

Farm mechanisation to enhance income and rural jobs



India can be a role model for South and Southeast Asian nations in making agriculture remunerative

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SOUTH Asian and Southeast Asian countries like India, Bangladesh, Philippines, Thailand, Cambodia, Pakistan, Sri Lanka, and Vietnam have primarily an agrarian economy. The agriculture of these countries largely depends upon animate and small-scale power source with agri-inputs supplied as per convenience, unlike the western world where organised farming is practised. A large population (more than 50 percent) of these countries still depends upon agriculture as the main source of income. A large number of small-scale and tiny industries fully depend upon agriculture as source of raw material. Therefore, the growth in rural employment in these countries primarily needs accelerated growth of agriculture and its allied sector.

With increasing population pressure, most of the countries of the region cannot afford to increase area under agriculture; therefore, increasing agricultural productivity is another alternative. Changing climatic pattern (dry spells,

high intensity rains, high temperature spells) has posed additional challenge on performing farm operations in timely manner in order to obtain a good harvest. Timeliness of operation and optimum utilisation of inputs are two key factors to improve the productivity, reduce the cost of cultivation, and avert the vagaries of climate to some extent. Modern methods such as precision farming, increase in area under irrigation, conservation tillage, strong management, and diversification in agriculture is the need of the hour. These practices require improvement in farm-power availability as there is direct correlation among farm mechanisation, crop productivity, and rural employment. In the last six decades, food grain productivity in India has increased from 0.710 t/ha in 1960-61 to 2.21 t/ha in 2013-14 with increase in farm-power availability from 0.296 kW/ha to 2.02 kW/ha during the same period. **Table1** represents the availability of total cultivable area and farm-power availability in some of the countries of the region.

Among various inputs for intensive agriculture, farm mechanisation has made significant contribution in increasing agricultural production and productivity through timeliness of operation, efficient application of inputs, conserving soil and water resources, and reducing crop losses, apart from increasing cropping intensity. Mechanisation in association with improved crop inputs have shown improved yields by 15-20 percent. The improved yield and reduction in cost of operation will lead to additional income to the farmers.

With the rapid growth of other service sectors of the economy, availability of manpower for agriculture is a major concern; in 2017, manpower engaged in agriculture ranged between 31.8 to 54.6 percent for most of the countries. However, the total number of agricultural workers engaged in Indian agriculture has been gradually increasing from 185.3 million in 1991 to 263 million in 2011 (**Table2**).

Table1: Total cultivable area, farm-power availability, and workforce employed in agriculture in some South and Southeast Asian nations

Country	Total cultivable area (million ha)	% contribution of agriculture in GDP	India's cultivable area (%)	Population employed in agriculture (%)	Power availability (kW/ha)	
					1990	2017
Bangladesh	8.55	13.41	5.35	52	0.3	1.83
Cambodia	5.4	23.38	3.38	45	0.3	1.32
Pakistan	21.2	22.9	13.27	45	0.75	1.1
Philippines	12.4	9.7	7.76	40	0.39	1
Sri Lanka	0.87	7.7	0.54	31.8	0.43	1
Thailand	22.1	8.7	13.84	34.3	0.89	2.5
Vietnam	10.8	15.3	6.76	40.9	0.61	1.7
India	159.7	15.5	100	54.6	0.75	2.2

Source: Singh (2016), data.worldbank.org (2017)

Table2: Employment of workers in agriculture in India (million)

Particulars	Year				
	1991	2001	2011	2020	2050
Country population	846.4	1028.7	1210.7	1323.0	1612
Number of agriculture workers	185.3	234.1	263	230	202
Agricultural workers including cultivators	110.7	127.3	118.7	110	-
Agricultural workers including labourers	74.6	106.8	144.3	120	-

Source: Anonymous 2015

The availability of manpower as source of power during critical periods of agricultural operations is a major concern. With mechanisation, the employment characteristics of the manpower engaged in agriculture will change from a source of power to controller of the machine(s) and entrepreneurship based on agriculture.

