Global market assessment of 3PL and PMP products in Agriculture and Construction Equipment

April 2022

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1. World Economy Overview and Outlook

Summary

The global recovery continues, but the momentum has weakened due to the resurgence of Covid-19 infections fuelled by the highly contagious delta and omicron variants. Pandemic outbreaks in critical links of global supply chains have resulted in longer-than-expected supply disruptions, further feeding inflation in many countries. Overall, risks to economic prospects have increased, and policy trade-offs have become more complex.

Fiscal 2020 was volatile for the global economy. The first three quarters were ensnared by trade protectionist policies and disputes among major trading partners, volatile commodity and energy prices, and economic uncertainty arising from the Brexit. Hopes for a broad-based recovery in the fourth quarter were dashed by the Covid-19 pandemic, which led to considerable human suffering and economic disruption.

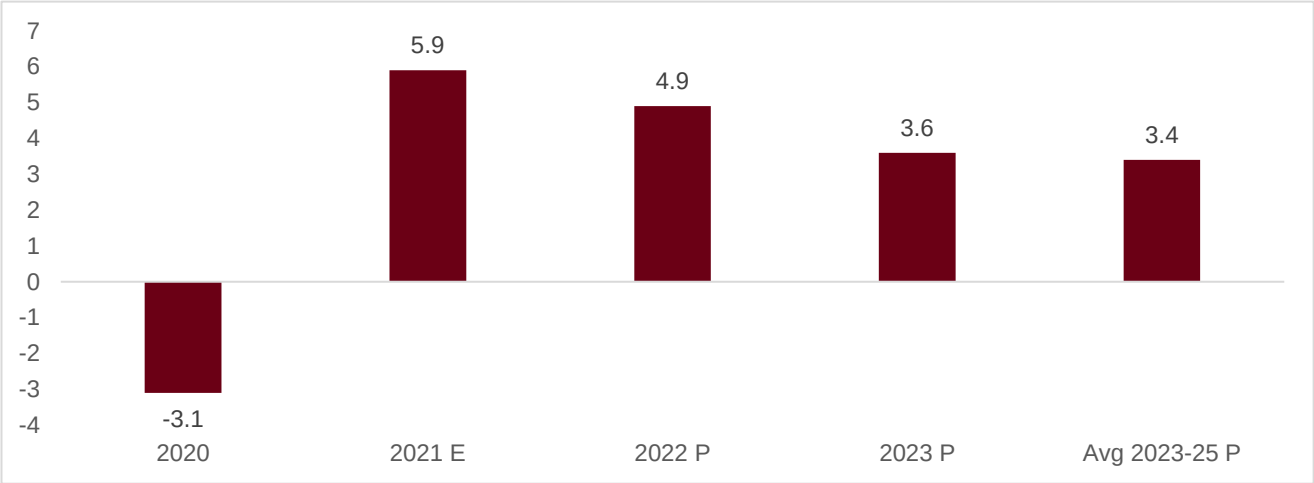
As per the International Monetary fund (IMF), the global economy is projected to grow 5.9% in 2021 and 4.9% in CY 2022. The CY 2021 global forecast is unchanged from the April 2021 outlook, but with offsetting revisions. Prospects for emerging market and developing economies have been marked down for CY 2021, especially for emerging Asia. By contrast, the forecast for advanced economies has been revised up. These revisions reflect pandemic developments and changes in policy support. The 0.5% revision on the upper side for CY 2022 derives largely from the forecast upgrade for advanced economies, particularly the United States (US), reflecting the anticipated legislation of additional fiscal support in the second half of CY 2021 and improved health metrics more broadly across the group.

Close to 45% of the population in emerging market and developing economies such as India and Russia have been fully vaccinated as of 17th January 2022. China has vaccinated 80% of its population, compared with close to 60%, 70% and 80% in advanced economies such as USA, Euro area and Japan respectively. Low-income developing countries have tiny fraction of their population vaccinated. Faster-than-expected vaccination rates and return to normalcy have led to upgrades, while lack of access to vaccines and renewed waves of Covid-19 in some countries, notably India, have triggered downgrades.

Divergences in policy support are a second source of the deepening divide. We are seeing continued sizeable fiscal support in advanced economies, with $4.6 trillion of announced pandemic-related measures available in CY 2021 and beyond. The upward global growth revision for CY 2022 largely reflects anticipated additional fiscal support in the US and from the Next Generation European Union funds.

While more widespread vaccine access could improve the outlook, risks on balance are tilted to the downside. The emergence of highly infectious virus variants could derail the recovery. Financial conditions could also tighten abruptly amid stretched asset valuations, if there is a sudden reassessment of the monetary policy outlook, especially in the US. Stimulus spending in the US could also prove weaker than expected. A worsening pandemic and tightening financial conditions would inflict a double hit on emerging market and developing economies and severely set back their recoveries.

