

A Road to Sustainable Agricultural Mechanization

– the Experiences of Conservation Tillage in China

Presentation by

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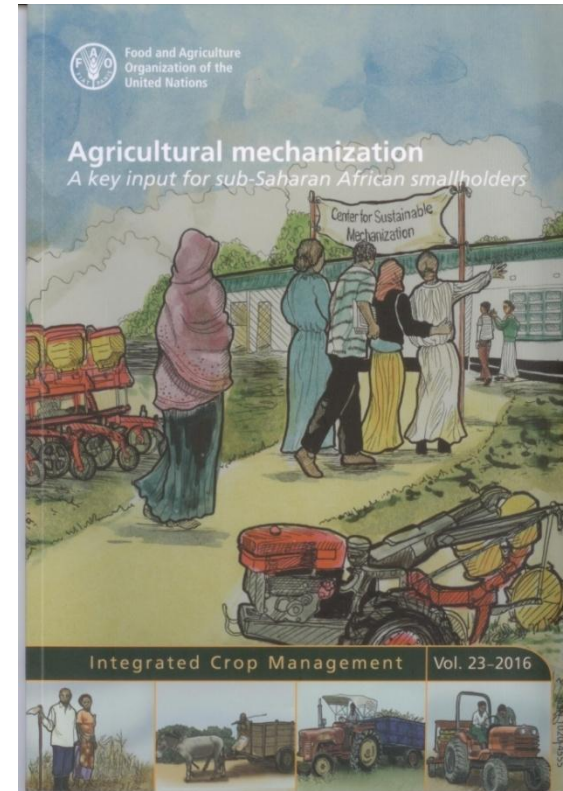
CSAM



What is Sustainable Agri Mech?

- To make Sustainable Agriculture **MECHANIZED?**
- To make Agricultural Mechanization **SUSTAINABLE?**

BOTH ?



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- To make Sustainable Agriculture **MECHANIZED?**
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BOTH ?

Conservation Tillage / Agriculture





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 Conservation Agriculture

1960-2015

	Conservation agriculture area (1000 ha)
Argentina	29 181 (2013)
Australia	17 695 (2014)
Azerbaijan	1.3 (2013)
Belgium	0.268 (2013)

FAO is monitoring the global adoption of Conservation Agriculture. The data presented above is the result of an ongoing collaboration between FAO's Conservation Agriculture and AQUASTAT programmes, and presents the latest values available for all countries that report Conservation Agriculture practices. This script automatically displays new data as updates become available and can be considered the most up-to-date repository for global implementation of conservation agriculture. The reported areas comply with the CA [definition](#), with the following quantifying parameters:

- 1. Minimum Soil Disturbance:** Minimum soil disturbance is defined as the area where direct seeding is used (i.e. no ploughing or other soil disturbance). The disturbed area must be less than 1% of the total area (i.e. 1000 ha or lower). There should be no periodic tillage. Periodic tillage is allowed if the disturbed area is less than 1% of the total area.
- 2. Organic soil cover:** Three categories are used to measure organic soil cover: (1) no cover, (2) cover, and (3) cover with crop residues. Organic soil cover is measured immediately after the direct seeding operation.
- 3. Crop rotation/association:** Rotation is defined as the area where a crop is followed by a different crop in a repetitive wheat, maize, or rice cropping system. Crop rotation/association is recorded where practiced.

Minimum Soil Disturbance

Organic Soil Cover

Crop Rotation/association



Agriculture and Consumer Protection Department Conservation Agriculture



| CONTACTS |

| ENGLISH | FRANÇAIS | ESPAÑOL |

- ◆ HOME
- ◆ INTRODUCTION
- ◆ COVER CROPS
- ◆ MACHINERY
- ◆ LIVESTOCK INT.
- ◆ ECONOMICS
- ◆ ADOPTION

* Advantages and disadvantages of CA

To be widely adopted, all new technology needs to have benefits and advantages that attract a broad group of farmers who understand the differences between what they are doing and what they need. In the case of conservation agriculture these benefits can be grouped as:

- **Economic benefits** that improve production efficiency.
- **Agronomic benefits** that improve soil productivity.
- **Environmental and social benefits** that protect the soil and make agriculture more sustainable.

