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## RESEARCH ARTICLE

# Tractor Production and Sales in India, 1989–2009

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**Abstract:** This paper argues that mechanisation of Indian agriculture, as measured by growth in the production and sale of tractors, has continued, although not uniformly, over the last two decades. While the last two decades were a period of slowdown in agricultural production, the data do not support a view of undifferentiated economic decline in rural areas. Our focus on tractors is justified as the Indian agricultural sector has a higher density of four-wheel tractors than other less-developed countries, and India is also one of the major manufacturers of tractors. The paper uses data from a range of sources on production, domestic sales, and exports of tractors for the period 1989 to 2009. Two factors associated with the sale of tractors, namely, availability of credit from banks and public investment in agriculture, are examined. The paper also shows that growth in tractor sales has been associated with a decline in the regional concentration of sales.

**Keywords:** Tractor production, tractor sales, Indian agriculture, agriculture and liberalisation, mechanisation.

### INTRODUCTION

The state of Indian agriculture over the last two decades, particularly since 1991, has been a matter of concern to many scholars. Studies show that growth of production and productivity in agriculture have slowed down,<sup>1</sup> affecting incomes and livelihoods from farming,<sup>2</sup> and resulting in severe crises in certain regions and time-periods.<sup>3</sup> Indeed, the poor performance of the agricultural sector has led some scholars to argue that there has been across-the-board income deflation in rural India (Patnaik 2003). Others have argued that the period from 1991 to the present has been one of crisis but not “undifferentiated crisis – that is, of deceleration, a general absence of dynamism and even retrogression across all classes, regions, crops and

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<sup>1</sup> Sen (2004); Chandrasekhar (2007, 2009); RBI (2012).

<sup>2</sup> Bhatia (2006); Singh (2009); Galab, Revathi, and Reddy (2009).

<sup>3</sup> Patnaik (2003); Chand (2007); Walker (2008); Bhalla and Singh (2009); Reddy and Mishra (2010); Ramachandran and Rawal (2010); Ramachandran (2011).

years” (Ramachandran 2011). Using a set of indicators, which includes the growth of production, public and private investment, and flows of rural credit, three broad phases of agricultural growth can be distinguished at the all-India level: a period of slow growth from 1991 to 1997–98, followed by a period of sharp decline from 1997–98 to 2003–04, and a period of recovery after 2003–04 (*ibid.*).<sup>4</sup>

In this note, I argue that mechanisation of Indian agriculture, as measured by growth in the production and sale of tractors, has continued, although not uniformly, over the last two decades despite the slowdown in the agricultural sector. The focus on tractors is justified by the fact that the Indian agricultural sector has a higher density of four-wheel tractors than other less-developed countries (Vyas 1982; Pingali 2007). India is also one of the largest manufacturers of tractors in the world, and, more recently, has become an exporter of tractors as well.

### DATABASE

The data on aggregate production of tractors used in this paper are from various issues of the *Monthly Abstract of Statistics*, a Central Statistical Organisation (CSO) publication. Data on domestic sales of tractors have been collected from *Annual Reports* of the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. State-wise data on sales are from the *Agricultural Engineering Data Book*, published by the Central Institute for Agricultural Engineering (CIAE), Bhopal. Data on exports of tractors are from the United Nations Commodity Trade Database.

### GROWTH OF THE TRACTOR INDUSTRY IN INDIA: 1989–2010

Production of tractors in India was started by Eicher Good Earth Limited in 1961, though the initial boost in the demand for tractors came after the advent of the Green Revolution in the late 1960s. The first tractor with fully indigenous technology, the Swaraj tractor, was produced in 1974 by Punjab Tractors Limited, based on a model developed by the Central Mechanical Engineering Institute, Durgapur. Today, India is one of the leading manufacturers of tractors in the world,<sup>5</sup> with a production figure of 383,000 in 2009–10.<sup>6</sup>

<sup>4</sup> According to Ramachandran (2011), in the 1997–98 to 2003–04 period, “Many things came together – the lagged effect of a decline in public investment, the withdrawal of state support to agriculture, the crisis in rural credit, the effects of the new WTO-driven trade regime, falling international product prices, and drought – to make this the worst period for rural India under liberalisation.”

<sup>5</sup> According to the *Annual Report, 2010–11*, of the Department of Heavy Industry, Ministry of Heavy Industries and Public Enterprises, Government of India, “the Indian tractor industry is the largest in the world (excluding sub 20 HP belt driven tractors used in China), accounting for one third of global production.”

<sup>6</sup> For detailed discussion on earlier phases of growth of the Indian tractor industry, see Aurora and Morehouse (1972); Bhatt (1978); Morehouse (1980); Patel and Gandhi (1996); and Singh (1998, 1998a, 1998b, 2000).