IMF estimates of World GDP growth (in %)



Source: IMF

Note: Period for all years denoted by calendar year

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agricultural sector

Rising food prices have focused increased attention on global agricultural production and supply chains in the past year. Currently, supplies of many commodities remain at their tightest levels in years, and that is likely to prolong inflationary pressure for food into the new year.

As a result, 2022 will be another year of unprecedented supply and demand shocks, tight food supplies, and uncertain climate conditions.

For wheat, the global supply and demand balance is the tightest it has been in many years, and wheat futures prices rose by double-digit percentages in 2021. Stocks-to-use for major wheat exporting countries combined is at a 13-year low.

Devastating drought in Canada and the US northern Plains sharply reduced spring wheat supplies. Yields in Russia were also impacted by dry weather.

Some recent bright spots in wheat production are Australia and Argentina, and India's yield is off to a strong start.

Consumers could see higher prices for baked goods such as breads, muffins, and cakes as bakeries feel the impact of increased prices for wheat. Noodles and pasta could see the same upward pressure in prices.

Vegetable and edible oils will continue to be key to food inflation in 2022 after a tumultuous 2021 that saw some of the highest prices in 10 years. Demand is expected to continue to grow due to the need for vegetable oils in both food and fuel.

China's feed grain demand will remain high, although the growth in feed grain imports will slow as the hog population stabilizes. However, domestic grain prices are likely to remain high, and susceptible to spikes, after years of drawing down corn and wheat reserves.

The La Niña global weather pattern is back for a second year, which could have big ramifications for 2022 crops around the world. In South America, drier than normal weather could once again reduce harvests of soybeans and corn.

Industrial sector

In December 2020, global industrial production, excluding the United States, grew by 2.8 percent compared to the same time in the previous year, based on three month moving averages. This is compared to a contraction of 1.89 percent in advanced economies (excluding the United States) for the same time. Industrial growth rate tracks the output production in the industrial sector.

Global production value is forecast to recover from the COVID-19 shock and return to steady growth during the period CY2021-2030. The recovery will be associated with middle class expansion in emerging markets, government investment in infrastructure projects and recovery in the B2B segment.

Asia Pacific is forecast to remain the largest region globally by production value and increase its global share slightly by CY2030. Growth in consumer incomes and exports is set to support production value growth in the region's largest economies, namely China, India and Japan.

Companies are expected to increase investment in new technologies and digitisation after the COVID-19 pandemic. To shield themselves from similar risks in the future, manufacturers are anticipated to increase investment in production automation and digital tools that can help to comply with new health measures and increase operational flexibility.

B2B e-commerce sales are forecast to more than double over the period CY2019-2030. Changing consumer preferences and the growing need to invest in new sales channels post-COVID-19 pandemic will drive growth.

To better shield themselves from future risks, companies are expected to increase production localisation of critical components. Production localisation will mainly affect industries providing critical components, such as food products and pharmaceuticals, as well as industries with long supply chains.

