



Summary Information 1



Research Findings 2



Policy Implications 3



References & Contacts 4

## Labor-Saving Farm Technology in Nepal

Based on the peer-reviewed publication Bhandari and Ghimire 2013 in *Rural Sociology*<sup>1</sup>

Nepal has faced agricultural labor shortages in recent years. The resulting high demand for agricultural labor can induce higher fertility since households desire more children to work on the farm. The importance of relaxing the agricultural labor shortage grows as more and more young men are migrating out from rural areas. To address this issue, application of labor time-saving technology is crucial. However, the application of machines is still low in Nepal, especially in hilly and mountain regions.

New empirical research from the Western Chitwan Valley of Nepal supports the labor-substitution hypothesis. The use of modern farm technology,

which is designed to reduce labor-intensive work, reduces the labor demand. Therefore, it discourages birth in farming households. This policy brief highlights the importance of providing more programs to support agricultural mechanization in Nepal.

“The consequences of the uses of these labor-saving farm technologies for various aspects of the economy, society (including gender relations), and the environment must be considered before formulating policy.”

- Drs. Prem Bhandari and Dirgha Ghimire

### Research Context

- In 2011, around 50% of the Nepali male population ages 15-29 and 30-44 years were not present in the households (Figure 1). Both internal (rural to urban) and international migration of young males are primary reasons for absenteeism of the male population.
- The task of male-dominant farm labor such as ploughing is managed by females in some migration households, which adds a labor burden on top of female domestic work.
- Child labor in farming is still prevalent. In 2014, 37.4% of children aged 5-17 were found to be engaged in child labor, where the majority work in agriculture.<sup>2</sup>

### Data Source

This policy brief is based on a peer-reviewed publication<sup>1</sup> that analyzes data from the Chitwan Valley Family Study (CVFS) — a comprehensive mixed-method panel study of individuals, families, and communities in the Western Chitwan Valley of Nepal.

The CVFS investigates the relationships between changing social contexts, environmental factors, land use, and population processes. CVFS data include full life histories for more than 10,000 individuals, tracking and interviews with all migrants, continuous measurement of community change, 21 years of demographic event registry, and data linking human and natural systems.

# Findings: Benefits of Mechanization on Labor Shortage and Human Fertility

Mechanization in agriculture not only solves the temporary labor shortage, but also leads households to desire a smaller family size in the long term. A recent study from ISER-N in the western Chitwan Valley shows that households with modern farm technology have significantly lower fertility rates.

## Labor Time Input

A substantial benefit of using modern farm technology is its power to save labor time. In northern districts of Bangladesh, a study showed that households with mechanized technology spent 32 hours to plough one hectare of wheat, while traditional farming (animal power and human labor) households spent 168 hours.<sup>3</sup> A study in India shows that the use of tractors in ploughing saves 82.4 hours per hectare of work compared to bullock ploughing.<sup>4</sup>

## Smaller Family Size

While the human fertility rate is decreasing in Nepal, the issue of high fertility is still prevalent in rural areas. In

2011, the Total Fertility Rate (TFR)<sup>5</sup> in rural Nepal was 2.8, which is the same level as some Sub-Saharan African countries, for example, Swaziland in 2015.<sup>6, 7</sup>

High fertility rates with low labor productivity leads to food security issues. The Food and Agricultural Organization (FAO) reported that 42 out of 75 districts in Nepal are considered to be food insecure.<sup>8</sup> Tackling the issue is urgent since it cause malnutrition and affects the physical development of future generations in Nepal.

The labor-substitution hypothesis suggests that the use of modern technology reduces the demand for farm labor by replacing human labor. Thus, it can reduce birth rates in farm households. The results from an empirical study in Chitwan demonstrate that households with modern farm technologies have lower subsequent births.<sup>1</sup> Another study from ISER-N supports the relationship between labor demand and fertility by showing that shorter hours required collecting firewood is associated with smaller family size, since it decreases labor demand.<sup>9</sup>

## Low Use of Modern Machinery

Despite the benefits of mechanization, the use of machinery is lagging behind in Nepal. Because of the nation's complicated topology, each region requires diffusion of different types of farm technology.

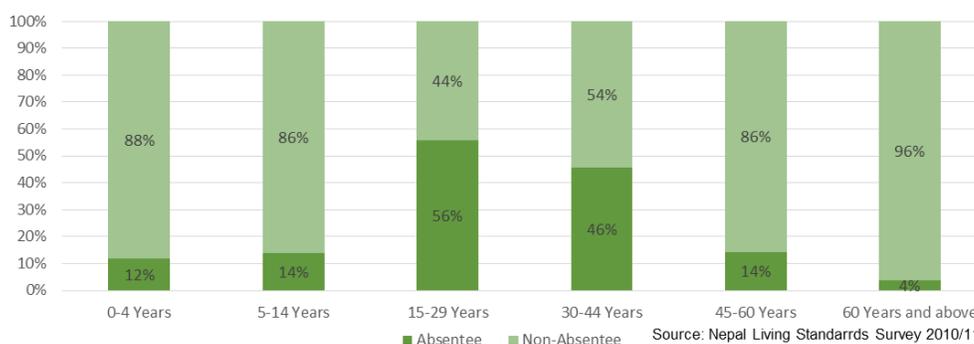
Mechanical power (mostly 4-wheel tractor and power tillers) are widely used in tarai (flatland) areas.<sup>10</sup> However, rice planting and harvesting is still predominantly performed manually by female laborers. As is shown in the

case study, the benefit of rice transplanters is promising in Nepal.

