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ON

## **Main Challenges and Constraints in using Machinery for Conservation Agriculture for smallholders in the region**

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# Conservation agriculture (CA)

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- Conservation agriculture (CA) aims to conserve, improve and make more efficient use of natural resources through integrated management of available soil, water and biological resources combined with external inputs.
- It contributes to environmental conservation as well as to enhanced and sustained agricultural production.
- (i) less soil disturbance, (ii) allow crop residue management and (iii) keep beneficial crop rotation.

## Constrains of CA technology adoption

1. Policy planners are not much convince about these technology
2. Limited investments of local manufacturers to scale-up production linked with uncertain machinery demand
3. Manufacturing infrastructure and distribution channels of products are little developed
4. High price of machinery and low prices of agricultural produce discourage investments in agriculture, including machines and tools.
5. Financial organizations are not much friendly to farmers in terms of reducing rate of interest and installments.

## Constrains of CA technology adoption (Cont.)

6. Absentee farmer and small landholder limited access to new technology
7. Additional learning is still more compare to conventional system
8. Research–extension-farmers linkage are not well established about these CA technology transfer
9. Limited promotional activity and awareness build up program.

## Main Challenges of CA technology

1. Changing mind set up of high officials in of favor conservation agriculture technology
2. How to encourage private sector investment scaling up these technology
3. How to make available appropriate CA implements and tools at an affordable price to farmers.
4. Training to be conducted in different level of workers, considering the advantages of conservation agriculture.
5. Moreover, policy support is necessary for further acceleration of this technology among the users.



## Main Challenges of CA technology (Cont.)

6. Availability of farmers' friendly appropriate small machinery in the field. There are prototypes of machinery available with the research institutes.
7. Increasing the number of local machinery service providers in the farming community as the custom hiring business-which is very sustainable system for small holders.
8. Training of progressive farmers, extension workers, machinery operator, mechanic for dissemination of CA technology and mechanization.



## **Constraints and challenges to be foreseen**

1. Making appropriate small CA machinery available in the farmers' field with affordable price.
2. Strategy to be taken for increasing number of local CA machinery service providers.
3. Arrange effective training to local machinery operator, mechanic, extension workers, and small progressive farmers.



# Different tillage techniques





# Minimum tillage by power tiller operated seeder

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- Working as shallow tilling, fertilizing, seeding in line, seed covering at a time
- Residual soil moisture using for seeding
- **Uniform depth of seeding**
- Easy planting
- **Seed saving 20%, cost saving 67%**
- Wheat, maize, pulses, jute, rice, oilseeds can be sown successfully



## Mungbean after wheat harvest

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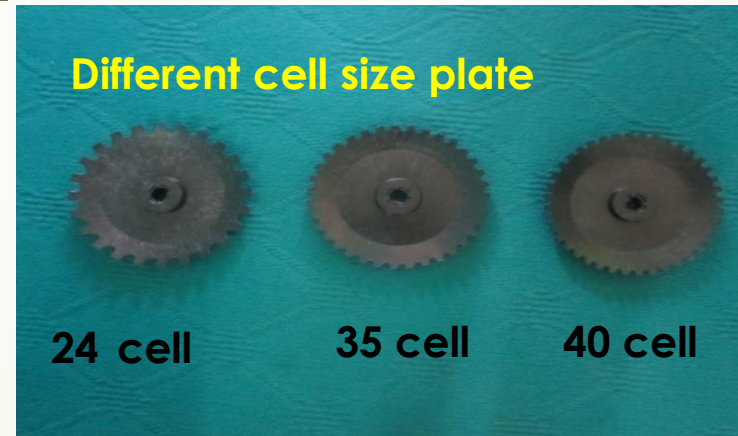
- Mungbean planting rice-wheat cropping system
- Farmers can harvest it as bonus crop as crop duration minimum





# Different seed sowing by the same seeder

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- Plate need to change as per seed size



# Rice direct seeding by seeder

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- Dry direct seeding (DSR)
- Seed rate: 25 kg/ha
- 9-11 days early maturity
- Water saving avoiding puddling operation

- Roundup herbicide used before 3 days of seeding
- Herbicide sprayed after seeding at moist condition (after 6-24 hrs)
- One hand weeding after 35 days



DSR field Darompur, Rajshahi



## 2. Strip till

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Seeding, fertilizing and seed covering simultaneously-one operation



- Making a narrow strip and work through moderate level residue, 4-6 cm
- Fine till the strip
- Uniform depth of seed placement, 5-7 cm
- Un-till between the seeding line



- Seed & fertilizer unit separate
- Use as both strip till and minimum till
- Can handle maize and other small seeds efficiently

- Seed & fertilizer unit separate

# 3. Bed planting

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BARI developed



BARI 4 WT

6 12 2007



attachment

## Advantages

- Less seed
- Less water
- Less labor
- Less crop damage (**rats, pests, diseases**)
- Less production cost
- Higher yields
- Higher economic returns
- Facilitate crop diversification
- Increased agricultural sustainability



# Efficient irrigation water application



Method of planting	Wheat cultivation			Maize cultivation		
	Irrig. Time/irri (hrs)/ha	No. irrigation	Total Irrigation time (hr)/ha	Irrig. Time/irri (hrs)/ha	No. of irriga.	Total Irrigation time (hrs)/ha
Bed planting new bed method	6.6	3	19.8	6.4	3	19.2
Permanent bed	5.4	3	16.2	5.5	3	16.5
Conv. method	8.25	3	24.75	6.4	3	19.2