## Growth in Production

Between 1989–90 and 2009–10, there was a three-fold increase in tractor production, from 125,000 to 383,000, equivalent to an annual rate of growth of 4.3 per cent (Appendix Table A1). However, there were large year-to-year fluctuations in growth during this period. There were three instances where growth of production of tractors was negative for two or more successive years. The first such instance was during 1992–93 and 1993–94, that is, just after liberalisation of the Indian economy in 1991. There was a short recession in the tractor industry as production dipped from 166,000 in 1991–92 to 147,000 in 1992–93, and, further, to 139,000 in 1993–94. The second phase of negative growth was from 2000–01 to 2003–04, with the production of tractors in 2003–04 falling below the level of 1995–96. This slowdown began in 1997–98 with negative or low growth rates up to 2000, followed by large negative growth rates during 2001–02 and 2002–03. Production picked up and increased rapidly from 2004–05, with output crossing the 300,000 mark in 2006–07. There was then another dip in production in 2007–08 and 2008–09, followed by a big rise in 2009–10.

The phases of growth in tractor production closely follow the three post-1991 phases of growth in agricultural production and investment identified by Ramachandran (2011), namely, 1990–91 to 1997–98, 1997–98 to 2003–04, and the period after 2003–04. The years between 1997–98 and 2003–04 witnessed a particularly sharp fall in the growth rate of production and yield of foodgrains, investment, and input use. There was a partial recovery in the period after 2003–04.

As shown in Table 1, in the first phase, that is, from 1989–90 to 1997–98, tractor production grew at 9.2 per cent per annum. In the second phase, 1997–98 to 2003–04, tractor production declined at a rate of –7.7 per cent per annum. It then recovered rapidly, growing at a rate of 11 per cent between 2003–04 and 2009–10.

It may be mentioned here that the period of recovery of agricultural growth in India, from 2003–04 onwards, is also a period when India's industrial output, particularly manufacturing output, grew at a rapid pace. At current prices, industrial GDP and

**Table 1** *Growth rate of production of tractors, 1989–90 to 2009–10*

Period	Annual compound rate of growth (CGR)
1989–90 to 1997–98	9.2
1997–98 to 2003–04	–7.7
2003–04 to 2009–10	11.0
1989–90 to 2009–10	4.3

*Note:* Growth rate was estimated from the semi-logarithmic trend line (instantaneous growth rate),  $\text{Log } y = \log \beta_1 + \beta_2 t$ , where  $y$  = production of tractors,  $t$  = time, and  $\beta_1$  and  $\beta_2$  are intercept and slope respectively.  $\beta_2$  is interpreted as the percentage change in production due to one unit change in time. Compound growth rate ( $r$ ) was calculated from the semi-logarithmic equation using the relationship  $\beta_2 = \log(1+r)$ . So  $\text{CGR}(r) = \text{antilog}(\beta_2) - 1$ .

*Source:* *Monthly Abstract of Statistics*, CSO, various issues.

GDP from the manufacturing sector grew at an annual rate of 15 per cent between 2003–04 and 2009–10 (RBI 2012). During the same period, the index of industrial production (IIP) increased at a rate of around 9 per cent per year (CSO 2011). After a slowdown during the Ninth Plan period (1997–98 to 2001–02), when industrial GDP grew at 4.4 per cent per year, industrial GDP grew at 8 per cent per year from 2002–03 to 2005–06 (Acharya 2007). Hence, the period of recovery of tractor production also coincides with the period of some revival of general industrial growth in India.

It should also be pointed out that the automobile industry in India (of which tractors are a small part) has grown spectacularly in the last two decades. After an initial recession between 1992 and 1994, production of automobiles in general grew at 7 per cent during the 1990s and at 11 per cent during the 2000s (barring 2007–08). Global automobile companies have entered the Indian market; this is so even in the tractor industry (New Holland in 1998 and John Deere in 2000).

### *Growth in Domestic Sales*

Growth in domestic sales of tractors has followed a similar trend: an annual growth rate of 8.3 per cent was registered between 1990 and 1997, followed by a decline of –7.5 per cent per year between 1997 and 2003, and a recovery at 10.5 per cent after 2003–04 (Table 2 and Appendix Table A1). The sharp fall in sales between 1997–98 and 2002–03, of around 40 per cent, resulted in an inventory pile-up of over 65,000 units by the end of 2002–03, almost twice the level that the industry regarded as acceptable (EPWRF 2003). The strategies followed by manufacturers to counter this included cutbacks in production and a search for export markets (*ibid.*). As discussed below, from the beginning of the 2000s, exports of tractors expanded rapidly.