Economic benefits

Three major economic benefits can result from CA adoption:

Agronomic benefits

Adopting conservation agriculture leads to improved soil productivity.

Environmental benefits:

- Reduction in soil erosion, and thus of road, and other infrastructure costs.
- Improvement of water quality.
- Improvement of air quality.
- Biodiversity increase.
- Carbon sequestration.

Economic Benefits

Agronomic Benefits

Environmental Benefits

Experience 1

Government Support



National Programs and Plans

- The National plan for conservation tillage development.
- The **Sustainable Agriculture** Plan (2015-2020)
- The National Plan for response to **climate change** (2014-2020) .
- Conservation tillage **extension** (2002-)
- National **Key research programs** (2000-)

Accelerate the modernization of Agriculture with the driving force of reform and innovation 以改革创新为动力 加快推进农业现代化

Conservation tillage is listed as a way to promote sustainable agriculture development

Premier Li Keqiang



- Conservation tillage has been deeply rooted in China.
- Without government support, Conservation tillage is still on the papers
- *A Common View: Reform Conventional Tillage, Develop conservation tillage*

Experience 2 Long Term Effort

- **It needs years for CA to show its benefits**
- **It needs years for government to accept and support CA**
- **It needs years for farmers to understand, accept and try CA**
- **It needs years to find whether CA will bring negative effects**
- **.....**

Time will prove everything!



After about 3 years, earthworm can be found.

