



The Spread of Smaller Scale Machinery in South Asia: Observations

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Why the focus on smaller scale engines, equipment, and markets in services?

- Equity issues- that small scale via service provision makes “access” to agri-machinery more equitable
- “Operational Consolidation”- No need to physically consolidate land when small scale machinery are widely available (Mandal 2016).
- No evidence from traditional economists and engineers that current small scale mechanization on small holdings is any less productive than western-industrial farming
- Overwhelming concern of large scale agro-machinery in globaleconomic debates.





Illustrations of what are we talking about: Rural Capital Goods

- Capital goods are assets such as machinery, equipment, vehicles and tools used in the production of other goods.
- Used in analysis of the flow of goods and services between economic sectors
- Study of economic agents producing, acquiring and buying and selling services
 - Concerned with structural dimensions of the economy
 - Linkages between sectors of central importance





Illustrations of what are we talking about: rural capital goods in SA

- “Good enough” **diesel pump sets** shallow tube wells and lay flat delivery pipe





Illustrations of what are we talking about: rural capital goods industry

25 meter shallow tube wells





Illustrations of what are we talking about: rural capital goods industry

Chinese **two-wheel tractors** but also Indian, Thai, and lately Vietnamese.





Illustrations of what are we talking about: rural capital goods industry

12,000 “Good Enough” Chinese Mini Tillers in hills of Nepal

- Where avg life of MT is 3 years but a pay back in 1-2 years.
- Many of these small machines operate in same space, same economic and social environment as smaller or larger equipment





Illustrations of what are we talking about: rural capital goods “ industry “

Examples of agro sales, manufacturing and repair industries

- Examples Nuwakot Nepal
- Hikarie Sales Agency in Sri Lanka and
- Rajkot, India mini-4WT factory





Observations on the experiences from South Asia: #1 - diverse patterns of ag & rural mechanization (Estimates for 2012)

	Bangladesh			India			Nepal		
Energy Source	No Units	Total hp	% of total hp	No. units	Total hp	% of total hp	No. units	Total hp	% of total hp
2WTs*	500,000	7,500,000	53%	300,000	4,500,000	2%	16,000	240,000	13%
4Wts**	35,000	460,000	3%	3,500,000	122,500,000	55%	30,000	900,000	51%
Irrigation shallow tube well pump Diesel ***	1.2 M	6,000,000	42%	9,000,000	45,000,000	20%	120,000	600,000	34%
Irrigation pumpsets Electric****	100,000	200,000	1%	12,000,000	48,000,000	21%	10,000	40,000	2%
Total		14,160,000	100%		220,000,000	100%		1,780,000	100%

Estimates of the numbers of power sources (and their horsepower ratings) used primarily in agricultural and processing uses, including groundwater irrigation pumps. It does not for example include the many engines used in Bangladesh to power riverboats, rice mills, processing, etc, although these are a major part of the Bangladesh agriculture and rural economy

* Average of 14 hp per 2-wheel tractors (2WT)

** Average of 30 hp per 4-wheel tractor

*** Diesel / petrol irrigation pumpsets are average 5 hp. 5 – 10 % of the pumpsets are petrol/kerosene

**** Average electric tubewell is 4 HP



Observation #2: Markets in “powered” services have always been present

In SA the Supreme Importance of Markets for providing needed agro-machinery inputs and **SERVICES**

- Water markets (STWs and LLPs) in Bihar, Bangladesh and Thailand
- Two and four wheel tractor tillage in Sri Lanka and Bangladesh
- Transport services in Nepal



Bangladesh 1980s



Nepal
2003



Bangladesh
1991



Observation #3: Innovation in rural engineering from the field is particularly important

- Mini tillers Nepal- Came out of nowhere-Pvt sector led
- Jumping of technologies between sectors
 - Pump engines jump to rural transport - boat engines in Bangladesh and Vietnam
 - Layflat – Plastic drinking water pipe industry begins selling flexible hose pipes in Indo-Gangetic Plains





Observation #4: South South Exchanges – A new thing?