### *Growth in Exports*

India started exporting tractors in 1987–88, and there has been a consistent increase in exports since then. Over the last two decades, from 1989–90 to 2009–10, exports grew at an annual compound rate of growth of 28.5 per cent (Table 3). The growth rate was above 30 per cent in the first two phases, but declined to 19 per cent after

**Table 2** *Growth rate of domestic sale of tractors, 1989–90 to 2009–10*

Period	Annual compound rate of growth
1989–90 to 1997–98	8.3
1997–98 to 2003–04	–7.5
2003–04 to 2009–10	10.5
1989–90 to 2009–10	4.4

*Note:* See note in Table 1.

*Source:* *Annual Report*, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, various years.

**Table 3** *Growth rate of export of tractors, 1989–90 to 2009–10*

Period	Annual compound rate of growth
1989–90 to 1997–98	41.3
1997–98 to 2003–04	34.0
2003–04 to 2009–10	19.0
1989–90 to 2009–10	28.5

*Note:* See note in Table 1.

*Source:* United Nations Commodity Trade Database.

2003–04. This decline was mainly due to a big fall in exports in the financial year 2009–10. In 2009–10, India exported 34,984 tractors (Appendix Table A1).

Exports rose both in absolute terms and as a percentage of total sales. Starting from less than 1 per cent in 1987–88, India's export of tractors as a percentage of sales increased to nearly 14 per cent in 2008–09. Thus, external demand became an important factor in keeping the tractor industry buoyant in the late 2000s. To boost the country's export potential of tractors, a 4 per cent duty refund on exported tractors was announced under the Duty Entitlement Passbook scheme of 2009.<sup>7</sup> Under this scheme, the basic import duty on imports of items for the manufacture of products that are meant for export is refunded to manufacturers.

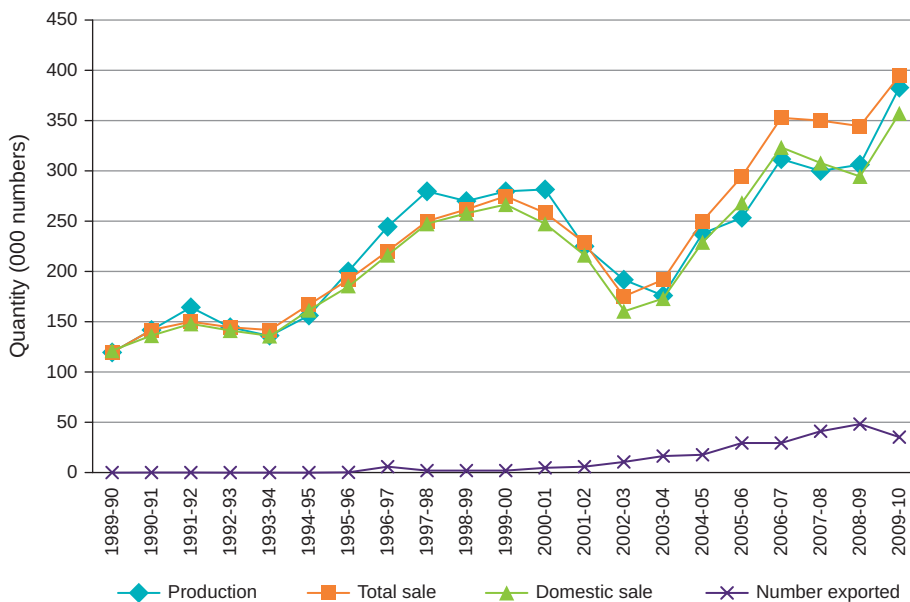
The growth in volume of exports has been accompanied by a gradual widening of the international market for Indian tractors (Patel and Gandhi 1996). In 1987–88, tractors were exported to seven countries; the number rose to 26 countries in 1993–94 (*ibid.*). In 2009, India exported tractors to as many as 98 countries. The USA, Turkey, Nepal, Bangladesh, and Sri Lanka were the major export destinations: the share of these five countries in total quantity exported and total value of exports was 68.5 per cent and 59.2 per cent respectively.<sup>8</sup>

Trends in the growth of production, domestic sales, exports, and total sales of tractors from 1989–90 to 2009–10 are shown in Figure 1.

A few points clearly emerge from the preceding discussion. First, barring the period of 1997–98 to 2002–03, there was more or less a steady increase in the production and sales of tractors in India. Secondly, the phases of growth of the tractor industry corresponded with phases of growth of agriculture. Thirdly, the period of rapid growth of the tractor industry since 2003–04 partly overlaps with the upward surge in industrial production in general in the 2000s, and with the post-liberalisation growth of the Indian automobile industry in particular. This suggests that, apart from the performance of the agricultural sector, the general industrial environment and

<sup>7</sup> See Press Trust of India, "Tractor Exporters to get 4% Duty Refund," *Business Standard*, October 21, 2009.

