of adoption** during the last three years, Kazakhstan has no rivals: **it appears to be the 1st.**

Yield Increases



Incremental production due to No-till technology in 2012

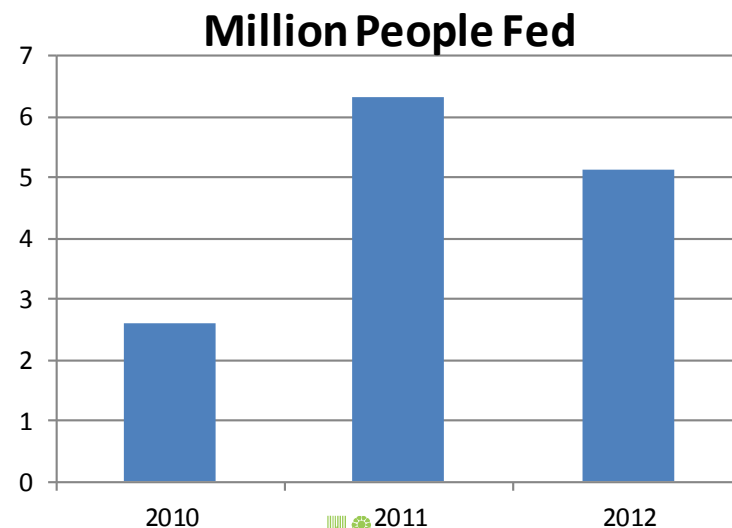
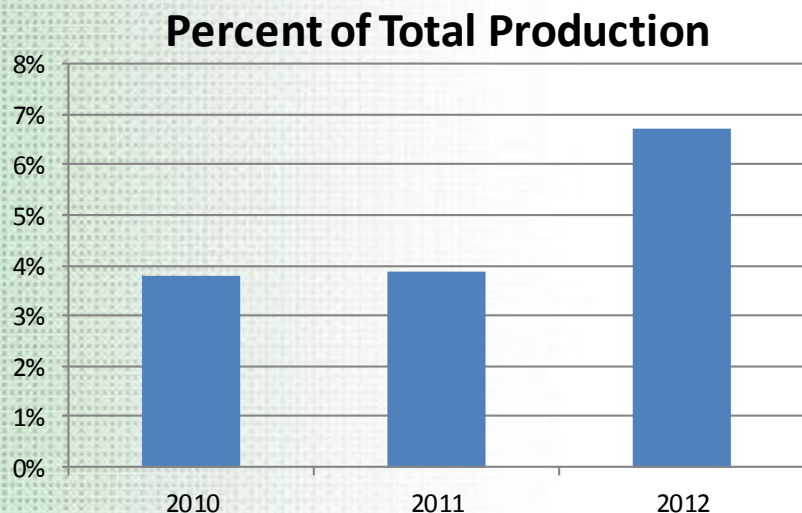
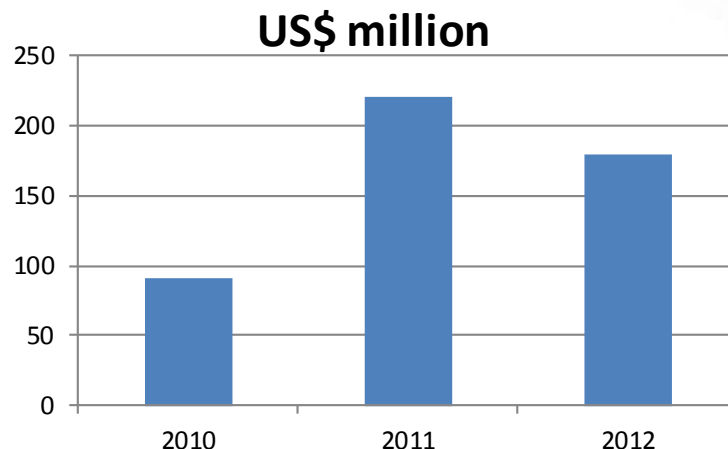
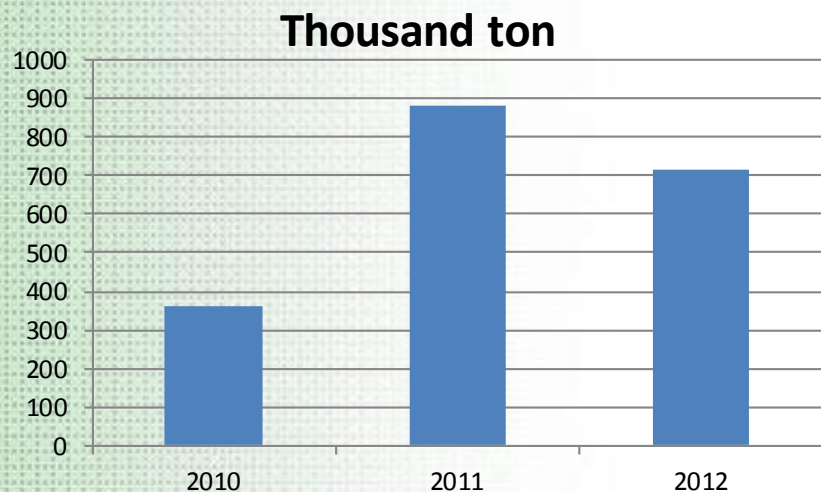


