



IFPRI

# Policy Research on Agricultural Mechanization in Bangladesh

Technical Advisory Committee (TAC) Meeting

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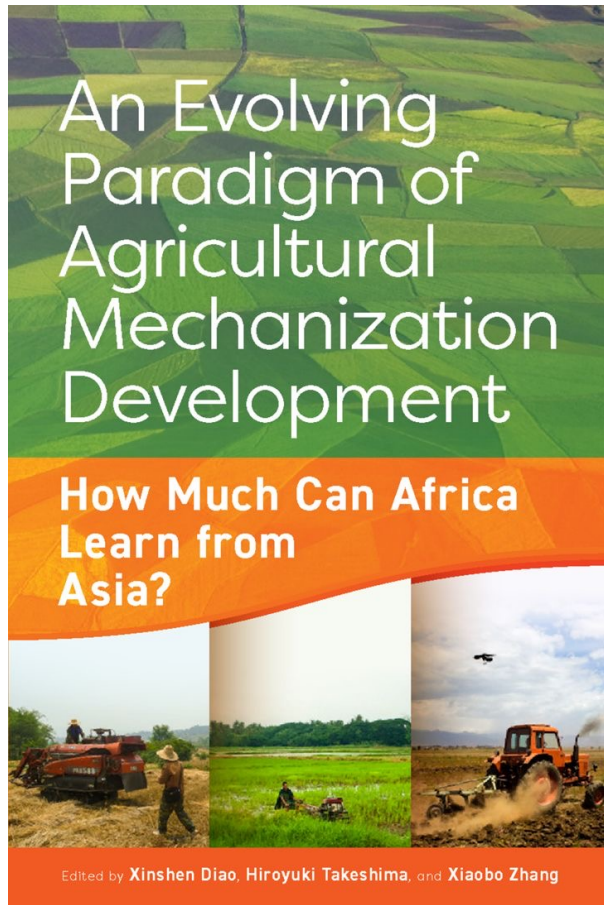
International Food Policy Research Institute (IFPRI)

Dhaka, Bangladesh | February 28, 2024



CGIAR

# CGIAR Centers have extensive experience with research on agricultural mechanization

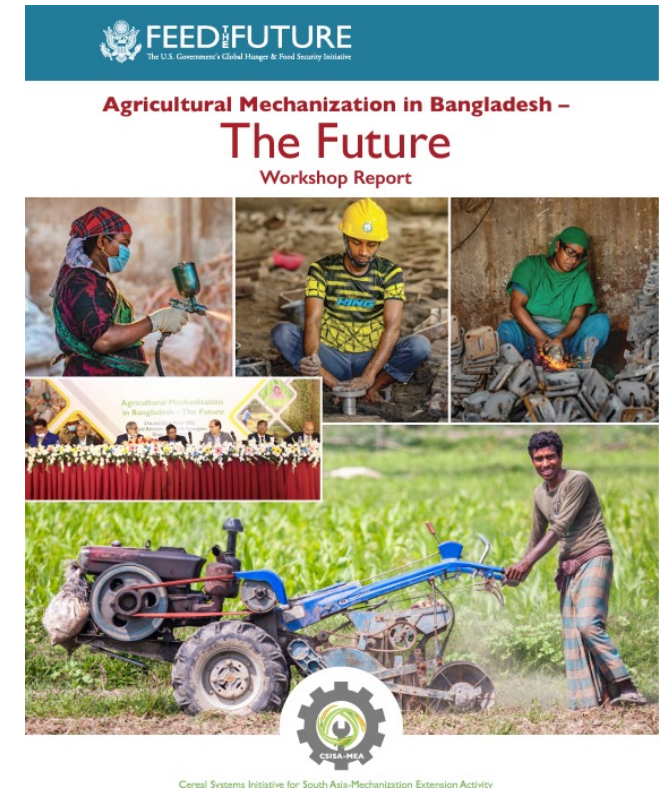


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## The rapid rise of agricultural mechanization in Myanmar