<sup>8</sup> See Mail Today Bureau, "India Still Tiny Player in Auto Export Market," *India Today*, October 5, 2010.



**Figure 1** Production, domestic sales, export, and total sales of tractors in India, 1989–90 to 2009–10

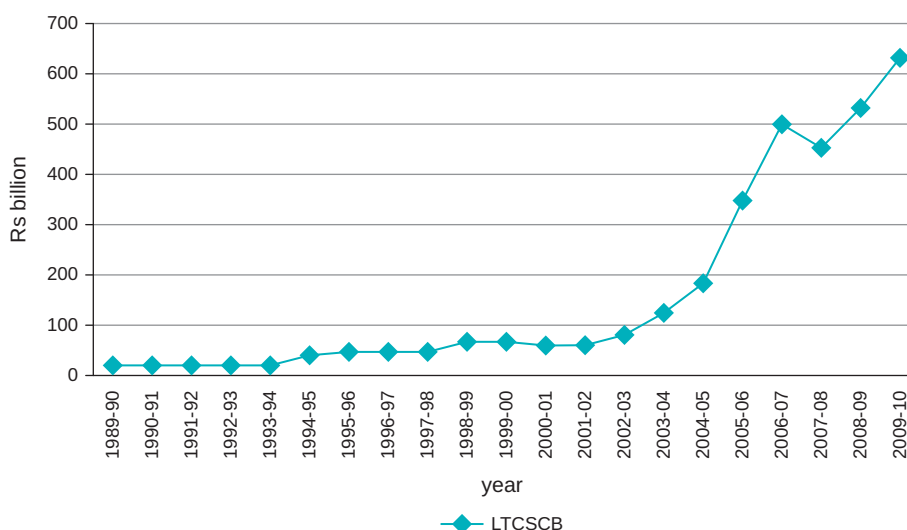
Source: *Monthly Abstract of Statistics*, CSO, various issues; *Annual Report*, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, various years; United Nations Commodity Trade Database.

internal dynamics of the industry have had a role to play in determining the course of the tractor industry. Lastly, the external demand for tractors of Indian make was an important source of tractor sales in the 2000s.

### THE ROLE OF CREDIT IN TRACTOR SALES

Many factors affect domestic sales of tractors, including the growth of farm output and incomes, steady availability of finance, the minimum support prices of agricultural products, the state of the monsoon, public investment in the farm sector, the spread of contract farming, and the demand for labour (influenced, in recent years, by the implementation of the National Rural Employment Guarantee Act and Scheme). (EPWRF 2003; CRISIL 2011). In this paper, I examine only two of these factors, namely, trends in the availability of long-term credit and the growth of public investment over the last two decades.

Formal credit plays a major role in financing the purchase of machinery. According to Pingali (2004), “nearly 95 per cent of purchases of mechanised power in India were through loans taken from banks and agricultural institutions.” A decline in agricultural credit, along with higher interest rates, is likely to have an adverse effect on tractor purchases. Investment in machinery such as tractors and pump-sets constitutes a major component of private investment in agriculture. In a



**Figure 2** Long-term (direct) credit for agriculture from scheduled commercial banks (LTC-SCB), at current prices, 1989–90 to 2009–10 in Rs billion  
Source: Handbook of Statistics on Indian Economy, RBI, 2012.

less-developed country, there is little doubt that public and private investments are complementary.

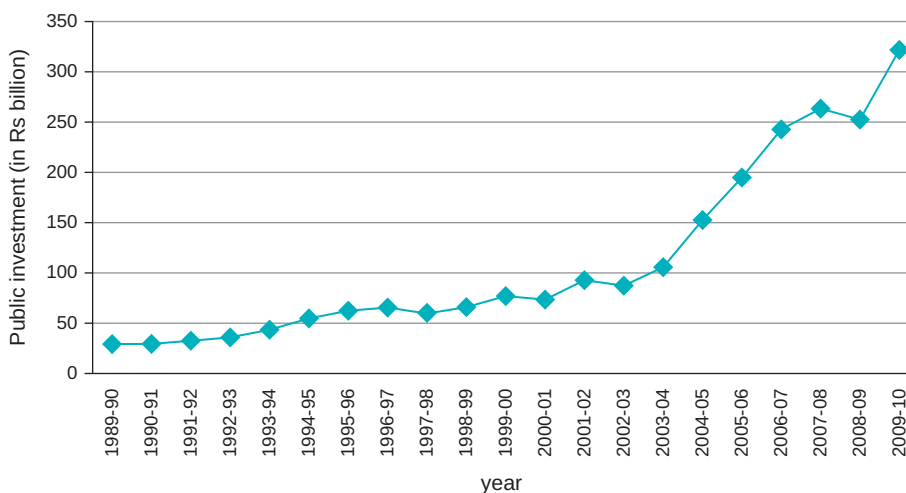
Figures 2 and 3 show a rise in long-term (direct) credit from scheduled commercial banks as well as in public investment (gross capital formation or GCF) in agriculture after 2002–03, following a long period of stagnation (at current prices).<sup>9</sup> Table 4 indicates a slowdown in public investment and flow of credit to agriculture between 1997–98 and 2003–04, and a notable rise thereafter. In a regression exercise where change in domestic sales was the dependent variable, the coefficients of both long-term credit and public investment were positive.<sup>10</sup>