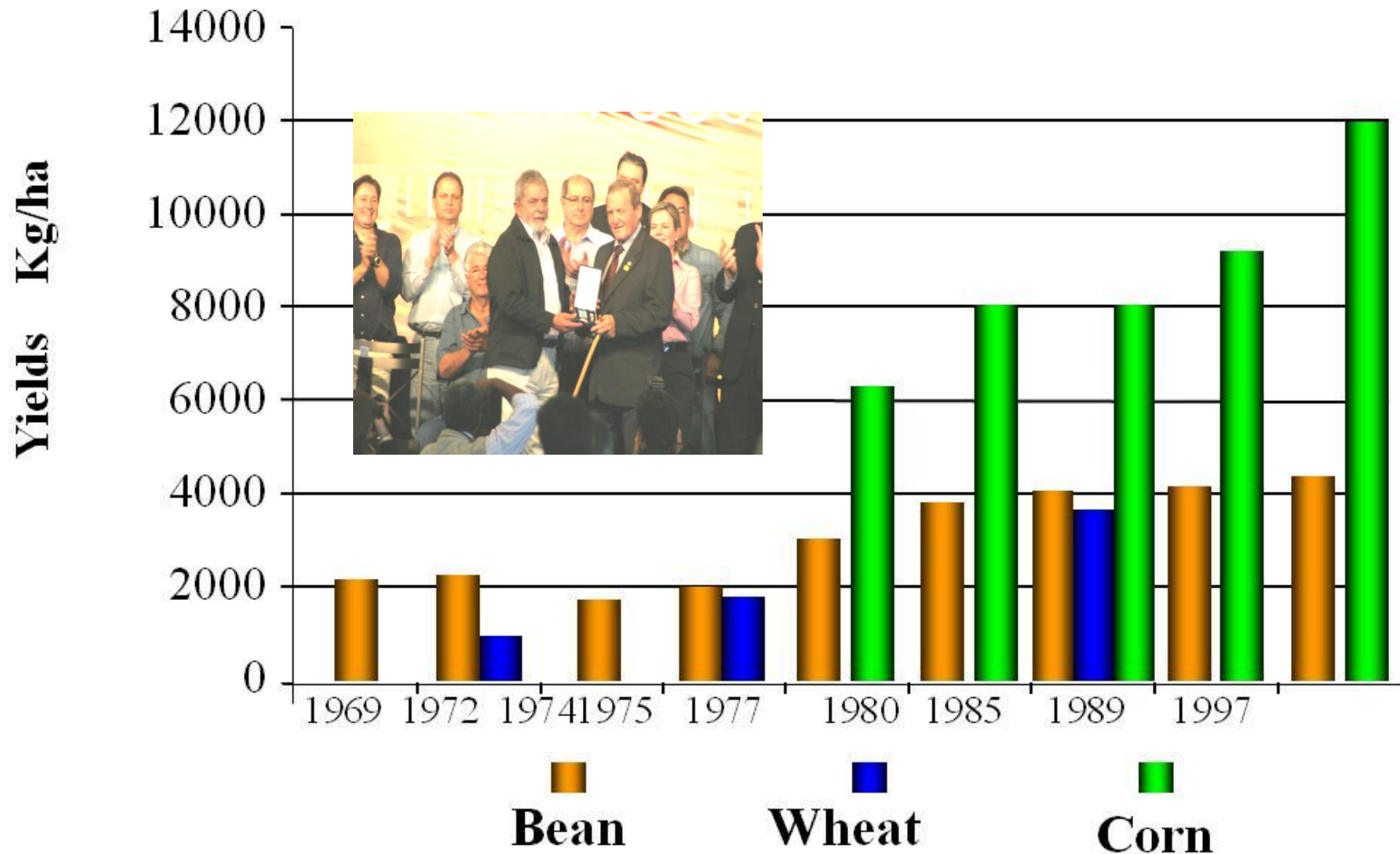


- **With long term experiments, we will have more chances to show the comparison results**

Published Papers

- The effect of conservation tillage on crop yield in China. *Frontiers of Agricultural Science Engineering*, 2(2), 179-185.
- The effects of no-tillage with subsoiling on soil properties and maize yield: 12-Year experiment on alkaline soils of Northeast China. *Soil & Tillage Research*, 137, 43-49.
- Soil properties and crop yields after 11 years of no tillage farming in wheat-maize cropping system in North China Plain. *Soil & Tillage Research*, 113, 48-54.
- Effects of 10 years conservation tillage on soil properties and productivity in the farming-pastoral ecotone of Inner Mongolia, China. *Soil Use and Management*, 25, 201-209.
- Soil physical properties and infiltration after long-term no-tillage and ploughing on the Chinese Loess Plateau. *New Zealand Journal of Crop and Horticultural Science*, 37, 157-166.
- Soil structure and crop performance after 10 years of controlled traffic and traditional tillage cropping in the dryland Loess Plateau in China. *Soil Science*, 174, 113-119.
- Effects of 11 years of conservation tillage on soil organic matter fractions in wheat monoculture in Loess Plateau of China. *Soil & Tillage Research*, 106, 85-94.
- Soil chemical properties and microbial biomass after 16 years of no-tillage farming on the Loess Plateau, China. *Geoderma*, 144, 502-508.
- Effects of 15 years of conservation tillage on soil structure and productivity of wheat cultivation in northern China. *Australian Journal of Soil Research*, 45, 344-350.
-

Yields from Herbert Bartz Farm (The first CA farm in Brazil)



Experience 3

No Suitable Machineries, No CA Extension



1950s



1980s



Difficult to extend

Hand Planter (Li Seeder)



Vietnam



Australia



Tanzania



Cuba

Small land, Slope land

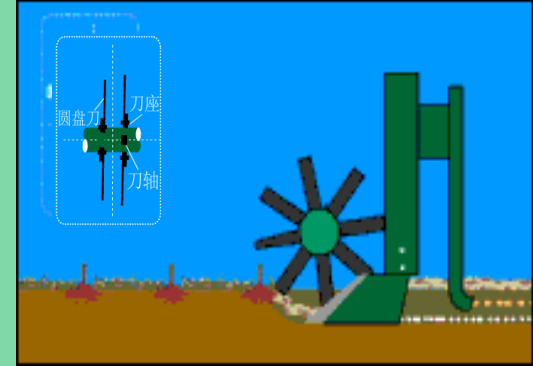
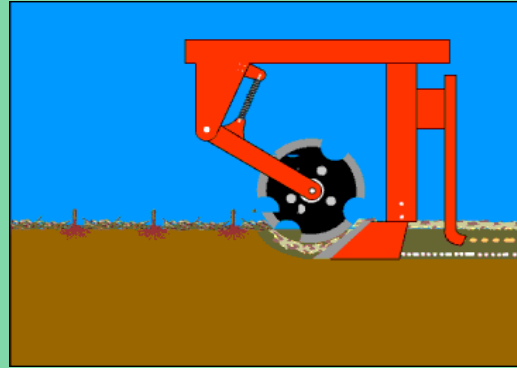
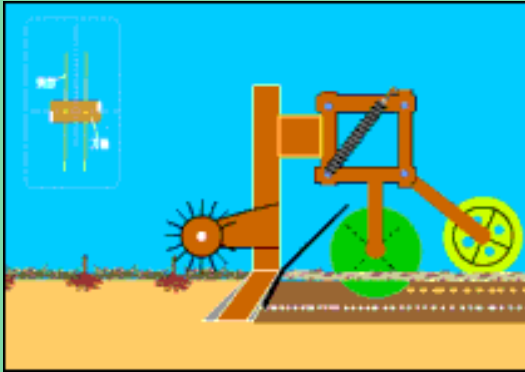
Small No till Seeders