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Cereal Systems Initiative for South Asia-Mechanization Extension Activity



# Research Background

- **Responding to a High-Level Request for Policy Research and Process Evaluation**
  - Request from Ms. Wahida Akter, Secretary, Ministry of Agriculture and Dr. Mohammad Abdur Razzaque, MP and former Minister of Agriculture
  
- **Program in Focus**
  - Quantify the effect of mechanization in Bangladesh's agricultural sector
  - Assess the government's ongoing and previous mechanization support/incentive phases
  - Process evaluation of 'Farm Mechanization through Integrated Management'
  
- **IFPRI/CGIAR Role:**
  - Commitment to comprehensive research on agricultural mechanization
  - Research supported by the Bill & Melinda Gates Foundation

# Goals and Objectives

## ▪ Overall Goals

- Research on the state of agricultural mechanization in Bangladesh
- Assess the mechanization support program's impact on the agricultural sector and its effectiveness

## ▪ Specific Objectives

- Investigate mechanization trends across crops and geographic regions
- Assess existing process of machinery procurement
- Evaluate current methods of targeting beneficiaries
- Assess the impact of mechanization
- Provide recommendations to policymakers based on the findings

# Purpose of Meeting

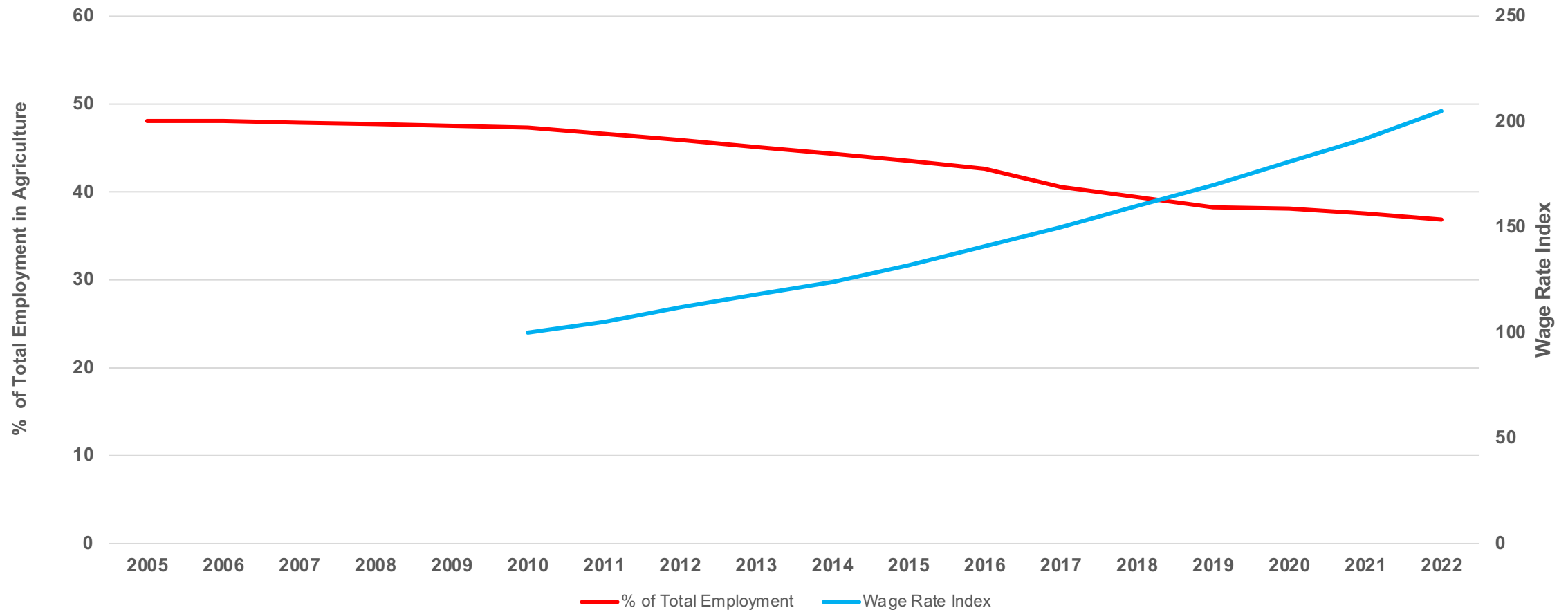
- Inform Technical Advisory Committee (TAC) about IFPRI's ongoing and proposed research on agricultural mechanization
- Provide TAC members with overview of proposed research objectives and methodology
- Solicit feedback from TAC members on proposed research activities
- Promote direct and transparent communication and information sharing between TAC members and CGIAR researchers