While we have identified some of the factors that affect tractor sales at the aggregate level, and tested the relationship between tractor sales on the one hand, and long-term credit from formal sector banks and public investment in agriculture on the other, there are several other factors – such as the scope for custom work, marketing strategies of manufacturers, expenditure on advertising, dealer networks, modes of payment, and so on – that affect tractor sales, and that must be studied in detail for a more complete picture of the determinants of tractor sales.

<sup>9</sup> We have not converted the series into constant prices for methodological reasons, but it is clear that, after adjusting for inflation, the growth of both investment and agricultural credit is likely to be very low during the late 1990s to 2003 period.

<sup>10</sup> The regression used the first difference of domestic sales of tractors as the dependent variable, and a de-trended first difference of long-term (direct) credit to agriculture (LTCSCB) and public investment in agriculture (GCF) as independent variables (see Sarkar 2013).





**Figure 3** *Public investment (gross capital formation) in agriculture, at current prices, 1989-90 to 2009-10 in Rs billion*

Source: National Accounts Statistics, CSO, various years.

**Table 4** *Annual compound growth rate (CGR) of production of tractors, public investment in agriculture (at current prices), and long-term credit for agriculture from scheduled commercial banks (at current prices), over different periods*

Period	Domestic sale of tractors	Public investment in agriculture (GCF)	Long-term (direct) credit for agriculture from scheduled commercial banks
1989-90 to 1997-98	8.3	12.0	12.0
1997-98 to 2003-04	-7.5	9.3	10.2
2003-04 to 2009-10	10.5	18.0	30.0
1989-90 to 2009-10	4.4	12.5	19.0

Source: For domestic sales: *Annual Report*, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, various years; for public investment: *National Accounts Statistics*, CSO, various years; for credit: *Handbook of Statistics on Indian Economy*, RBI, 2012.

### STATE-WISE SALE OF TRACTORS

We begin this section with a look at the State-wise density of tractors in India, as measured by the number of tractors per 1,000 hectares of net sown area. Table 5 shows that there is great disparity across States in the number of tractors per 1,000 hectares of net sown area, with Punjab and Haryana being in a class apart. In general, there are more tractors per 1,000 hectares of net sown area in northern Indian States than elsewhere.

Although huge regional disparities still exist in the level of tractorisation in the country, recent data on State-level tractor sales show that growth has been relatively

**Table 5** *Number of tractors per 1,000 hectares of net sown area, 2005–08, by State*

State	Number of tractors per 1,000 hectares of net sown area
Andhra Pradesh	8.2
Assam	0.5
Bihar	13.1
Gujarat	15.2
Haryana	56.4
Jammu & Kashmir	6.9
Karnataka	6.0
Kerala	1.0
Madhya Pradesh	13.2
Maharashtra	5.9
Orissa	2.9
Punjab	79.3
Rajasthan	18.9
Tamil Nadu	9.8
Uttar Pradesh	47.0
West Bengal	3.5

*Note:* Computed from Bhalla and Singh (2012).

high in States where tractor penetration in agriculture was low initially. Thus, over the last two decades, western, eastern, and southern India have emerged as the major markets for tractors. In the more heavily mechanised regions of northern India, the annual growth rate of the sale of tractors was sluggish or even negative in this period: 2.5 per cent in Uttar Pradesh, –2.6 per cent in Punjab, and 0.2 per cent in Haryana (Table 6).<sup>11</sup>

The differential pattern of growth in sales, with faster growth in the initially laggard States, has reduced the regional concentration of tractor sales over time. To illustrate, the share of the top five States in total tractor sales was 55 per cent during the period 2004–05 to 2009–10, as compared to 70 per cent during the period 1990–91 to 1994–95. The value of the Hirschman–Herfindahl index (HHI) has declined, indicating diversification in State-wise sales of tractors over time (Table 7).