In hilly/mountain areas, machinery has not been widely applied because of steep slopes. Nowadays many enterprises produce mini power tillers, which are light enough in weight (60-70kg) that two people can carry them. Those small power tillers could be applied to reduce females' labor burden in male migration households.

## Male Absentee Population in Nepal<sup>11</sup>

Figure 1: Percentage of Absentee Population by Age (Male)



# Policy Implications

The Agriculture Development Office provides a 50% subsidy for any purchase of agricultural machinery to farmers' groups. However, there are several more factors to consider in future policies to enhance the subsidies program and effectively facilitate implementation of agricultural machinery.

## Inform Farmers Through Workshops

Despite the invention of new technologies, farmers do not fully comprehend the availability and benefits of machinery. More workshops could be provided so that farmers can see and understand the value of various new farm technologies. (More info: Agriculture Engineering Division, NARC)

## Provide Training for Women

Due to migration of males, more women are expected to work in agriculture. Since women do not traditionally participate in decision making in farming, they need support both in participation and application of machinery. Such programs would increase female earnings by providing skills, which consequently empowers them both inside and outside households.

## Form Farmers' Groups to Connect Cropland

Fragmented land is another problem for application of modern farm technology. Many farmers have either small parcels of land or participate in short-term share cropping arrangements. The government should promote the formation of resource sharing groups for small farmers. Forming farmers' groups integrates cropland and facilitates investment in agricultural advancements such as mechanization and irrigation.

## Be Health- and Ecology-Friendly

One concern in moving to the use of modern farm technology is its effect on the environment and human health. Agricultural mechanization programs should promote affordable machinery to promote human and environmental health. (More info: The Centre for Sustainable Agricultural Mechanization)

## Conclusion

Reducing labor demand in agriculture consequently reduces households' desired number of children. By removing barriers for wide application of farming technology, more programs should promote mechanization in agriculture.

## Case Study: Corporate Social Responsibility in Buddha Air



Buddha Air implemented a project to lend farm machines to local farmers in Morang district, Nepal. By providing advanced mechanical technology, the program aims to help small farmers increase agricultural productivity.

Twenty-seven rice farmers with a variety of land holding sizes ranging from 0.13 to 3.67 hectares participated in the program. The participants paid rent for agricultural machines. For example, a transplanter costs US\$28 and combine harvester US\$60 per hectare.



A report from the Agriculture Development Officers shows "Farmers who have introduced mechanization into their rice farming have found that they can reduce production costs by 27% and increase their profits per hectare by 36%".<sup>12</sup> The report also shows labor requirements are reduced by 60%.

# Footnotes and References

- 1) Bhandari, P., & Ghimire, D. (2013). Rural agricultural change and fertility transition in Nepal. *Rural sociology*, 78(2), 229-252.
- 2) Central Bureau of Statistics. (2014). *Nepal Multiple Indicator Cluster Survey 2014, Key Findings*. Kathmandu, Nepal: Central Bureau of Statistics and UNICEF Nepal.
- 3) Rahman, M. S., Miah, M. M., & Hossain, S. (2011). Impact of farm mechanization on labour use for wheat cultivation in northern Bangladesh. *Journal of Animal and Plant Sciences*, 21(3), 589-594.
- 4) Agarwal, B. (1981). Agricultural mechanisation and labour use: a disaggregated approach. *International Labour Review*, 120(1), 115-127.
- 5) Average number of children that would be born to a woman over her lifetime, if all women lived to the end of their reproductive years and bore children according to the age-specific fertility rates across their reproductive years.
- 6) Ministry of Health and Population, New ERA & ICF International. (2012). *2011 Nepal Demographic and Health Survey: Key Findings*. Kathmandu, Nepal and Calverton, Maryland, USA: Ministry of Health and Population, New ERA and ICF International.
- 7) *The World Factbook* (2016-17). Washington, DC: Central Intelligence Agency, 2016. <https://www.cia.gov/library/publications/the-world-factbook/index.html>
- 8) Assessment of Food Security and Nutrition Situation in Nepal (2010). Food and Agriculture Organization of the United Nations UN Complex, Pulchowk, Nepal.
- 9) Biddlecom, A. E., Axinn, W. G., & Barber, J. S. (2005). Environmental effects on family size preferences and subsequent reproductive behavior in Nepal. *Population and Environment*, 26(3), 583-621.
- 10) AED (2015). *Annual Report 2071/72 (2014/15)*. Agricultural Engineering Division, NARC, Khumaltar, Lalitpur, Nepal.
- 11) An "absentee" is an individual who was away from the household for more than 6 months out of the last 12 months, or has recently left and is expected to be away for more than 6 months.
- 12) Uprety, R. (2010, November). Meshing mechanization with SRI methods for rice cultivation in Nepal. In *28th International Rice Research Conference* (pp. 8-12).

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