# **IFPRI's Work on Agricultural Mechanization in Bangladesh Using Existing Data**



# Declining Labor Force Participation and Increasing Real Wage in the Agriculture Sector Bangladesh



**Percent of total employment in agriculture sector, 2005-2022 and growth of real wage in agriculture**

Source: World Bank Indicators, various years & BBS Wage Rate Index (Base 2010-11)



# Evolution of Agricultural Mechanization Policy in Bangladesh

1970-1990

- Adoption of mechanized irrigation
- Liberalization of input markets
- Elimination of import tariff on ag machinery
- Multiple engine and pump brands and sizes & spare parts enter the market
- Repair works mushroom all over the country

1990-2005

- Adoption of mechanized land preparation
- Duty-free import for 2WT (1995)
- Credit support for 2WT purchase
- Flourishing of SME metal workshops
- Flourishing of machinery rental market local service providers

2005-present

- Adoption of mechanized threshing
- Targeted incentives for purchase of selected items of machinery (combines, transplanters etc.)
- Special consideration to areas where mechanization is lagging



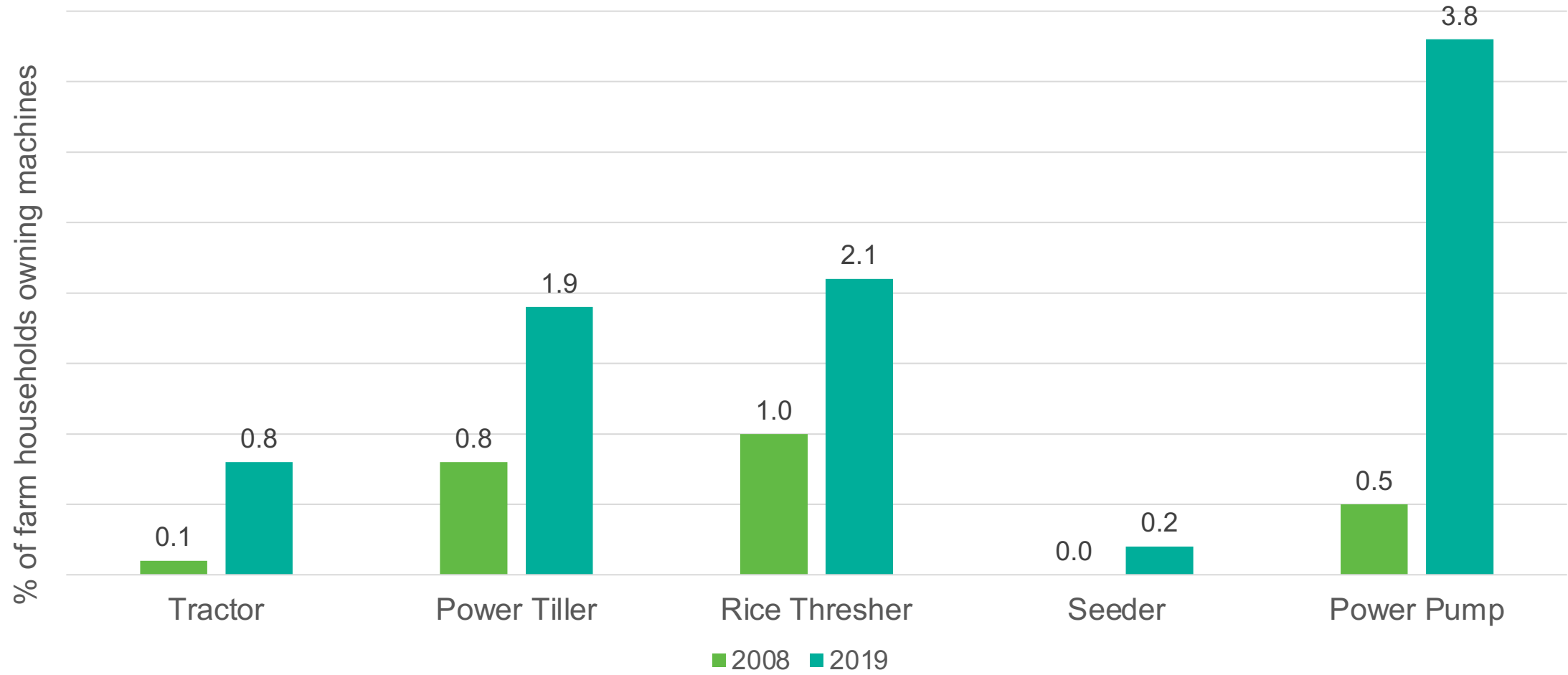
# Evolution of Government support for agricultural mechanization, 2005-present