This trend, i.e. increase of labour force per unit area, suggests that operationally specialised and field-worthy equipment and technology is the need of the hour for Indian agriculture and other neighbouring countries as well to cater to the food needs of the increasing population. However, the type of equipment suitable for cultivation and the rate of introduction of new equipment are to be considered with a multi-disciplinary approach

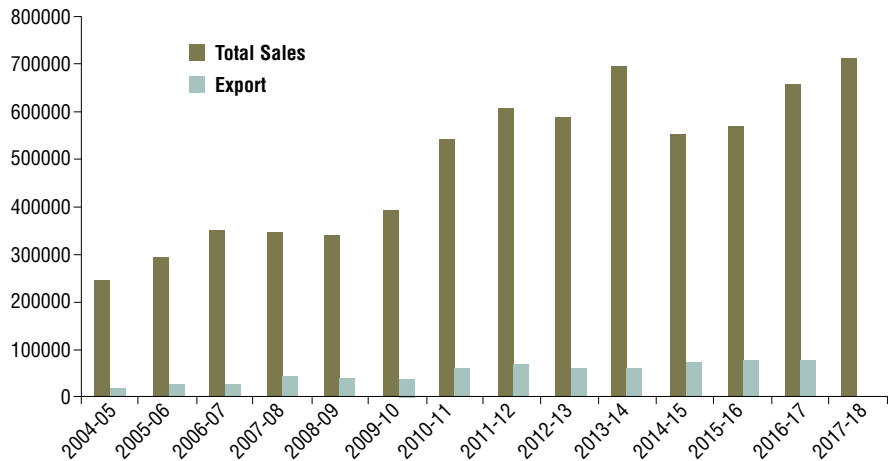
to meet the specific needs.

Tractors, power tillers, and small engines have emerged as the main mechanical farm-power source in Indian agriculture over the last six decades while self-propelled equipment operated by engines of higher power – combine harvester, dozers, and power sprayers have also become popular during the last two decades. Electric motors are primarily used for energising pump sets and other stationary operations. There were only 8500 tractors in use in 1951, 20,000 in 1955, and 37,000 by 1960 (Singh et al 2009; 2011) with annual production of 880 units in 1961. Subsequent to the Green Revolution, farmers realised the importance of timeliness of operation and increased availability of credit inflow; today the Indian tractor industry is

the largest in the world and accounts for one-third of the global production. The sale of tractors has grown at a CAGR of 11 percent from 247,531 in 2004-05 to 711,400 in 2017-18 (Singh 2015a TMA and PTMA). The sales figures of the Indian tractor industry and its exports (Figure1) indicate that the Indian tractor industry is exporting about 10 percent of its annual production to China, Australia, Latin America, the Middle East, and South Asian countries. The domestic consumption of tractors indicates that the highest share is of 31-40 hp (46.2 percent), followed by 27.6 percent of 41-50 hp, 13.8 percent of 21-30 hp, and 11.6 percent for >50 hp tractors; the rest are <20 hp tractors. However, the export consumption of tractors indicates that highest demand is for tractors above 51 hp (56.4 percent) followed by 41-50 hp (27.5 percent). Power tiller is another farm-power source mainly produced in the 8-14 hp range. The annual sale of power tillers has increased from 15,220 in 2003-04 to 55,000 in 2015-16. However, the power tiller industry of the country is facing growing competition from the Chinese power tiller industry in terms of exports of the power tillers.