Small land, Slope land



No till Seeders for 4 wheels tractor



Mainly used in the areas with double crops a year



Mainly used in the areas with one crop a year

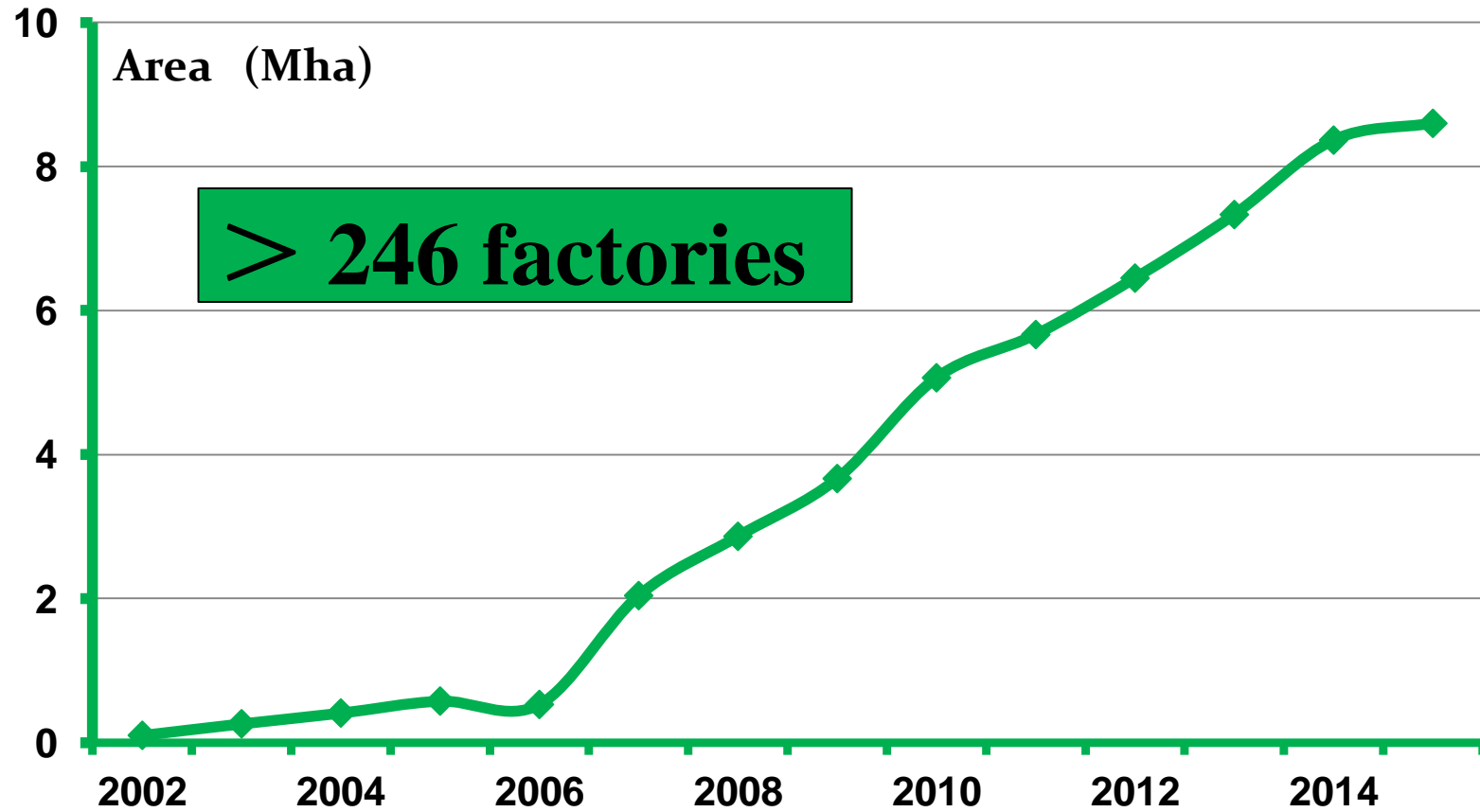
Rice transplanting



No till Seeders towed by tractors



Development of CT in China



Without suitable machineries, CA can be only a dream never realized.