Phase 1 (2005-2012)	Phase 2 (2012-2019)	Phase 3 (2019-Present)
<p><b>30% incentive for purchasing:</b></p> <ul style="list-style-type: none"> <li>• Power Thresher</li> <li>• Reaper</li> <li>• Sprayer</li> <li>• Power Tiller</li> <li>• Seeder</li> <li>• Weeder</li> <li>• Dryer</li> <li>• Power Winnower</li> <li>• Sprinkler irrigation set</li> </ul>	<p><b>50-70% incentive for purchasing:</b></p> <ul style="list-style-type: none"> <li>• Power Thresher</li> <li>• Reaper</li> <li>• Sprayer (foot pump)</li> <li>• Combine Harvester</li> <li>• Rice Transplanter</li> </ul>	<p><b>50-70% incentive for purchasing:</b></p> <ul style="list-style-type: none"> <li>• Power thresher</li> <li>• Reaper</li> <li>• Sprayer (power)</li> <li>• Combine harvester</li> <li>• Rice transplanter</li> <li>• Seeder/Bed Planter</li> <li>• Power Weeder</li> <li>• Dryer</li> <li>• Maize Sheller</li> <li>• Potato Digger</li> <li>• Potato Chip Maker</li> <li>• Carrot Washer</li> </ul>

