A Road to Sustainable Agricultural Mechanization
– the Experiences of Conservation Tillage in China

Presentation by

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What is Sustainable Agri Mech?

• To make Sustainable Agriculture MECHANIZED?
• To make Agricultural Mechanization SUSTAINALBE?

BOTH?
What is Sustainable Agri Mech?

• To make Sustainable Agriculture MECHANIZED?
• To make Agricultural Mechanization SUSTAINABLE?

BOTH?
Conservation Tillage / Agriculture
**Minimum Soil Disturbance**

**Organic Soil Cover**

**Crop Rotation/association**

<table>
<thead>
<tr>
<th>Country</th>
<th>Conservation agriculture area (1000 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>29 181 (2013)</td>
</tr>
<tr>
<td>Australia</td>
<td>17 695 (2014)</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>1.3 (2013)</td>
</tr>
<tr>
<td>Belgium</td>
<td>0.268 (2013)</td>
</tr>
</tbody>
</table>

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**: Minimal soil disturbance is meant to be direct seeding. The disturbed area must be less than or equal to 20% of the field (when is lower). There should be no periodic tillage, and strip tillage is allowed if the disturbed area is less than 10% of the field.

2. **Organic soil cover**: Three categories of soil cover are measured, measured immediately after the direct seeding and afterwards as CA.

3. **Crop rotation/association**: Rotation/association is recorded where practiced.
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:

**Environmental benefits:**
- Reduction in soil erosion, and thus of road, drainage, and fertiliser costs.
- Improvement of water quality.
- Improvement of air quality.
- Biodiversity increase.
- Carbon sequestration.
Experience 1
Government Support
National Programs and Plans

• The National plan for conservation tillage development.

• The **Sustainable Agriculture** Plan (2015-2020)


• 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

- 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.

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

- Bean
- Wheat
- Corn

Yields Kg/ha

- 1969: 2000
- 1972: 2000
- 1974: 2000
- 1975: 2000
- 1977: 4000
- 1980: 8000
- 1985: 12000
- 1989: 14000
- 1997: 14000

The 4th Regional forum on Sustainable Agricultural Mechanization in Asia and the Pacific
Experience 3
No Suitable Machineries, No CA Extension

1950s
1980s

Difficult to extend
Hand Planter (LiSeeder)

Vietnam

Tanzania

Small land, Slope land

Australia

Cuba

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

India
No till Seeders towed by tractors
Development of CT in China

Area (Mha)

> 246 factories
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

The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
Stubble handling
Exposed Seeds
Stubble Chopping
Strip No tillage
The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
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

The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
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
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
The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
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?
• ......
Not only 3 principles

Conservation Agriculture +

Seeds

Machineries

Irrigation

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 Voegele, 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.

—Sadil Mekoma, 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.

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

Exchanging Experience with Conservation Agriculture
Towards Climate Resilience
Authors: LI Hongwen, XIE Mei, HE Jin
Art drawing: JIANG Heping
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– Neeraj Prasad, Manager, Climate Change Knowledge, World Bank
Acknowledgment

- **Wang Guozhan**, Division Director, Department of Agricultural Mechanization Management, Ministry of Agriculture of the People’s Republic of China

- **Zhang Yuan**, Extension Division Deputy Director, Agricultural Mechanization Technology Development & Extension Center

- **Feng Yuee**, CSAM
Thanks

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