<sup>11</sup> The viability of investment in and the under-utilisation of tractors in States like Punjab and Haryana have been discussed in various forums. According to a study by the Punjab Agricultural University (PAU), there were 410,000 tractors in Punjab, which is much higher than the 150,000 tractors the State actually needs (EPWRF 2003). A recent study shows that tractors are used for 751.26 hours per year, on average, in Punjab, which is far below the standard norm of 1,000 hours per year, and that nearly 70 per cent of farmers in Punjab use tractors for 500 hours, which is even lower (Singh 2010). Leading manufacturers of tractors now believe that the market for their product in States like Punjab and Haryana is saturated, and that they need to focus on other regions of the country, where the level of mechanisation is low (*Indian Express* 2008).

**Table 6** *Growth rate of sale of tractors, 1990–91 to 2009–10, by State*

State	Annual compound growth rate
Andhra Pradesh	9.9
Assam	10.2
Bihar	9.2
Gujarat	4.4
Haryana	0.2
Himachal Pradesh	14.5
Jammu & Kashmir	9.9
Karnataka	8.2
Kerala	–1.6
Maharashtra	6.4
Madhya Pradesh	4.0
Orissa	14.3
Punjab	–2.6
Rajasthan	4.8
Tamil Nadu	5.3
Uttar Pradesh	2.5
West Bengal	11.2

*Note:* See note in Table 1.

*Source:* Computed from CIAE (2010).

Further, there has also been a change in the composition of the top five States with respect to tractor sales. While Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, and Rajasthan were the top five in the early 1990s (1990–91 to 1994–95), by the end of the 2000s, Punjab, Haryana, and Madhya Pradesh had been replaced by Andhra Pradesh, Maharashtra, and Gujarat.<sup>12</sup>

Some of the growing demand for tractors is also due to an increase in the use of tractors in construction work. According to Escorts, the company witnessed a nearly 70 per cent increase in the demand for tractors from the infrastructure sector in States such as Maharashtra and Gujarat (Mukherjee and Modi 2011). Similarly, in Bihar, tractor sales have tripled in recent years due to an infrastructure boom (*ibid.*).

<sup>12</sup> If we follow the convention in Bhalla and Singh (2009) of categorising the States of India into four regions – northwest, central, eastern, and southern – then, among the five States which emerged as major markets for tractor sales during this period, four States – Rajasthan, Maharashtra, Gujarat, and Madhya Pradesh – fell in the central region, and one State – Andhra Pradesh – fell in the southern region. The authors have shown that in the post-liberalisation era (1990–93 to 2003–06), the central region showed relatively better agricultural performance than the other regions. Output and yield growth rate were higher in the States belonging to this region than in other parts of the country. The growth rate of value of output and yield per hectare between 1990–93 and 2003–06 in the central region were 3.2 per cent and 2.6 per cent per annum respectively, while the average output and yield for the country as a whole grew at 1.7 per cent and 1.5 per cent annually. Growth rates of value of output of the individual States comprising the central region – Rajasthan, Maharashtra, Gujarat, and Madhya Pradesh – were 3.2, 2.1, 5.3, and 2.5 per cent per annum respectively, and growth rates of yields in these States were 2.3, 2.2, 4.6, and 1.9 per cent per annum respectively. In comparison, in Andhra Pradesh, output and yield grew at 1.76 per cent and 2.17 per cent per annum respectively.

**Table 7** *Share of States in the sale of tractors over different periods*

State	1990–91 to 1994–95	1995–96 to 1999–2000	2000–01 to 2004–05	2005–06 to 2009–10
Andhra Pradesh	4.8	5.4	7.2	11.5
Assam	0.2	0.2	0.3	0.6
Bihar	2.9	4.2	7.2	5.5
Gujarat	6.9	8.4	6.1	8.0
Haryana	12.3	9.1	6.6	7.2
Himachal Pradesh	0.1	0.2	0.3	0.3
Jammu & Kashmir	0.3	0.2	0.6	0.4
Karnataka	3.6	3.9	5.1	6.7
Kerala	0.4	0.3	0.2	0.3
Madhya Pradesh	9.2	12.0	14.1	8.0
Maharashtra	5.1	6.8	4.6	8.8
Orissa	0.6	0.7	1.9	2.1
Punjab	16.9	11.9	8.1	6.2
Rajasthan	8.5	9.7	8.5	9.8
Tamil Nadu	4.4	4.3	4.0	5.7
Uttar Pradesh	23.2	21.5	24.1	17.0
West Bengal	0.7	1.0	1.3	2.0
Total	100.0	100.0	100.0	100.0
Measures of regional concentration				
Share of top 5 States	70.0	64.2	62.0	55.0
HHI	0.12	0.11	0.1	0.07

*Note:* HHI is defined as  $\sum_{i=1}^N S_i^2$ . Here,  $S_i$  is defined as the share of the  $i$ -th State and  $N$  is the number of States. The value of HHI ranges from  $1/N$  to 1. The higher the value of HHI, the higher is the concentration.