**Source:** Evaluation report by the Ministry of Planning (2014, 2018); Ministry of Agriculture.



# Machine ownership increased from 2008 and 2019, but from a very low base

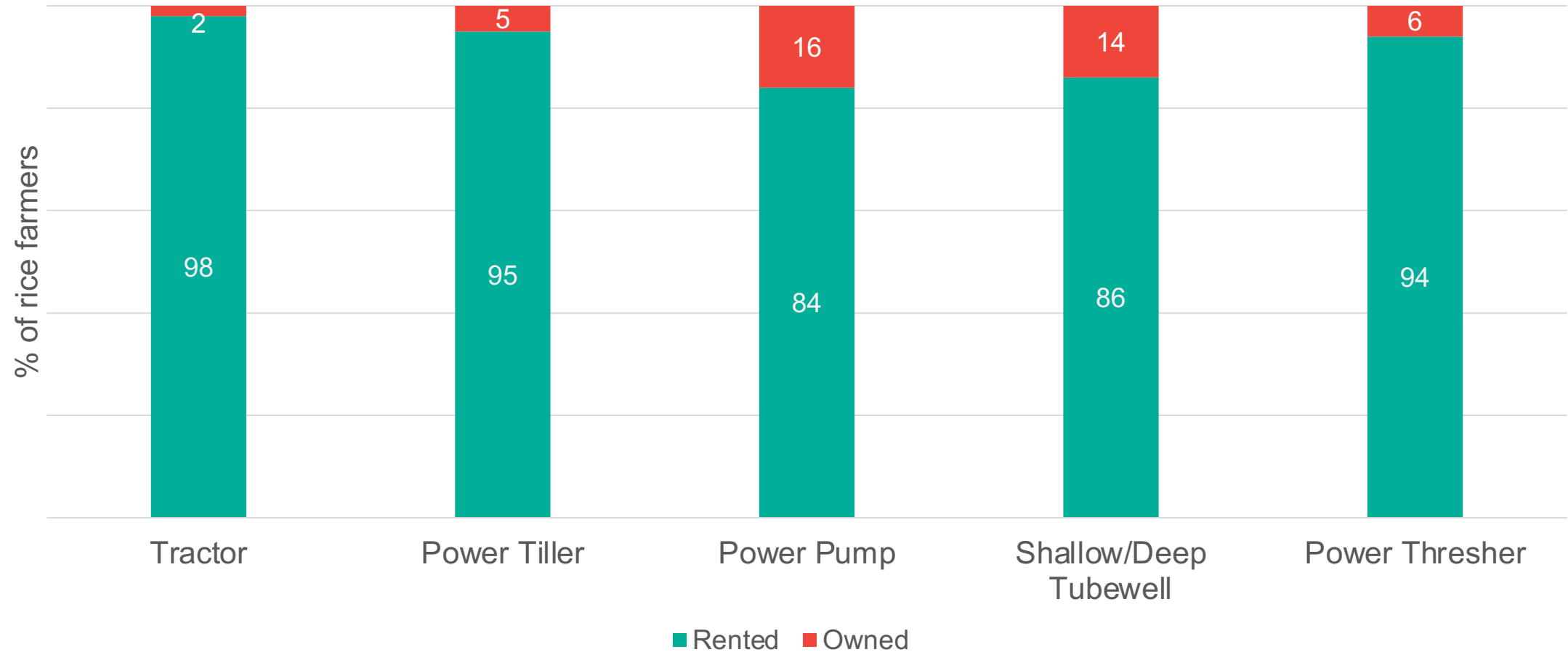


**Share of farmers owning machines by type of machine, 2008 and 2019 (%)**

Source: Authors' calculation using Bangladesh Agriculture Census, 2008 and 2019.