(Actual production from no-till area in 2012 is 1.8 million tons)

2012 Incremental Estimates

- Wheat production is estimated to be **10.7 million tons**
- **Wheat no-till area** (only 80% of the no-till area) has produced an estimated **1.8 million tons of wheat**;
- **Incremental** wheat production only because of no-till area is thus about **0.7 million tons, equivalent to around 180 million dollars.**

National Benefits from CA Adoption - Wheat only



Impact of CA – No-till

- ✚ Increased income and food security during the last 3 years:
 - ✚ An estimated 490 million dollars incremental income;
 - ✚ Satisfied cereals requirements of about 5 million people annually
- ✚ Climate Change mitigation:

Kazakhstan contributes to the annual sequestration of about 1.8 million tons of CO²

Expected climate change in Kazakhstan: Key Findings

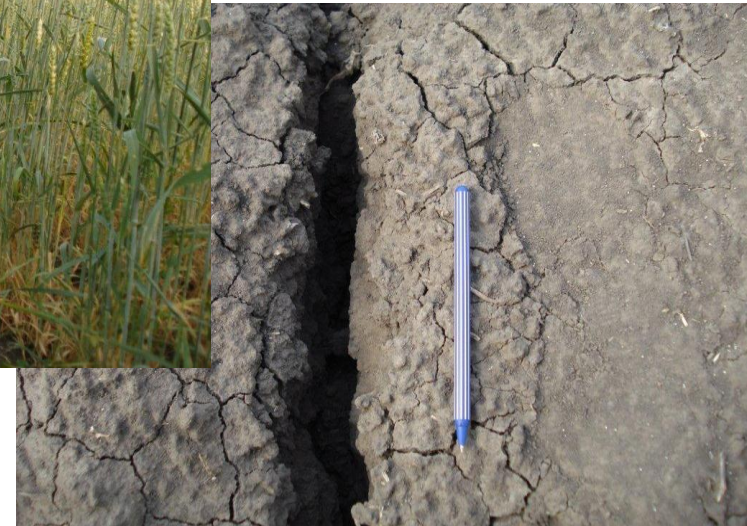
- ➡ **Rise in the seasonal and annual surface air temperature**
- ➡ **Almost constant or increase in winter precipitation**
- ➡ **Decline in summer precipitation**
- ➡ An increase of precipitation **will not compensate** for increase in air temperature
- ➡ **Increased irregularity** of rainfall in time
- ➡ For all scenarios, the change trends towards **increased aridity/drought**