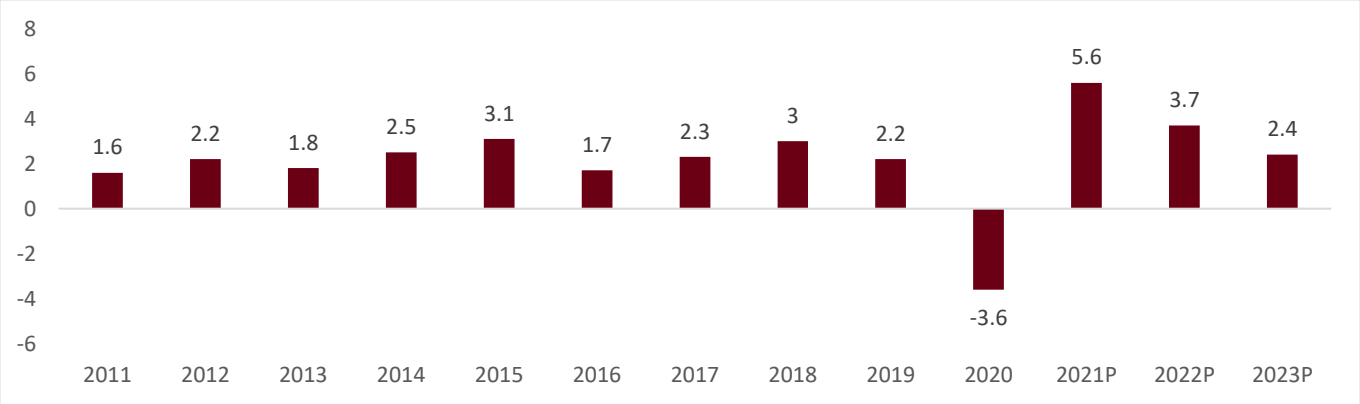
Geography-wise Economic Outlook

United States

Real GDP is anticipated to grow by 5.6% in CY2021, before rising by 3.7% and 2.4% in CY2022 and CY2023 respectively. Supply disruptions will gradually ease, facilitating a rebuild of business inventories and stronger consumption growth in the near-term. With the continued recovery in the labour market, nominal wage growth will pick up further. While price inflation is projected to moderate in some sectors as supply disruptions abate, higher wages, along with recent increases in housing rents and shipping rates, will lead to stronger overall consumer price growth than prior to the pandemic

Real gross domestic product (GDP) increased at an annual rate of 6.9 percent in the fourth quarter of CY2021, following an increase of 2.3 percent in the third quarter. The acceleration in the fourth quarter was led by an upturn in exports as well as accelerations in inventory investment and consumer spending. In the fourth quarter, COVID-19 cases resulted in continued restrictions and disruptions in the operations of establishments in some parts of the country. Government assistance payments in the form of forgivable loans to businesses, grants to state and local governments, and social benefits to households all decreased as provisions of several federal programs expired or tapered off.

GDP growth (annual %)



Source: World Bank

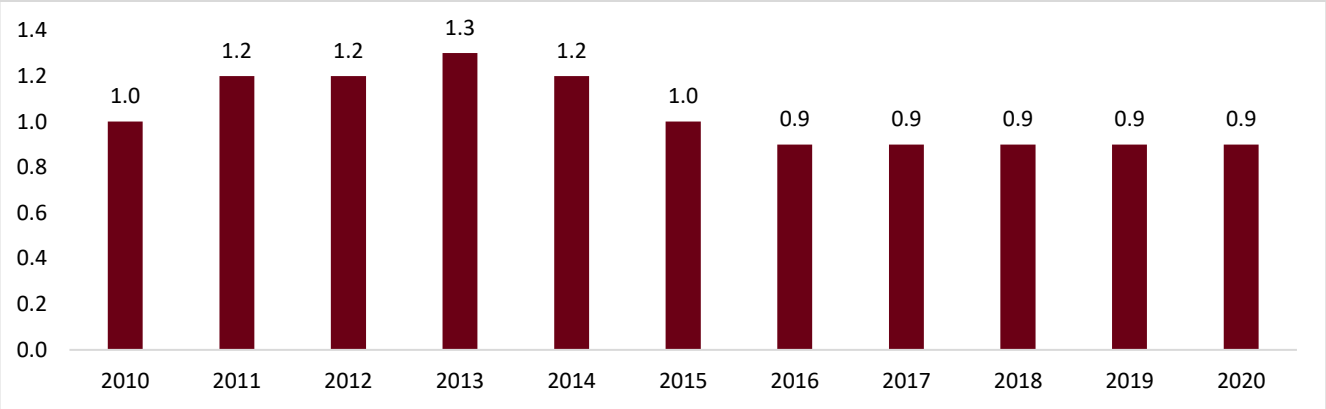
Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agricultural Sector

- The region is a notably important contributor to global agriculture.
- Agriculture represents less than 2% of output. However, large amounts of arable land, advanced farming technology and generous government subsidies make the U.S. a net exporter of food and the largest agricultural exporting country in the world.
- The region produces 10% of global agricultural and fish output. It has the most agricultural land and provides the highest value of agricultural and fish production per capita. Over the CY2018-20 base period, the region had the second largest trade surplus for agricultural commodities.
- Nevertheless, in proportionate terms, the role of North America in global agriculture is slowly diminishing over time, as the output from other regions are growing more quickly.

- The long-term decline in agricultural land use has slowed in recent years, but land utilised for crop production continues to trend downwards and contracted by 2.4% over the past decade. Yields have improved to the extent that the value of crop production increased by 17% over the same period. This trend is expected to continue.
- Following a recovery in per capita GDP of almost 3% per annum in CY2021 and CY2022, real per capita income is projected to grow at an average of 1.4% p.a. over the coming decade.

