China Actions of Sustainable Agricultural Mechanization to Promote Smallholders’ Resilience to Climate Change

Li Hongwen
Professor, China Agricultural University
Head, Conservation tillage research centre, MOA

www.cn-ct.net
Outline

◆ Policies
◆ Practices
◆ Comments
The Inexorable Trend of Modern Agriculture

- More population, more food.
- More farmers to city, few farmers do farming, require increasing productivity of labour.
- .......

In the future, more and more farming work is done by machines,
Part 1 Policies and Actions in China

China's Policies and Actions on Climate Change (2015)

The National Development and Reform Commission
November 2015

(I) Agriculture

Accelerating and promoting the transformation and modernization of agricultural production patterns. The Ministry of Agriculture (MOA) has worked in conjunction with China Meteorological Administration and developed 4 work plans including Plan to Cope with El Nino and Ensure Good Harvests, and issued 18 Notices on disaster prevention since 2014 for early implementation of preventive measures. It also organized work such as “Strengthening Guidance and Services to Win Summer Grain Harvest”, “Fighting Spring Drought and Flood to Ensure Spring Seeding in Northeast” and “Enhancing Services and Fighting Disasters to Win Autumn Grain Harvest”.

Promoting conservation tillage. In 2014, MOA invested 30 million Yuan to carry out conservation tillage in many regions, including 84 project-implementing counties and 10 test monitoring bases. By the end of 2014, the area with mechanized straw returning to the field reached 647 million mu, the area of conservation tillage reached 129 million mu, and the weight of wind-eroded farmland was cut by 64.5 Mtons.

Continuing to carry out farmland infrastructure construction. China enhanced soil fertility improvement, carried out “Action of
Enact Law on Climate Change
Long Term Plan on Climate Change

Including Agr Mech and conservation tillage
Old Machines Update

Encourage farmers to update their old high emission tractors.
Increase emission standard of Diesel Engine

- From 2016, all new diesel engines for agricultural machines must meet the 3rd phase standard, to reduce waste gas emission.
Long Term Plan on Climate Change

Technology of Energy Saving and Emission-reducing of Agricultural Mechanization
Part2  Practices

• Land preparation pre-seeding
• Seeding
• Spray agricultural chemicals
• Harvest
• Social Service
Land preparation pre-seeding

- Subsoil (Deep loose) instead of plough
- Stubble covered land instead of bared land
- Combined machines instead of single function machine
Plough

Deep loose
Benefits compared with Plough

- Reduce oil consumption;
- Reduce cost;
- High Yields;
- More water storage;
- Less CO2 emission
In Northern China, most farmers bared their fields without cover. Easy evaporation; easily eroded by wind; very dry before seeding in Spring.
Multifunction Machines

Very Common
Seeding

- No till or minimum till Seeding
Preparation + Seeding

The best method
• One pass can finish land preparation and seeding.

• Save energy, cost, time; improve soil moisture, organic matter, yield
Increase yields

Increase 5%～50%
增产5%～50%

Also reduce cost 30%–50%
Reduce Water Erosion

Runoff Experiment

Reduce water erosion
50%-80%

Rainfall Simulation
Reduce Wind Erosion

Dust Sampler

>50%

Wind Tunnel
Reduce Fuel Consumption

>30%
Effect of CT on GHG Emission from Field
Reduce $\text{C}_2\text{O}$ emission

- Plough
- Rotary Hoe
- No Tillage

CO2 flux (mg/m².h)

30/July 7月

10/Sept 9月

15/Oct 10月
Increase Organic matter

No earth worm in plowed field

After 3 years conservation tillage, can find earth worm.

10~15/m² after 10 years
Spray agricultural chemicals

• Old technologies
Spray agricultural chemicals

- New technologies
Water saving irrigation
Combine harvest
Social Service of agricultural mechanization

• High level management to increase use efficiency of agricultural machines
Comments

• To extend sustainable agricultural mechanization to farmers to reduce GHG emission from farm, not directly from reducing GHG emission
• Conservation tillage is one of the best agricultural mechanization technology which can get double wins of yields and environment
• Better management of agricultural machines to get high use efficiency
• Establish an Asian Unit research center or Alliance to find the sustainable technologies for each countries
# Cartoon book

<table>
<thead>
<tr>
<th>Conservation Agriculture Cartoon book</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation Agriculture Cartoon Book (Chinese version)</td>
<td>(Chinese)</td>
</tr>
<tr>
<td>Conservation Agriculture Cartoon Book (Russian version)</td>
<td>(Russian)</td>
</tr>
<tr>
<td>Conservation Agriculture Cartoon Book (Mongolian version)</td>
<td>(Mongolian)</td>
</tr>
<tr>
<td>Conservation Agriculture Cartoon Book (Arabic version)</td>
<td>(Arabic)</td>
</tr>
<tr>
<td>Conservation Agriculture Cartoon Book (Kiswahili version)</td>
<td>(Kiswahili)</td>
</tr>
<tr>
<td>Conservation Agriculture Cartoon Book (Bangla version)</td>
<td>(Bangla)</td>
</tr>
<tr>
<td>Conservation Agriculture Cartoon Book (Thai version)</td>
<td>(Thai)</td>
</tr>
</tbody>
</table>

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.

– Jürgen Voegeler, Senior Director, Agriculture Global Practices, World Bank

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

– Ke Bingzheng, 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 Prosad, Manager, Climate Change Knowledge, World Bank

Use the book title to search on yahoo.

Thanks