*Source:* Computed from CIAE (2010).

While no segment-wise data are available on the purchase of tractors, according to the Tractor Manufacturers Association, around 10–12 per cent of tractors sold in the domestic market are used in the construction sector (*ibid.*).

It should be noted that while there has been an increase in the sale of tractors and a closing of the gap between States with respect to sales, there remain wide State-wise variations in the use of tractors. Reported below is a section of the results on use of tractors in different agro-economic regions of India, from a large-scale survey conducted by the National Bank for Agriculture and Rural Development (NABARD) in 2001, on various economic aspects of tractors in India.

Table 8 shows the average annual use of tractors across different agro-climatic regions in the country in 2001. If we assume 1,000 hours per year as the standard annual norm for use of tractors, then, on average, only 59.5 per cent of the total annual capacity was used in the country at that time. Wide variations existed in capacity utilisation across regions. Capacity utilisation was highest in the Karnataka

**Table 8** *Annual hourly use of tractors on own farm and in custom hiring*

Agro-climatic region	Tractor use (in hours)			Total use of tractor time as percentage of standard norm of 1,000 hours
	Own Farm	Custom Hiring	Total	
<b>Trans Gangetic Plains Region</b>	469	85	554	55.4
Punjab Plains Division (Arid Zone)	317	66	383	38.3
Punjab Plains Division (Semi-arid Zone)	631	106	737	73.7
<b>Middle Gangetic Plains Region</b>	396	112	508	50.8
Bihar Plains Division	396	112	508	50.8
<b>Western Dry Region</b>	36	494	530	53.0
Rajasthan Dry Division	36	494	530	53.0
<b>Central Plateau and Hills Region</b>	333	274	608	60.8
Eastern Plains and Hills Division	245	433	678	67.8
Northern Plains Division	443	178	621	62.1
Central Plateau and Hills Division	413	167	580	58.0
Vindhya Hills and Plateau Division	248	298	546	54.6
<b>Southern Plateau and Hills Region</b>	721	261	982	98.2
Karnataka Plateau Division	721	261	982	98.2
<b>Eastern Plateau and Hills Region</b>	228	128	356	35.6
Bihar Chhotanagpur Plateau Division	228	128	356	35.6
<b>Western Plateau and Hills Region</b>	419	333	752	75.2
Malwa Plateau Division	419	333	752	75.2
<b>West Coast Plains and Ghats Region</b>	400	112	512	51.2
Mysore Coastal and Hills Division	400	112	512	51.2
<b>Gujarat Plains and Hills Region</b>	344	218	562	56.2
Gujarat Plains and Hills Division	518	126	644	64.4
Western Dry Division	363	247	610	61.0
Saurashtra Plains Division	215	261	476	47.6
<b>All Regions</b>	383	212	595	59.5

*Source:* Reproduced from Kishor and Mor (2001).

Plateau Division (98.2 per cent) and lowest in the Punjab Plains Division (Arid Zone) (38.3 per cent).

To summarise, the major trends from State-level data on tractor sales are as follows. In spite of the established and widely discussed fact of regional concentration of the level of tractorisation, there has been increasing diffusion in State-wise sales of tractors over the last two decades. The southern and western States have witnessed rapid growth in tractor sales. In particular, the States of Andhra Pradesh, Maharashtra, and Gujarat have emerged as major hubs of tractor sales in recent years. The data also show an increase in the non-agricultural use of tractors and severe under-utilisation of capacity of tractors in certain parts of the country.

## CONCLUDING REMARKS

This paper has examined the pace and pattern of tractorisation in Indian agriculture in the period from 1989 to 2009, using data on production and sales of tractors. It would have been useful to complement this analysis with data from buyers. Unfortunately, however, since only aggregate data are available on expenditure on agricultural machinery in different rounds of the All-India Debt and Investment Survey, it has not been possible to separate expenditure on tractors from expenditure on other machinery.

Tractor production in India began in 1961. Today, more than five decades later, India is one of the leading manufacturers of tractors in the world, and exports tractors to many countries. Overall, there was a three-fold increase in tractor production and sales over the last two decades, that is, from 1989–90 to 2009–10. The growth was not uniform over the years, however, and there were at least three periods of negative growth for two or more successive years. The first of these was immediately after liberalisation in 1991, and the second was in the late 1990s and early 2000s. There was a dip in production and sales in the early 1990s and a much larger fall in 2000–03, which was also a period of a serious agricultural crisis. There was another small decline, the third, during 2007–09.