Agriculture Value added percentage of GDP

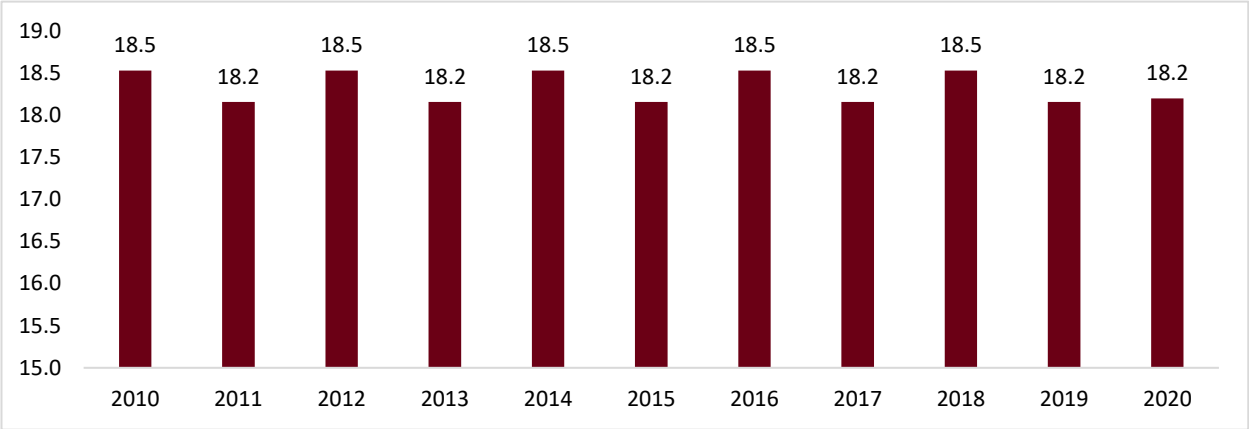


Source: World Bank

Industrial Sector

- Manufacturing, which accounts for 11.9% of the U.S. economy, remains supported by lean inventories at businesses as demand for goods remains strong. But COVID-19 and the recovery from the pandemic have overstretched supply chains, igniting inflation.
- Manufacturing production increased at a 4.9% annualized rate in the fourth quarter after rising at a 4.0% rate in the July-September quarter.
- Manufacturing output dropped 0.3% in December 2021 after increasing 0.6% in November 2021 as production at U.S. factories unexpectedly fell, pulled down by a decline in output at motor vehicle plants amid an ongoing global semiconductor shortage.
- Despite facing challenges at the domestic level along with a rapidly transforming global landscape, the U.S. economy is still the largest and most important in the world. The U.S. economy represents about 20% of total global output and is still larger than that of China.
- Mining production rose 2.0%. Industrial production grew at a 4.0% rate in the fourth quarter. That followed a 3.5% pace of increase in the third quarter.
- Capacity utilization for the manufacturing sector, a measure of how fully firms is using their resources, decreased 0.2 percentage point to 77.0% in December. Overall capacity use for the industrial sector slipped 0.1 percentage point to 76.5% last month. It is 3.1 percentage points below its 1972-2020 average