- Minimize water loss
- Less labour involvement for irrigation

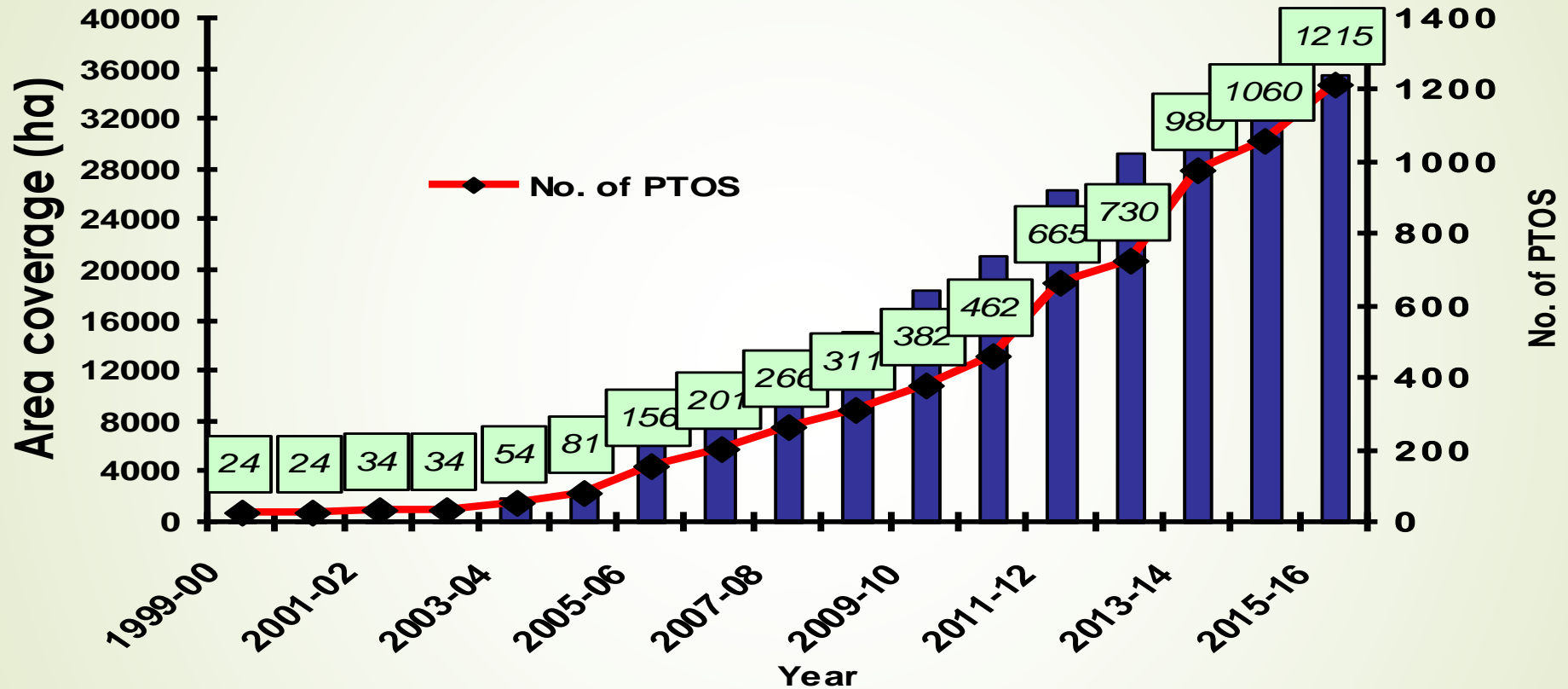
- Faster irrigation
- Water saving: 31%

## Yield comparison of major crops under CA tillage systems

Conservation agriculture system	2013-14 (t/ha)			2014-15 (t/ha)			2015-16 (t/ha)		
	Wheat	maize	Mung bean	Wheat	maize	Mung bean	Wheat	maize	Mung bean
Minimum tillage	4.7	9.5	1.3	4.5	9.3	1.1	4.2	9.2	1.1
Strip tillage	5.2	9.3	1.2	4.6	8.4	1.2	4.3	9.0	1.1
Zero till	4.4	8.8	1.2	4.1	8.2	1.1	3.9	8.8	1.2
Bed planting	5.2	9.7	1.0	4.8	8.2	1.1	4.5	8.1	1.1
Conventional system	3.5	9.0	0.7	3.6	8.3	0.75	3.5	8.8	0.8



# Adaption of Minimum tillage Technologies Bangladesh



Number of active minimum till planter (PTOS)

## Cost of planting in different CA over conventional methods

Sl. No.	CA based Seeding	Cost of seeding (Tk./ha)	Cost saving (%)
1	Minimum tillage	2250.0	62
2	Strip tillage	2030.0	65
3	Zero tillage	2275.0	61
4	Raised bed system	3394.0	42
5	Conventional method	5895.0	

## Recommendations

- Program should be taken for development of skill and capability of the machinery researchers and local machinery manufacturers.
- Pilot projects to be undertaken in collaboration with the research institute, extension agencies and manufacturer for promoting CA technologies in the farmers' field.
- Exchange of appropriate small machinery prototype among the region and organize traveling seminar, workshop with multi stakeholders showing the success cases of CA technology adoption and buildup confidence of the promoters, service provider's and farmers.



## Conclusion



- ❖ Conservation agriculture based technology is capable to sustain crop yield and save natural resources with climate resilient evidence.
- ❖ CA can sustain long run crop productivity and national food security.
- ❖ Promotional program should be considered for the greater interest of Sustainable Development Goals of the region.





Thank You Very

Much.....



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