Constraints and challenges to adoption and promotion of Conservation Agriculture and CA mechanization:

Chinthaka Balasooriya
Deputy Director
Farm Mechanization Research Center, Department of Agriculture
Sri Lanka

Regional Workshop on the Role of Mechanization in Strengthening Smallholders’ Resilience through Conservation Agriculture in Asia and the Pacific
18-20 April 2018, Phnom Penh, Cambodia
The Democratic Socialist Republic of Sri Lanka

- Location - 7°N 81°E
- Total land area: 65,610 Km²
- Population Density: 325 per sq.km
- Annual Rainfall: Average 900 mm, wet zone: 5000 mm
- Per capita consumption of rice is 105 kg/year
Land use

**Land Use** [5]

% of total land

46% Arable land
17% Permanent meadows and pasture
37% Permanent crops

Agricultural area is 41.8% of total land area [5]

**Main Crops** [5]

% of total harvested area

2.5% Maize
46.1% Paddy rice
3.5% Vegetables
9.7% Tea
17.5% Coconut
20.7% Others
Land use

- Agricultural land - approx. 2.6 million hectares (42%)
- No. of smallholder farmers - 1.65 million
- Average landholdings - less than 2 hectares
- Smallholder farmers are in charge of almost 80% of Sri Lanka’s total annual crop production
Land use

- The agricultural area in Sri Lanka has increased gradually in the past decade.
- With the end of internal conflict, previously inaccessible territories have been converted into productive cropland.
- From 2003 to 2013;
  - rice-harvested areas increased by 30.4% (911,440 to 1,188,230 hectares)
  - maize-harvested areas more than doubled (27,060 to 67,720 hectares)
Rice Consumption Per Capita by Country
Basic Principles of CA

- Minimum soil disturbance
- Permanent organic soil cover with living or dead plant material
- Rotating different types of crops
Key features of conservation agriculture systems

- No ploughing, diskng or soil cultivation (i.e., no turning over of the soil);
- Crop and cover crop residues stay on the surface;
- No burning of crop residues;
- Permanent crop and weed residue mulch protects the soil;
- The closed-nutrient recycling of the forest is replicated;
- Lime and sometimes fertilizers are surface-applied;
- Specialized equipment;
- Continuous cropland use;
- Crop rotations and cover crops are used to maximize biological controls (i.e., more plant and crop diversity).
<table>
<thead>
<tr>
<th>Common practices</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal or burning of crop residues</td>
<td>Loss of soil fertility and decreasing yields</td>
</tr>
<tr>
<td>Continuous ploughing and harrowing</td>
<td>Erosion</td>
</tr>
<tr>
<td>Overgrazing</td>
<td>Increased drought and flood risks</td>
</tr>
<tr>
<td>Deforestation</td>
<td>Food insecurity and health risks</td>
</tr>
<tr>
<td>Mono-cropping</td>
<td>Contamination of ground and surface water</td>
</tr>
<tr>
<td>Excessive use of fertilizers</td>
<td>Contamination and degradation of soils</td>
</tr>
<tr>
<td>Misuse of pesticides</td>
<td>Greenhouse gas release</td>
</tr>
<tr>
<td>Misuse of water</td>
<td>Pest invasions</td>
</tr>
<tr>
<td></td>
<td>Loss of biodiversity</td>
</tr>
</tbody>
</table>
Main Crop: Rice

2000 - 3000 litres of water required to produced 1kg of rice
Traditional Rice Cultivation Practices in Sri Lanka
Current Practices

Ploughing Two times;

- Primary: with Disk or MB Plough
- Secondary: Rotary tiller followed by Puddling
Challenges for CA in rice cultivation system

- Need much water to control weed
  - difficult for intercropping and mulch
- Small plot sizes due to hilly terrain and land ownership
  - difficult for mechanization
- Cultivates 2 seasons per year, rice followed by rice
- No suitable machinery
- Upland rice is often effected by diseases
- Lack of research
OFC: Sri Lanka’s Traditional “Chena” Cultivation; Evidence of CA from history
Machinery Available for CA in Sri Lanka

Rice
Laser leveler for Land Leveling
Dry Sowing

Minimizes water use and conserves soil moisture, when combined with minimum or zero tillage.
Transplanters: Wet planting
Rice Straw Burning

- Burn because field need to prepare for upcoming season. No time to degrade
- No straw collectors
- Cannot practice rice broadcasting while straw stay in field
- To prevent diseases spreading
Machinery Available for CA in Sri Lanka

OFC
Jap Seeders
Injector Planter
- Manual
Zero Tillage : Injector Planter
- For maize only
Injector Planter – 2W Tractor
Strip Tillage: Tine tiller coupled seeder
- For all OFC
Electro static sprayer
Upcountry Cultivations
Upcountry Cultivations

- Vegetable Cultivation is mainly done in hill country
- Heavy soil erosion due to rain
- Heavy tillage
- Crop rotation is possible
Issues and Challenges in implementing CA

- Over decades Officers and farmers are taught the importance of tillage
  - R & D, extension were conducted focusing tillage
  - Difficult to change the attitudes.
- Difficulty of implementing CA practices in Rice cultivation
- Ban on Glyphosate from 2015
- Minimum government attention on CA mechanization practices
- Lack of knowledge (policy makers, officers, farmers)
- Lack of resources (resource personnel, machinery, capital)
- Resistance to change
Conclusion

- As a small tropical island, rice being the staple food, it is huge challenge to practice CA, especially in rice cultivation.
- Findings/experience of reginal countries should be studied and adopted if suitable
- Investment towards CA should be immediately increased
Dr. Ray Wijewardene
Engineer, Aviator, Inventor and Olympian athlete
Inventor of Landmaster Two Wheel Tractor (1955)

“We have to question whether we practice correct type of agriculture. Many forms of ‘bare-soil’ agriculture, as practiced in countries with a temperate vegetation and climate, have been blindly adopted in the tropics...Sri Lanka’s agricultural authorities have been ‘brainwashed’ totally by the ‘open field’ concepts of temperate farming.”

- 1984

Conclusion

- As a small tropical island, the feeding the staple food is a huge challenge to practice CA, especially in rice cultivation.
- Indigenous practices of regional countries should be studied and adopted if suitable.
- Investment towards CA should be immediately increased.
Thank you