Industry, value added percentage of GDP



Source: World Bank

Services Sector

- The U.S. economy is dominated by services-oriented companies in areas such as technology, financial services, healthcare and retail.
- GDP From Services in the United States averaged 11409.20 USD Billion from CY2005 until CY2021, reaching an all-time high of 13507 USD Billion in the third quarter of CY2021 and a record low of 9734.70 USD Billion in the first quarter of CY2005.
- During the first half of 2021-22, the services sector grew by 10.8 percent. The Gross Value Added (GVA) of services crossed the pre-pandemic level in the second quarter of 2021-22.
- The services sector—a broad category of the economy that now includes financial services, media, transportation and technology—accounted for 78 percent of GDP in the United States as of CY2020.
- While Gross Value Added (GVA) of services crossed the pre-pandemic level in the second quarter of 2021-22, quarterly GVA of subsector trade, hotels, transport, communication and services related to broadcasting below pre-pandemic level.
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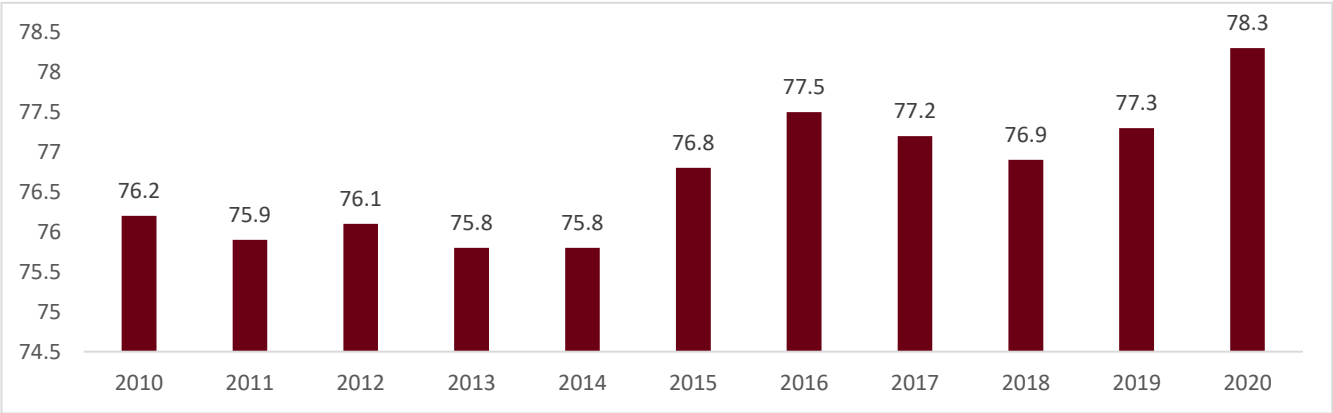
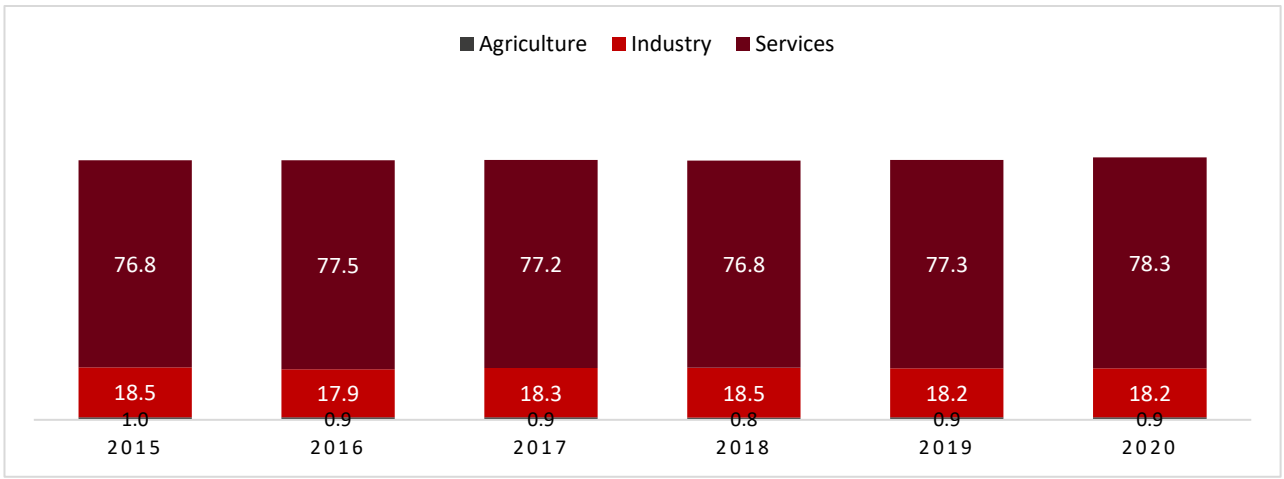
Services, value added percentage of GDP



Source: World Bank

Share of sector in GVA



Source: World Bank

US consumer price inflation at another record high

Rising inflation continued to dominate headlines for the United States (US) economy: Consumer price index-linked (CPI) inflation accelerated 7% on-year in December (6.8% in November). Core inflation, too, jumped 5.5% on-year compared with 4.9% in November. Sequentially, the rise in prices slowed for the second straight month, to 0.5% from 0.8%. Increases in the housing and used cars and trucks indices were the largest contributors to the monthly increase in prices. Notably, the energy index, which was one of the largest contributors to inflation through most of CY2021, declined 0.4% on-month.

In December, the US Federal Reserve (Fed) announced it will double the pace of tapering of asset purchases. Chairman Jerome Powell stated the economy is healthy and in need of a tighter monetary policy, pointing to the Fed's intentions of raising rates through CY2022.

Employment data in the US for December showed a mixed picture: non-farm payroll increased ~2 lakh, lower than the 2.5 lakh in November. But there were sector-wise job gains in contact-based services: notably, in leisure and hospitality, construction, and transportation and warehousing. The unemployment rate declined 0.3 percentage points (pp) over the previous month to 3.9%.

The US trade deficit widened to $80.2 billion in November from $67.2 billion in October, since goods imports increased, and exports decreased. Exports of goods declined $2.9 billion on-month to $155.9 billion, driven by a decrease in capital goods exports (industrial machines, telecom equipment) and industrial supplies (including crude oil). Goods imports increased by a much higher $12.3 billion on-month to $254.9 billion in November, led by industrial supplies, consumer goods, and automotive vehicles.

New infrastructure spending plans should be coupled with strong governance

Boosting public infrastructure investment can support the prospects of the United States economy and the well-being of the population. However, an efficient selection of infrastructure projects is vital, utilising careful cost-benefit analysis that considers inter-jurisdictional spill overs of different projects and the structural shifts since the onset of the pandemic, such as more remote working. Infrastructure priorities also need to be carefully aligned with environmental and climate action plans. In plotting a path to net zero emissions by CY2050, greater use of renewable

sources in electricity generation will be required. Dramatic cost reductions in wind and solar power generation are underpinning their significant expansion. However, ongoing complementary investments to ensure good connections with electricity grids and energy storage capacity (given the intermittent nature of these renewable sources) are needed. More broadly, enhanced pricing of environmental externalities will further encourage emission abatement opportunities.