- South Asia has a long history of South South exchanges and trade in small scale “good enough” equipment
 - Chinese pumpsets in Bangladesh (1980s)
 - Nepal: 2WTs from Japan (1970s) Korea (1980s) and China (1990 – present)
 - Vietnamese 2WTs into Sri Lanka
 - Chinese small scale equipment coming into India in last 10 years
 - Axial flow pumps from Thailand to Bangladesh (2013)





Evidence of new interest in South South exchanges

A growing recognition of importance of South South exchanges and trade in agro industry

- By projects - IFPRI South South, project, USAID India & “Triangular Trade” support into Kenya, Nepal, etc.
- Use of “South South” by export oriented “South” governments and MNCs based there and their claims that their products are solutions for African ag.





Problems encountered in South South Exchanges

- Lack of knowledge of available smaller scale equipment existing and spreading
 - National governments promoting their large scale equipment for export under South South justification
- Shortage of contemporary academic policy analysis of rural mechanization
- Expensive large machinery used in research programs serve as examples for government programs and projects- skew national aspirations
- Inadequate provision of training of operators and market support activities
- Agri Machinery MNCs of the “West” now have heavy footprint in the South confounding “what is South”





Conclusions

There are no generalizations for agricultural and rural mechanization policies.

- Local natural resources
- Local and intl political context
- Trade and industrial policy
- Energy policy
- Agenda of donor, MNCs, government agencies





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References

Abeyratne, Fredrick 2017 Economic Study of Agricultural Mechanization in Sri Lanka. In forth coming IFPRI Book.

Biggs, David 2005 'Managing a Rebel Landscape: Conservation, Pioneers, and the Revolutionary Past in the U Minh Forest, Vietnam', *Environmental History*, 10 (3), 2005, pp. 448–76

Biggs, Stephen & Justice, Scott, 2015. Rural and Agricultural Mechanization: A History of the Spread of Small Engines in Selected Asian Countries. *IFPRI Discussion Paper 01443*. Washington: International Food Policy Research Institute (IFPRI). <http://www.ifpri.org/sites/default/files/publications/ifpridp01443.pdf>

Biggs, Stephen & Justice, Scott. 2016. A history of debates on patterns of rural and agricultural mechanization: A capital goods perspective. (Draft February 2016).

Baudron, Frédéric, Brian Sims, Scott Justice, David G. Kahan, Richard Rose, Saidi Mkomwa, Pascal Kaumbutho, John Sariah, Raymond Nazare & Girma Moges & Bruno Gérard. 2015 Re-examining appropriate mechanization in Eastern and Southern Africa: two-wheel tractors, conservation agriculture, and private sector involvement. *Food Security* August 2015, Volume 7, [Issue 4](#), pp 889–904.

Cabral, Lidia, 2016. Brazil's Tropical Solutions for Africa: Tractors, Matracas and the Politics of 'Appropriate Technology'. *European Journal of Development Research*. Vol. 28, 414–430.

Chancellor, William J See anything by Dr. Chancellor former head of Agri Engineering Division IRRI in the early 1970s such as:

the Chancellor, William J. 1986 Improving Access to and Use of Appropriate Technology Machinery by Small Scale farmers. *In* Small Farm Equipment for Developing Countries. Proceedings of International Conference on Small Scale Equipment for Developing Countries: Past Experiences and Future Priorities 2-6 September ,1986. IRRI Philippines

by Chancellor, William 2002 Energy Flow Relationships in Asian Rice Systems. Written for presentation at the 2002 ASAE Annual International Meeting / CIGR XVth World Congress. Sponsored by ASAE and CIGR Hyatt Regency Chicago. Chicago, Illinois, USA July 28-July 31, 2002. Contact him at wjchancellor@ucdavis.edu

Falcon, WP (1967) 'Agricultural and Industrial Inter-relationships in West Pakistan'. *American Journal of Agricultural Economics*, Vol. 49 (5), December, pp 1139-1154.