***CIMMYT, NCB, and KAI
Traveling seminars, 2010-2011***



**North Kazakhstan,
Summer, 2010**



Mobilization of Biotechnology, Breeding and PGR for FOOD and AGRICULTURE

(At 23rd Session of the FAO Agriculture Committee it was proclaimed the reorientation of breeding programs «...Methods of biotechnology, bioinformatics, DNA analysis must be wider and on the permanent basis used in breeding programs», 21-25 May, 2012, Rome, Italy)

1. Strengthening breeding programs
2. Introduction of advanced biotechnology tools and methods for breeding and PGR related issues
3. Advocacy and sensitization of policy makers; management, regulation, partnership, and funding systems improvement



and Shuttle Breeding “Mexico-KASIB” Program:

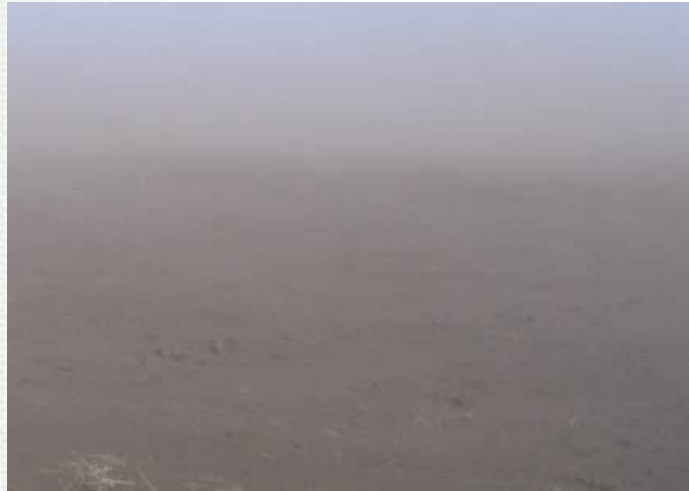
- **19 Breeding programs of Kazakhstan and Russia are united by KASIB Network and Shuttle Breeding**
- **For the period 2001-2012:**
 - **more than 10,000 wheat lines and varieties involved in breeding programs of Kazakhstan and Russia;**
 - **9 varieties developed, 4 of them in 2011/12**



The KASIB Network and Shuttle Breeding Program established and led by CIMMYT recognized as one of the best example of the effective regional and international cooperation in Kazakhstan and Russia



DUST STORMS. North Kazakhstan, 2007, 2009, 2012



No-till Potato

The International Maize and Wheat Improvement Center, known by its Spanish acronym, CIMMYT (www.cimmyt.org), is an international, not-for-profit research and training organization. With partners in over 100 countries, the center applies science to increase food security, improve the productivity and profitability of maize and wheat farming systems, and sustain natural resources in the developing world. The center's outputs and services include improved maize and wheat varieties and cropping systems, the conservation of maize and wheat genetic resources, and capacity building. CIMMYT belongs to and is funded by the Consultative Group of International Agricultural Research (CGIAR) (www.cgiar.org) and also receives support from national governments, foundations, development banks, and other public and private agencies.

CIMMYT Regional office for Central Asia and Caucasus, based in Kazakhstan, was established in 2000 according to the Law of the Republic of Kazakhstan "On Ratification of the Agreement on Collaboration in the Field of Agricultural Research between the Government of the Republic of Kazakhstan and CIMMYT" (№ 103-II 3PK, 13 Nov 2000, signed by Mr. N.Nazarbayev, the President of the Republic of Kazakhstan).

Contacts and for more information:

•Mexico (Headquarters):

CIMMYT, Apdo. Postal 6-641, C.P. 06600, Mexico, D.F., MEXICO.

Tel.: +52 5804 2004. Fax: +52 5804 7558.

Email: cimmyt@cgiar.org. Web Site: www.cimmyt.org

•Kazakhstan (CIMMYT Regional Office):

CIMMYT-Kazakhstan, PO Box 1446, Astana, 010000, KAZAKHSTAN

Tel./Fax: +7(7172) 343713. Email: m.karabayev@cgiar.org