A Common View: The Fundamental Way out of Agriculture Lies in Mechanization of Agriculture

Experience 4

Understanding CA Principles



- **Minimum Soil Disturbance**
- **Organic soil cover**
- **Crop rotation**

Soil Disturbance?





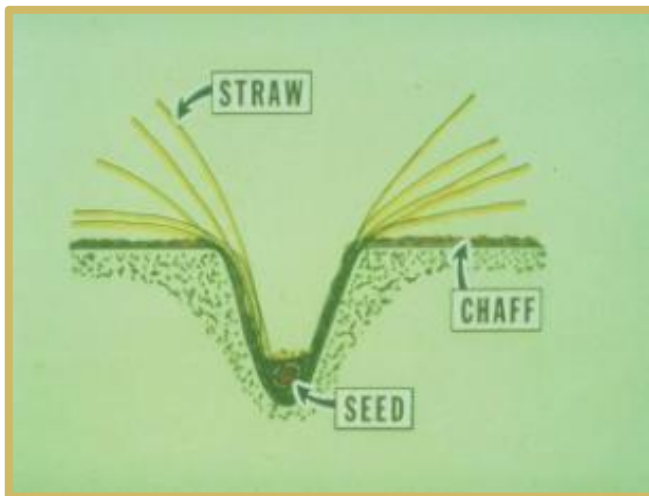
If already Hard Pan



Stubble handling



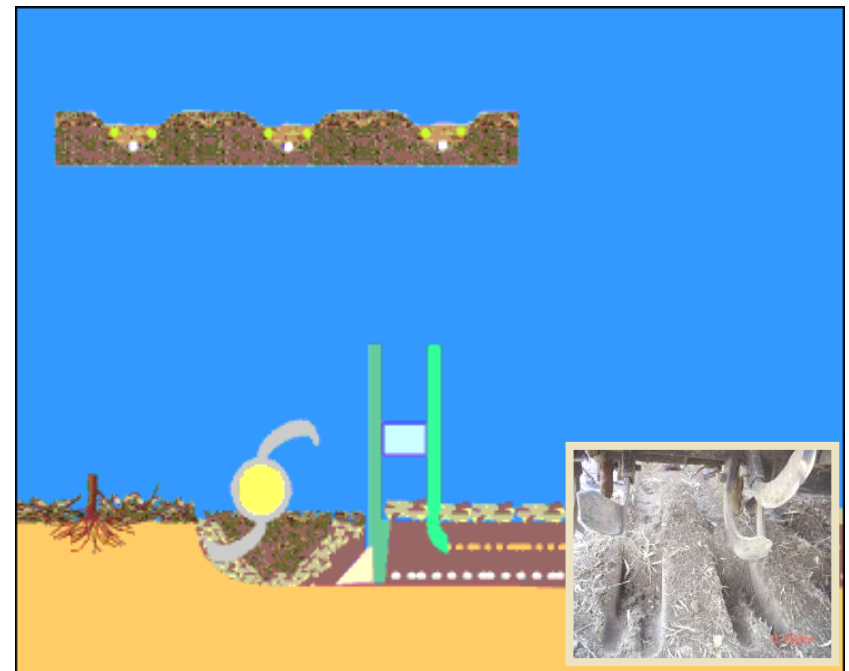
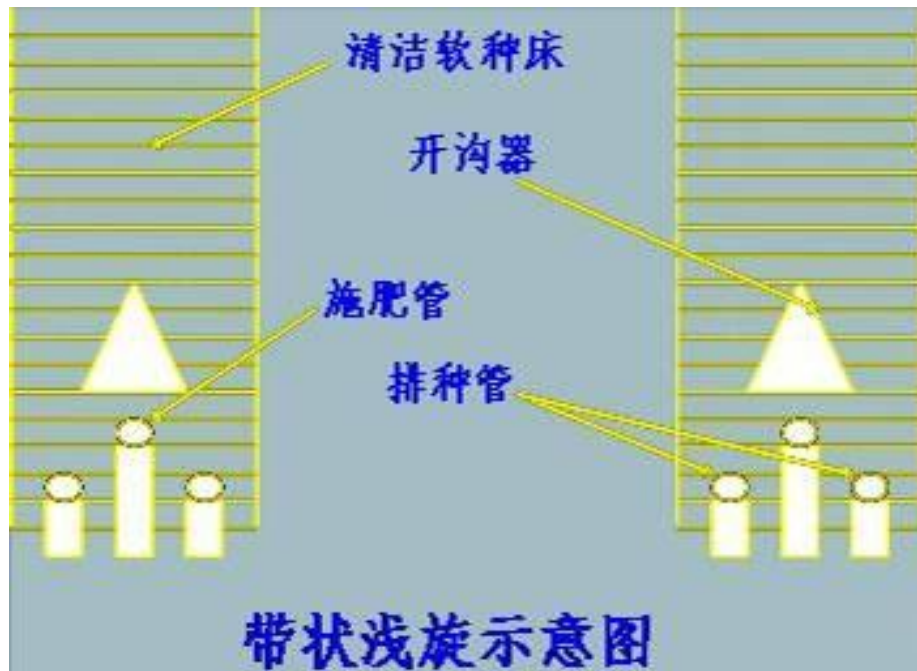
Exposed Seeds