Europe

The World Bank said economic growth in Europe and Central Asia will slow to 3 percent in CY2022 and decline further to 2.9 percent in CY2023.

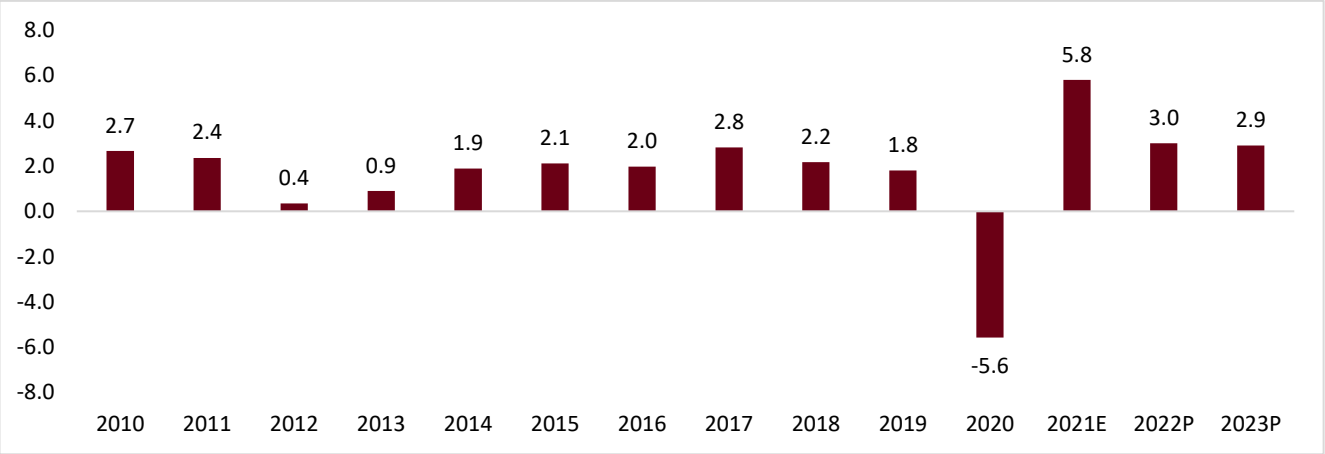
Output in Europe and Central Asia (ECA) is estimated to have expanded by 5.8 percent in CY2021, reflecting a faster-than-expected rebound in domestic demand through most of the year. Firming activity in the euro area and higher commodity prices lifted export growth and remittance inflows, further bolstering the regional recovery. Robust incoming data contributed to upward revisions of estimates for CY2021 growth in about 90 percent of ECA economies.

Recent high-frequency data, however, suggests that the latest surge of the pandemic will be disruptive, including through tighter domestic mobility restrictions and international travel bans. New export orders have slipped, reflecting softening external demand and supply bottlenecks.

Consumer confidence is waning owing to increasing COVID-19 cases, rising inflation, and policy uncertainty. Many of the region's central banks are rapidly withdrawing monetary policy accommodation, prompted by a surge in prices that has pushed inflation above targets in nearly all inflation-targeting economies in the region.

Growth in ECA is forecast to slow to 3 percent in CY2022—about half the pace in CY2021—as tighter macroeconomic policy and recurrent COVID-19 outbreaks, including from Omicron, weigh on demand. Regional growth is forecast to continue to ease in CY2023, reaching 2.9 percent, as fiscal support continues to be withdrawn.

GDP growth (annual %)