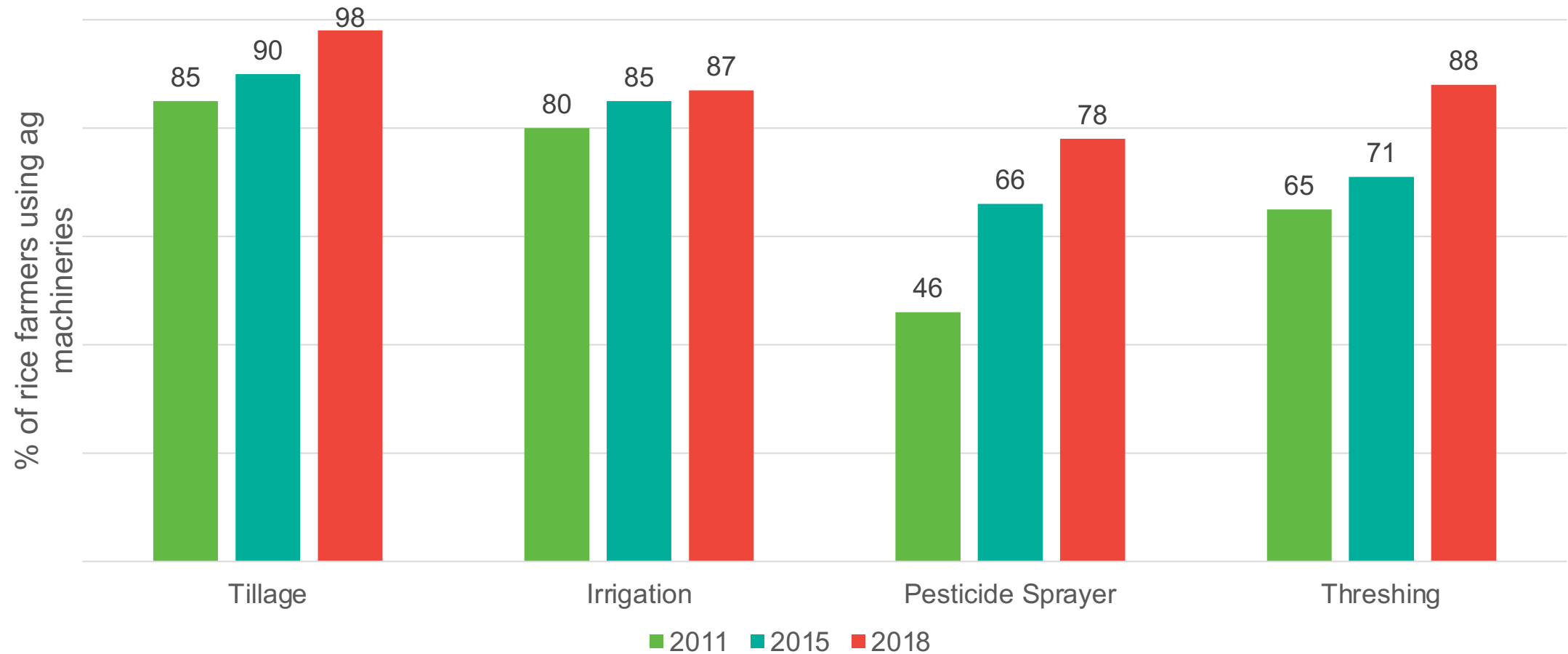
# Most agricultural machines used by farmers are rented



**% of rice farmers renting or owning machines by task, conditional on using**

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019.