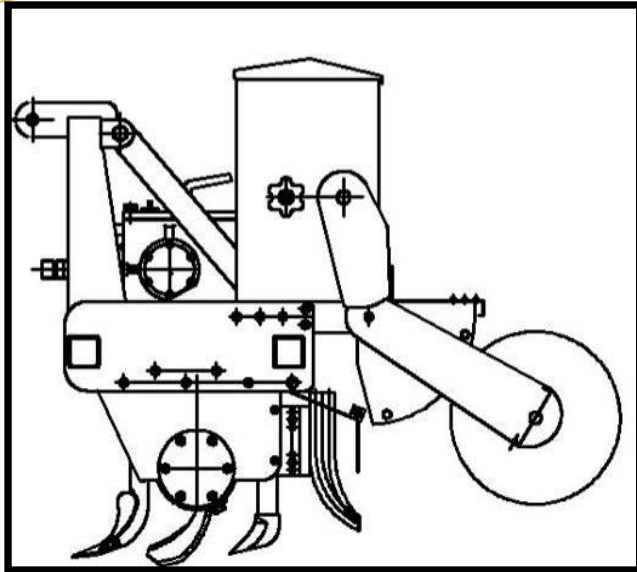


Stubble Chopping



Strip No tillage





Before we have super no till seeders to handle too much stubble, **Chopping stubble and minimum tillage can improve sowing quality**