Broadly, the growth in production of tractors may be divided into three phases: a phase of high growth from 1989–90 to 1997–98, followed by a phase of recession between 1998–99 and 2003–04, and, finally, a recovery phase from 2004–05 to 2009–10. These three phases of growth correspond roughly to three phases of change in India's agrarian economy. The last phase of recovery was also a period of growth in the country's industrial sector and in the automobile industry in particular.

While the factors affecting the growth in tractor sales are many, this note has examined two in detail: long-term (direct) credit for agriculture from scheduled commercial banks and public investment in agriculture. It was found that changes in these two have had a positive and significant effect on the growth of tractor sales. Further, during the 2000s, exports grew rapidly and export demand boosted domestic manufacturing.

An analysis of tractor sales across Indian States showed that growth was more rapid in States with an initially low level of tractorisation, resulting in a decline in the concentration of sales over time. In particular, growth declined or was even negative in Punjab, Haryana, and Uttar Pradesh, while it rose in states from the south, east, and west of India. In the early 1990s (1990–91 to 1994–95), Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, and Rajasthan were the top five States in terms of average sales of tractors per year, but by the late 2000s (2004–05 to 2009–10), Punjab, Haryana, and Madhya Pradesh had been replaced by Andhra Pradesh, Maharashtra, and Gujarat in the list of the top five States.

In conclusion, these data indicate that domestic production and sales of tractors grew at a rapid pace during most of the years of the 1990s and 2000s with a few exceptions. The data do not support the view of an undifferentiated rural economic decline after 1991. On the contrary, they indicate continued and sizeable capital accumulation (by purchase of tractors) by some sections and in certain regions in the countryside over the last two decades.

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Appendix Table A1 *Production, sales and export of tractors, 1989–90 to 2009–10*

Year	Production (000 numbers)	Annual percentage change in production	Total sales (000 numbers)	Annual percentage change in total sales	Domestic sales (000 numbers)	Annual percentage change in domestic sales	Quantity exported	Annual percentage change in export	Export as percentage of total sales
1989–90	125	–	122	–	122	–	360	–	0.29
1990–91	143	14.40	140	14.75	139	14.56	371	3.06	0.27
1991–92	166	16.08	151	7.86	150	7.74	325	–12.40	0.22
1992–93	147	–11.45	144	–4.64	143	–4.51	845	160.00	0.59
1993–94	139	–5.44	139	–3.47	138	–3.94	1041	23.20	0.75
1994–95	158	13.67	165	18.71	163	18.02	2163	107.78	1.31
1995–96	202	27.85	191	15.76	188	15.74	3041	40.59	1.59
1996–97	245	21.29	221	15.71	217	15.32	3811	25.32	1.72
1997–98	278	13.47	251	13.57	248	14.36	2890	–24.17	1.15
1998–99	273	–1.80	262	4.38	259	4.38	3136	8.51	1.20
1999–2000	280	2.56	273	4.20	270	4.34	2746	–12.44	1.01
2000–01	285	1.79	255	–6.59	250	–7.56	4827	75.78	1.89
2001–02	226	–20.70	225	–11.76	220	–12.12	5587	15.74	2.48
2002–03	192	–15.04	173	–23.11	162	–26.07	10682	91.19	6.17
2003–04	179	–6.77	190	9.83	175	7.64	15515	45.24	8.15
2004–05	242	35.20	248	30.53	231	32.32	16216	4.52	6.55
2005–06	254	4.96	296	19.35	268	15.79	28247	74.19	9.54
2006–07	311	22.44	353	19.26	324	21.14	28318	0.25	8.03
2007–08	304	–2.25	347	–1.70	308	–5.04	38407	35.63	11.08
2008–09	303	–0.33	343	–1.15	295	–4.09	47344	23.27	13.81
2009–10	383	26.40	394	14.87	359	21.44	34984	–26.11	8.88

*Note:* These are estimates of “complete tractors” only, produced in the country as provided by CSO (and also *Economic Survey*, Ministry of Finance, Government of India).

However estimates of tractor production as provided by different manufacturers’ associations, such as the Tractor Manufacturers Association (TMA), Automotive Component Manufacturers Association (ACMA), etc., are a little different. Specifically, estimates of tractor production provided by manufacturers’ associations in the period after 2002–03 are higher than the CSO estimates. Hence there are differences in periodic growth rates of production of tractors. But all these databases show the same broad trends in tractor production.

*Source:* *Monthly Abstract of Statistics*, CSO, various issues; *Annual Report*, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, various years; United Nations Commodity Trade Database.