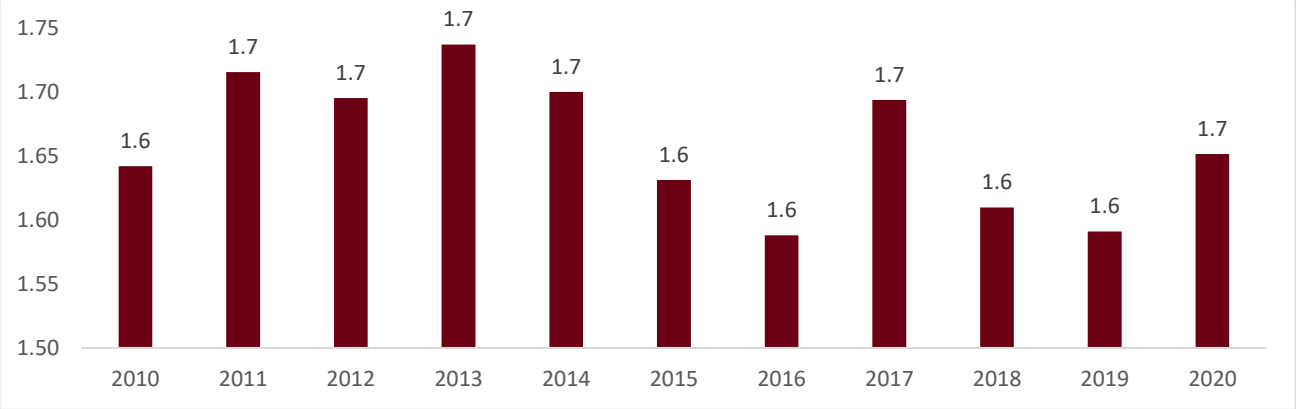
Source: World Bank

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agricultural Sector

- The EU's agricultural industry created an estimated gross value added of EUR 178.4 billion in CY2020.
- Agricultural income per annual work unit is estimated to have fallen slightly for the EU in CY2020 (-0.8 %) but remained an estimated 31.5 % higher than the index level in CY2010.
- The total EU agricultural area is projected to reduce slightly, mainly driven by reduced cereals and oilseed acreage. By contrast, the use of land for pasture, fodder and protein crops is expected to grow.
- Total EU cereal production, thanks to increasing yields, is expected to remain stable at 277 million t. better crop rotation systems, improved soil management and increased use of decision support tools should prop yields. The areas for barley and wheat are projected to decrease, while maize areas should compensate for this by meeting the demand for cereal feed. Domestic use, supported by higher food use, should also stabilise at 260 million tonnes.
- EU farm income is expected to increase due to a rising volume of production and appreciating prices. Crop production is expected to grow faster (1.9% per year).

Agriculture Value added percentage of GDP

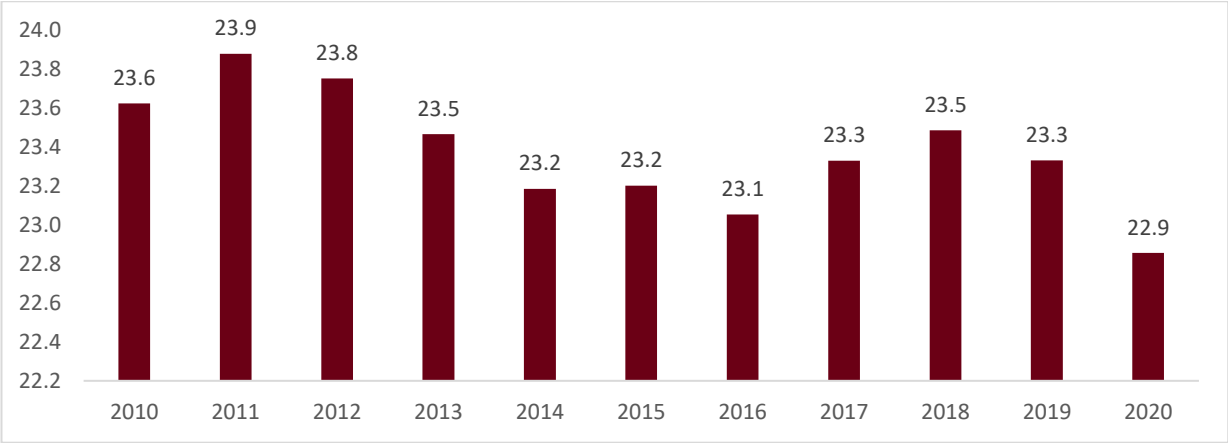


Source: World Bank

Industrial Sector

- In CY2018, industrial production in the EU grew only modestly, in CY2019 it fell by 0.8 %.
- In CY2020, the Covid-19 crisis and the resulting containment measures, such as lockdowns, resulted in a massive reduction in industrial production, especially for durable consumer goods and capital goods. In the subsequent months industrial production partly recovered (for more data on the Covid-19 crisis effects on industrial production see the
- In CY2020, the production of capital goods decreased massively in March and April but then recovered in the subsequent month without, however, regaining the pre-crisis level.
- In the first half of CY2020, the production of durable consumer goods decreased by more than a quarter between February and April but afterwards also increased again very quickly. The production of non-durable goods was a little more stable during this period.
- The eurozone manufacturing PMI fell to 58.0 in December 2021 from 58.4 in November 2021, posting its lowest reading in 10 months.