Experience 5

CA range

- **Most crops, most area**
- **Suggest to apply CA from easy crop and area**



Corn



Bean



Wheat

Experience 6 Farmers to Farmers



Doggerel by farmers



Pioneer farmer



CA Service station

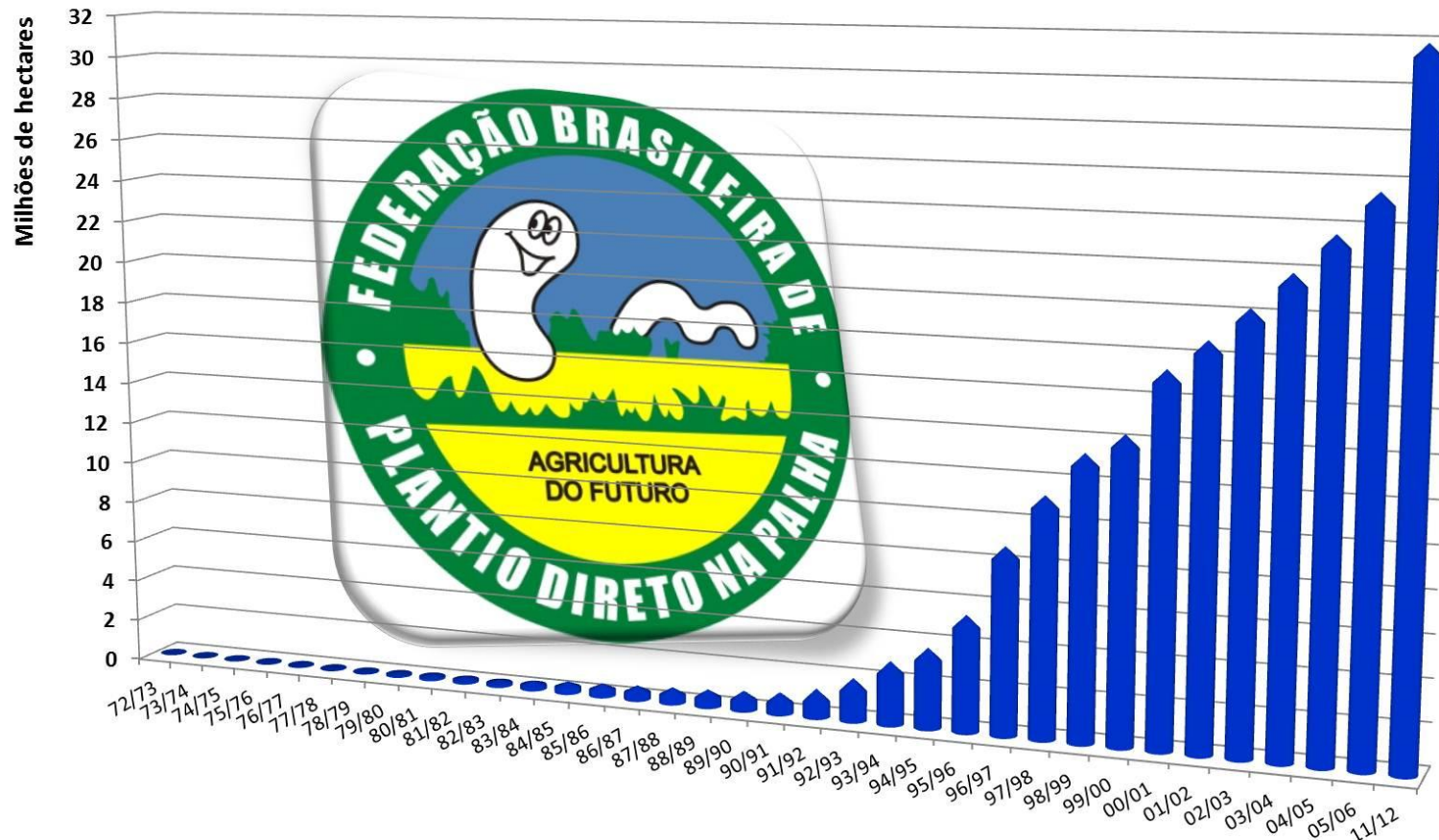


Farmers school



Brazilian President Luiz Inácio Lula da Silva presents pioneer of no-till and conservation agriculture, Brazilian farmer Herbert Bartz with the prestigious Apolônio Salles award and medal at the launch of the Brazilian 2009/2010 National Agricultural a Livestock plan on 22 June 2009

CA in Brazil



FONTE: Federação Brasileira de Plantio Direto na Palha e CONAB, 2012

It is easier for farmers to accept CA from farmers

Farmers' cooperative can do much work on CA extension

Experience 7 Propaganda



China Conservation Tillage Website

The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific

Laws



Agricultural extension law



Agricultural Mechanization Promotion Law

Agri Mech Extension System

- **National, Provincial, City, County, Town**
- **High Level Universities, polytechnic schools, vocational high schools**
- **NGOs**
- **Co-ops**
- **.....**





sound truck



Field school



CellPhone



TV



Farmers School

Cartoon Book



Cartoon Book

One crop a year



Two Crops a year



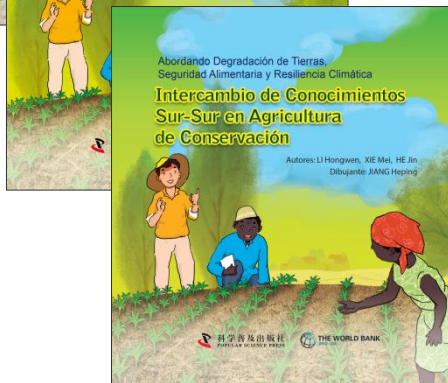
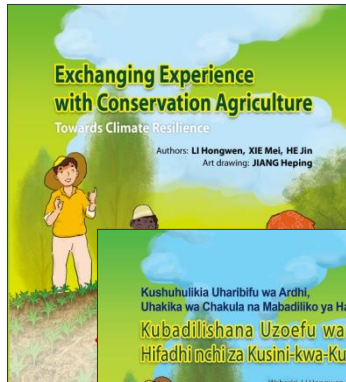
Chinese and Mongolian