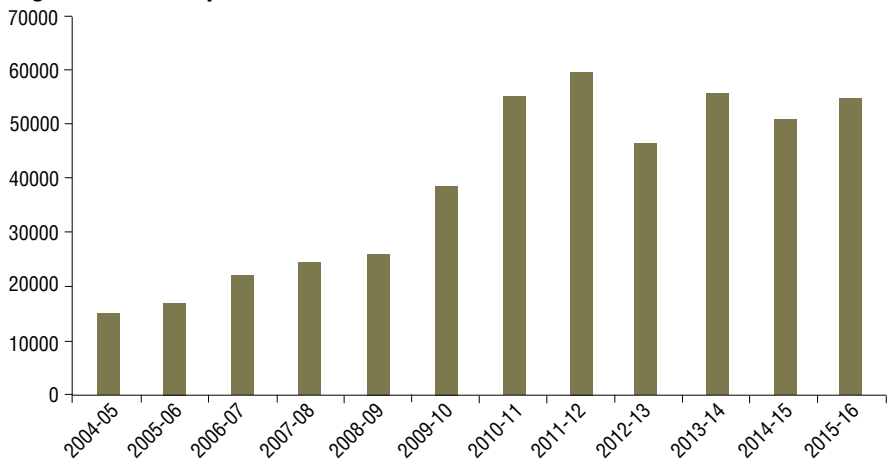
The share of animate source of power has declined steadily with the increase in use of mechanical and electrical power. The share of agricultural workers in total power availability in 1960-61 was about 16.3 percent, which has reduced to 3.6 percent in 2014-15 with similar trend for animal power. This has pushed up the energy demand of Indian farms and it is likely that other neighbouring countries are facing similar trends of farm-power availability. The availability of tractors, power tiller (2W tractor), irrigation pumps, and combine harvesters of different countries of the region is given in Table3. Now, the farmers have also realised the advantage of timeliness of operation and its effect on farm output. During the past four decades a large number of farm tools, implements, and machines

Figure1: Exports and total sales of tractors by Indian tractor industry



Source: Singh (2016), TMA

Figure2: Sale of power tillers in India



Source: Singh 2015a; and Power tiller Manufacturer's Association

Table3: Number of tractors, power tillers, irrigation pumps, combine harvesters in South and Southeast Asian nations (thousand)

Country	4W tractor		Power tiller (2W tractor)		Irrigation pump		Combine harvester (units)	
	1990	2013	1990	2013	1990	2013	1990	2013
Bangladesh	5	60	10	700	220	1729	-	130
Cambodia	0.3	9.5	0.5	152	1.0	256	-	4580
Pakistan	231	573	5	2	288	1050	1300	9000
Philippines	6	-	32	-	107	-	-	-
Sri Lanka	15	1.5	24	2.8	52	-	-	1099
Thailand	45	334	583	1750	851	2320	2250	15000
Vietnam	5.2	170	20	380	168	2170	0	20000
India	1200	5430	31	440	12900	28000	4500	38000

Source: Singh (2016)

have been developed for different farm operations such as seed bed preparation, sowing and planting, intercure and plant protection, harvesting, threshing, dehusking, decortication, material handling, etc. The demand of agricultural machinery and mechanical power source has increased multi-fold. The agricultural machinery market is estimated to grow at a CAGR of 10 percent. There are about 250 medium- to large-scale units, 2500 small-scale industries, 15,000 tiny industries and one lakh village level artisans in India. Most of the agricultural machinery manufacturing falls under the unorganised sector. The market for threshers (multi-crop and paddy), rotavator, planters, and plant protection equipment is highly unorganised and dominated by small- and medium-scale enterprises. The market share

of threshers was about \$205 million and of rotavators \$300 million in 2014-15. It is estimated that the global demand for agricultural implements will be about \$200 billion by 2020 and Asian countries will contribute more than 60 percent to the total. The current annual market of farm-power source and machinery in India for tractors is about 5.5-6 lakh, power tillers 50-60 thousand, combine harvesters 3500-4000, rotavators 1-1.5 lakh, threshers 70-75 thousand, power weeder 35-45 thousand, MB plough 45-50 thousand, laser-guided land leveller 2500-3500, and planters 15-25 thousand units. The requirement of tractors for different countries of the region, considering the present level of farm-power availability in India and area under cultivation, was estimated and is given in **Figure3**. The growth of

tractor, power tiller, and other machinery industries in future will require skilled manpower to meet the demand. Another set of skilled manpower will be required at the rural level to fulfil the demand of operators, repair, and maintenance of the farm machinery.