# Land preparation, irrigation, spraying, threshing highly mechanized by 2018

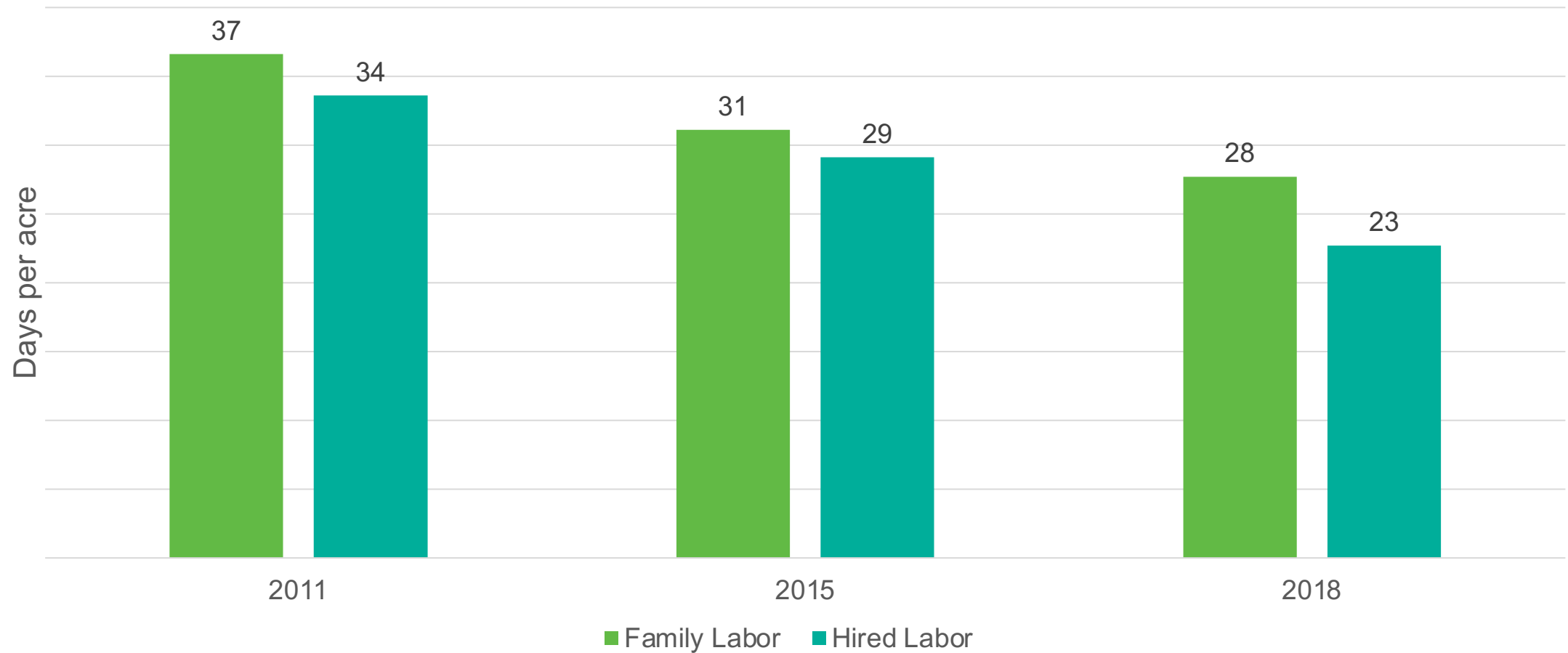


**% of rice farmers using agricultural machinery by task, 2011-2018**

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/2012, 2015, 2018/2019.



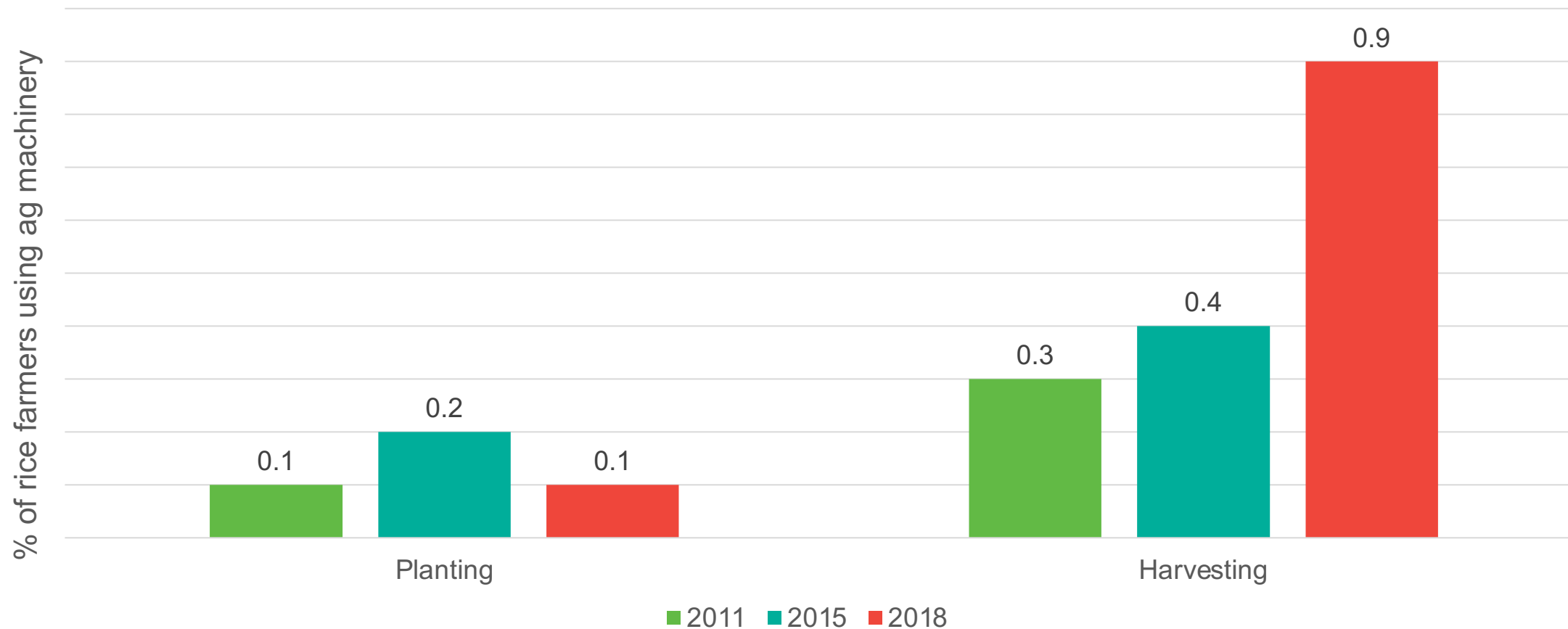
# Steady decline in labor use in boro rice production