Companies



10 languages versions



- English
- French
- Spanish
- Swahili
- Russian
- Thai
- Arabic
- Mongolian
- Bengali



Constraints

- **Traditional mindset;**
- **Negative effects; opposition voices;**
- **Lower sowing quality;**
- **Gap between sustainable agriculture and Farmers' requirement;**
- **Who Pay for sustainable development?**
- **.....**

Machineries

Irrigation

Seeds

**Not only 3 principles
Conservation Agriculture +**

Fertilizer

**Precision
Farming**



**CTRC would like to cooperate
with all who are interested in CA**

Climate-smart Agriculture?

This wonderful booklet offers hands-on, practical advice for farmers and extension workers interested in using conservation agriculture techniques to boost crop yields, soil quality and water retention. These practices represent some of the many ways we can become more 'climate smart', which is essential if we are to sustainably produce more food on less land to feed our growing planet.

—Juergen Voegelé, Senior Director,
Agriculture Global Practices, World Bank

Conservation Agriculture: a modern farming practice with ancient Chinese philosophy.

— Ke Bingsheng, President,
China Agricultural University

Smart use of land resources can turn agriculture around from being part of the problem to being part of the climate change solution.

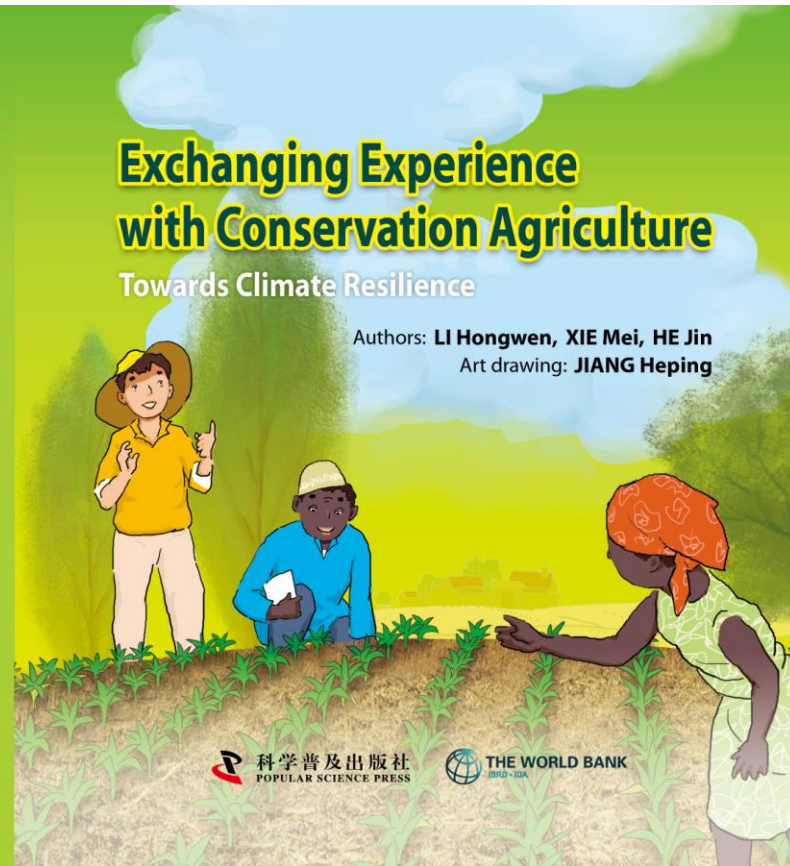
— Saidi Mkomwa, Executive Secretary,
African Conservation Tillage Network

Sharing of experience between practitioners through South-South exchanges is an effective way to learn from mistakes of the past and scale up successes to meet climate change challenges.

— Neeraj Prasad, Manager,
Climate Change Knowledge, World Bank



定价: 20.00 元



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Thanks

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