Scaling appropriate agricultural mechanization worldwide: two-wheel tractors and smallholder farmers

Van Loon, J., Woltering, L., Krupnik, T., Baudron, F.

Agricultural mechanization is gaining traction as farm labor shortages are even more common, while farm operations demand increased effectiveness and efficiency to achieve sustainable intensification under changing agricultural practices that enhance productivity at reduced costs while minimizing environmental impact.

CIMMYT and partners provide research evidence, technical analysis and advice to enable the large-scale adoption of the 2-wheel tractor (2WT) and its ancillary equipment that is suitable for the small fields and limited investment capacities of smallholder farmers.

The Scaling Scan tool developed by the PPP lab and CIMMYT was used to analyze systematically the experience of scaling 2WTs globally. The analysis provides insights on the global learning experience aiming to generate meaningful impacts, responsible systems change and achieve sustainability.

The case study of scaling the 2WT made clear that with "hard" technological interventions the parallel scaling of "soft" non-technological provisions is critical.

**Scaling ambition**

**Precision and low-cost services**

Small scaled equipment can reduce drudgery and create opportunities for re-monetization within the farming system. Two-wheel tractors can in this sense enable rapid transformation.

**Policy ambition**

Smallholder farmers around 6% of farmers worldwide are smaller than 2 ha and are located in low to middle income countries. Across farm sizes continue to decrease.

**What does impact look like?**

- **Innovation and Demand**
  - Bangladesh: Machinery friendly policies: red tape discourages purchase of small open-source and demand for 2WTs
  - Mexico: Two-wheel tractors are often associated with theft and violence, discouraging smallholder adoption
  - Ethiopia: Culturally value of draught animal discouraged

- **Technology**
  - Agriculture is a well-established high-value, high-return enterprise for finance service providers

- **Value Chain**
  - Hardware delivery requires proximity of service providers
  - Development of new software for integration of value chains (farmers, retailers, service providers, access to open parts etc.)
  - Access to services and finance are major missing links

- **Finance**
  - Highly price elastic: needs close to consumer

- **Public Sector Governance**
  - Subsidizing machinery is popular, not for the scale
  - Preference for hardware instead of delivery mechanisms
  - Support for infrastructure: equipment discourages private sector

- **Leadership and Management**
  - South Asia: Private company involvement
  - Latin America: Governmental interest
  - Start up companies
  - Public sector driven in Ethiopia
  - Private sector driven in Zimbabwe
  - Public-private partnerships

**Anticipated positive impact and potential benefits**

- More mechanized service provision
- CIMMYT’s Sustainable Intensification program focuses on these issues across Latin America, East, and Southern Africa, and South and South East Asia.

**Anticipated negative impact and potential risks**

- Displacement
- Risk for job loss
- Risk for job creation

**References**

CIMMYT’s Scaling Scan tool is available online. Scaling ambitions and potential impacts are discussed in more detail in the full report. Scaling ambition on these issues across Latin America, East and Southern Africa, and South and South East Asia.

**Scaling appropriate agricultural mechanization worldwide: two-wheel tractors and smallholder farmers**

**Scaling ambition**

**Precision and low-cost services**

Small scaled equipment can reduce drudgery and create opportunities for re-monetization within the farming system. Two-wheel tractors can in this sense enable rapid transformation.

**Policy ambition**

Smallholder farmers around 6% of farmers worldwide are smaller than 2 ha and are located in low to middle income countries. Across farm sizes continue to decrease.

**What does impact look like?**

- **Innovation and Demand**
  - Bangladesh: Machinery friendly policies: red tape discourages purchase of small open-source and demand for 2WTs
  - Mexico: Two-wheel tractors are often associated with theft and violence, discouraging smallholder adoption
  - Ethiopia: Culturally value of draught animal discouraged

- **Technology**
  - Agriculture is a well-established high-value, high-return enterprise for finance service providers

- **Value Chain**
  - Hardware delivery requires proximity of service providers
  - Development of new software for integration of value chains (farmers, retailers, service providers, access to open parts etc.)
  - Access to services and finance are major missing links

- **Finance**
  - Highly price elastic: needs close to consumer

- **Public Sector Governance**
  - Subsidizing machinery is popular, not for the scale
  - Preference for hardware instead of delivery mechanisms
  - Support for infrastructure: equipment discourages private sector

- **Leadership and Management**
  - South Asia: Private company involvement
  - Latin America: Governmental interest
  - Start up companies
  - Public sector driven in Ethiopia
  - Private sector driven in Zimbabwe
  - Public-private partnerships

**Anticipated positive impact and potential benefits**

- More mechanized service provision
- CIMMYT’s Sustainable Intensification program focuses on these issues across Latin America, East, and Southern Africa, and South and South East Asia.

**Anticipated negative impact and potential risks**

- Displacement
- Risk for job loss
- Risk for job creation

**References**

CIMMYT’s Scaling Scan tool is available online. Scaling ambitions and potential impacts are discussed in more detail in the full report. Scaling ambition on these issues across Latin America, East and Southern Africa, and South and South East Asia.