Among South Asian and Southeast Asian countries Indian agriculture has marked its presence at a higher level and it can play a model role for making agriculture more remunerative and source of income and employment to rural youth of these regions. Indian agriculture has top world ranking in production of pulses (17 MT) and second ranking in rice (157 MT), wheat (86 MT), sugarcane (342 MT), cotton (8.50 MT), fruits (74 MT), and vegetables (105 MT) after China. Introduction of improved implements has the potential

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Measuring the success

Benchmarking one's efforts towards world's proven standards in producing and delivering ferro chrome remains the most appropriate way to keep deserving them, President /CRM/ at Balasore Alloys Ltd. highlights.

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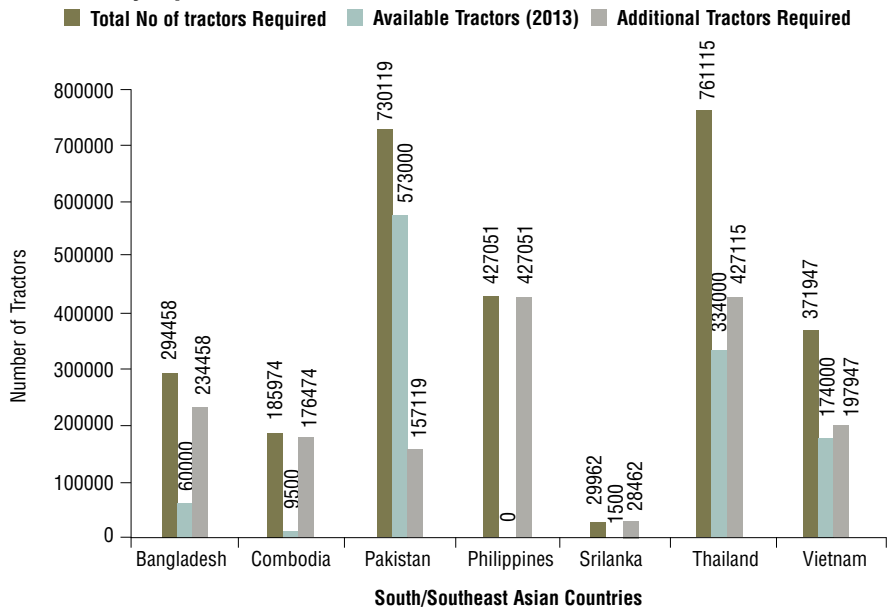


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to increase productivity by 15-20 percent and reduce the cost of cultivation up to 20 percent. Among the Southeast Asian countries, the farm-power availability (Table 1) is 2.2 kW/ha after Thailand (2.5 kW/ha), while farm-power availability of other countries are much lower. To improve the farm productivity of these countries, efforts are needed to promote efficient utilisation of inputs including farm mechanisation. Small and scattered landholdings, high initial cost of equipment, non-availability of high-tech precision equipment, poor quality of equipment available in the market, and poor after sales services are some of the major challenges for mechanisation of these countries, which hinder faster growth of farm mechanisation.

Although farmers have a number of options for financing, a number of challenges continue to hinder credit flow to the beneficiaries. These include high collaterals, especially for loans of more than Rs1 lakh, high interest rates, and relatively low repayment periods (5-7 years). The custom hiring of mechanical power for tillage, irrigation, harvesting, and threshing will be preferred by those farmers who cannot afford to own machines. The present trend in agricultural mechanisation is for the high capacity machines to be used for custom hiring and for contractual field operations. However, timely availability of these machines to small and marginal farmers is a major concern in spite of a large number of custom hiring centres being established. A strong backup infrastructure of repair and maintenance at the rural level needs to be built up which will certainly promote gainful employment of rural youth. For this purpose, appropriate policy level interventions are required to impart skill to rural youth with credit support. Level of mechanisation of horticulture and allied agricultural sector is still at very low levels; R&D efforts need to be strengthened to create infrastructure and facilities in order to overcome challenges of these sectors.

Figure 3: Number of tractors required to maintain present farm-power availability equal to India



The farm mechanisation sector has very high potential for rapid growth both in the domestic as well as the export market to keep pace with the requirement of agriculture in the region. The horticulture and allied agriculture sector will further push the demand of agricultural machinery in times to come. As discussed above, farm mechanisation will lead to change in rural employment patterns and more opportunities will be created for rural youth to acquire skills and have self-employment alternatives.

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