Gokul Paudel, Andrew McDonald, Scott E. Justice, Subash Adhikari, Mina Kumari Devkota, Dil Prasad Sherchan 2015 Conservation Agriculture: a resilient way to exterminate trade-offs in combine harvesters use and residue burning in rice-wheat systems of Nepal. Paper presented at International Conference on "Open Burning of Agricultural Residue" in the Himalayas Region, Feb 20-21, 2015. ICIMOD, Kathmandu, Nepal .

Poudel, Gokul Andrew McDonald, Scott Justice Stephen Biggs, Manisha Shah and Preity Khandelwal. 2017 The Economics behind the Spread of Two-Wheel Tractor Reaper Harvester in Nepal. Forth coming.

iDE Bangladesh 2012 Study Into The Commercialization Of Selected Agricultural Machines In Bangladesh. Internaonal Maize and Wheat Improvement Center (CIMMYT) Bangladesh House 9, Road 2/2, Banani, Dhaka 1213 , Bangladesh. <http://repository.cimmyt.org/xmlui/bitstream/handle/10883/3394/98527.pdf>





References (Continued)

Justice, Scott & Biggs, Stephen. 2013. Rural and agricultural mechanization in Bangladesh and Nepal: Status, processes and outcomes. Chapter 4, pp. 67-120 in Kienzle, Josef; Ashburner, John E. & Sims, Brian G., eds. 2013. *Mechanization for Rural Development: A review of patterns and progress from around the world*. Plant Production and Protection Division, Food and Agriculture Organization of the United Nations (FAO), Rome. ISBN 978-92-5-107605-7 (print). E-ISBN 978-92-5-107606-4 (PDF). (<http://www.fao.org/docrep/018/i3259e/i3259e.pdf>)

Justice, S. & Biggs, S. 2013. Diverse Patterns of Rural and Agricultural Mechanisation in Bangladesh and Nepal: Status and Emerging Themes in *Mechanization for Rural Development: A review of patterns and progress from around the world*. Editors, Josef Kienzle, John E. Ashburner, and Brian G. Sims. Food and Agriculture Organization. Rome.

Kulkari, Mahesh. 2019. Chinese firms expand dominance in Indian farm equipment market. Mahesh Kulkari Bangalore December 4, 2010. http://www.business-standard.com/article/companies/chinese-firms-expand-dominance-in-indian-farm-equipment-market-110120400001_1.html

Mandal, M.A. Sattar. 2017. Proceedings of the Regional Workshop on "Rural Mechanization: Technology and Policy lessons from Bangladesh and other Asian Countries", Editor. Held in BRAC Inn, Mohakhali, Dhaka, 7-8 March 2013. (Forth coming)

Pariyar, Madan P., Khadga B Shrestha and Nara Hari Dhakal. 2001. Baseline Study on Agricultural Mechanization Needs in Nepal. Rice Wheat Consortium Paper Series # 12. CIMMYT, New Delhi, India.

Rigg, J., A. Salamanca and E.C. Thompson (2016) "The Puzzle of East Asia's Persistent Smallholder," *Journal of Rural Studies* 43(1):118-133. <http://profile.nus.edu.sg/fass/socect/2016%20rigg%20et%20al%20jrs%20smallholder%20puzzle.pdf>

Samarasinghe, Melvin. 2017. Recent History of the Agriculture Machinery Industry in Sri Lanka with special reference to Rice. Case Study written for IFPRI South South Project. (Forth Coming) Abeyratne,

Can the Big Learn from Small? Agricultural Mechanization Policy Experiments in Odisha. Shambu Prasad C and Pratyay Jagannath. Emerging Patterns of Rural and Or
Agricultural Mechanization in Odisha: Policy Options???