## Use of family labor vs. hired labor for boro rice production (all stages)

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/2012, 2015, 2018/2019.

## But still extremely low mechanization of planting and harvesting in 2018 *(before current phase of incentive program)*



**% of rice farmers using agricultural machinery by task, 2011-2018**  
Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/2012, 2015, 2018/2019.





Photo Credit: Md. Aminul Karim/IFPRI





Photo Credit: Cereal Systems Initiative for South Asia–Mechanization Extension Activity (CSISA–MEA)



# Knowledge gaps and priorities for agricultural mechanization research in Bangladesh (1 of 2)

- Extent of farmer adoption of new technologies promoted under current mechanization support/incentive program
- Variations in adoption by region and crop
- Extent of productivity and income gains and labor savings associated with new technology adoption
- Barriers to accelerated adoption
- Nexus between mechanization, gender, and climate change



# Knowledge gaps and priorities for agricultural mechanization research in Bangladesh (2 of 2)

- Extent of adoption of new machines by service providers
- Service provision characteristics, such as cost and profitability of service and extent of market competition
- Effectiveness of selection process and targeting of incentive program
- Scope for improving access to financial services and financing mechanisms for machine purchases
- Capacity development needs of service providers, farmers, and extension officials



# Proposed research components and survey design (1 of 2)

- **Nationally representative farm mechanization survey (BIHS panel sample)**
  - Sample: 5,500 rural households; ~3,800 farming households (rice, maize, wheat)
  - Data: Farm size, machine ownership, use and access, production costs, agricultural productivity and profitability, labor allocation to farm and non-farm work by gender
  
- **Survey of mechanization service providers (snowball sampling + DAE records)**
  - Data: Type, cost and quality of services offered; area coverage, operational profitability by machine type, business models, access to finance, incentives received; access to training, repairs and spare parts

## Proposed research components and survey design (2 of 2)

- **Key informant interviews and case studies (DAE, machine importers and manufacturers, banks, NARS, NGOs)**
  - Data: Qualitative information on policy and regulatory environment, historical trends, challenges faced, successes
  - Somoloya (synchronized farming)
  
- **Policy analysis**
  - Examine current policies supporting mechanization
  - Formulate evidence-based recommendations to support future policymaking.

# IFPRI's Requests to the Technical Advisory Committee

- Provide feedback and inputs on research objectives and approach to ensure maximum policy relevance
- Access to upazila-level and individual-data on recipients of support for machine purchases during current and previous support periods
- Access to data on imported and locally-manufactured machinery and spare parts from DAE and private sector during current and previous support periods
- Access to process evaluation/impact evaluation reports of previous support periods
- Help finalize list of individuals for key informant interviews
- Facilitate interactions and interviews with DAE staff and mechanization program beneficiaries

**Thank You**