Industry, value added percentage of GDP

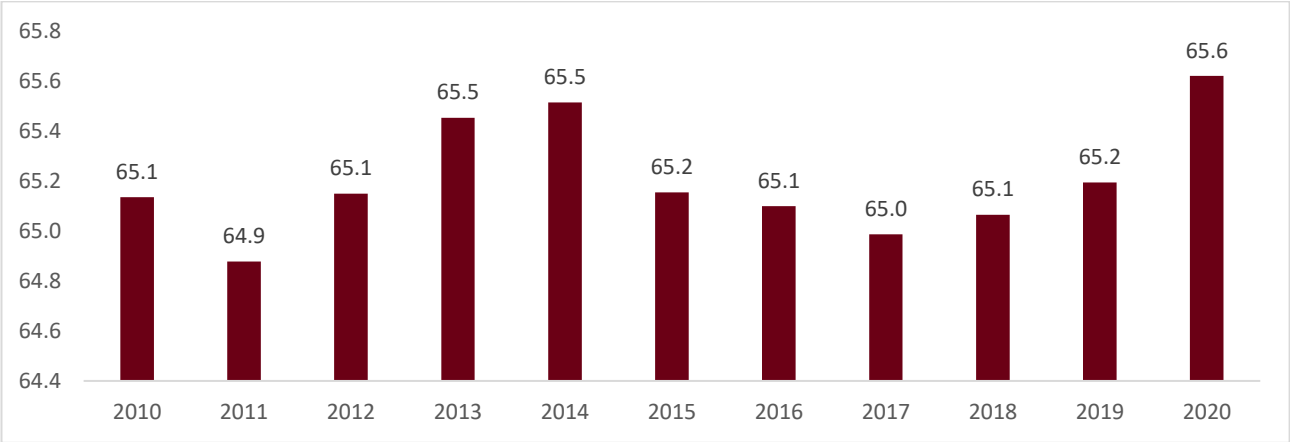


Source: World Bank

Services Sector

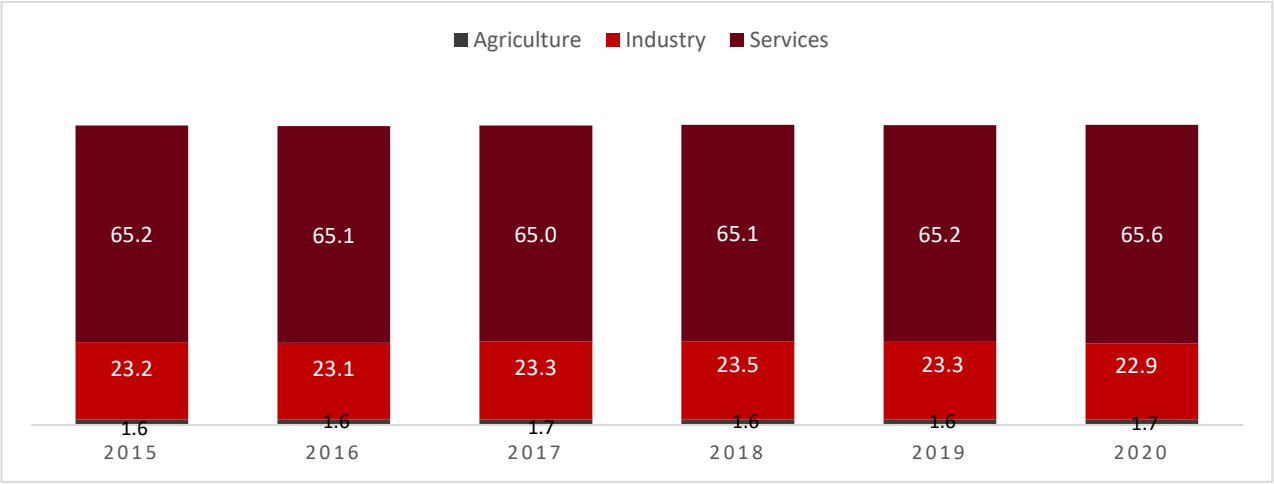
- In CY2020, the service sector contributed the most to the GDP, at 65.6 percent.
- Sectors covered by the Services Directive are retail and wholesale trade, construction, business/professional services, real estate, tourism and some entertainment services.
- Eurozone Services PMI was revised slightly lower to 51.1 in January of 2022 from a preliminary estimate of 51.2, signaling the softest expansion in services output since last April, as the omicron variant of COVID-19 constrained activity. The slower increase in business activity coincided with weaker new order growth. The improvement in demand was the softest seen across the current nine-month sequence of expansion. Nevertheless, backlogs of work continued to rise, and at a quicker pace. To enhance operating capacities, additional staff were hired in January. The rate of job creation was slightly weaker than previously but was still faster than the historical average. Input costs rose substantially and to an extent which was the second quickest on record, surpassed only by last November's peak. Meanwhile, selling price inflation accelerated to a fresh series high

Services, value added percentage of GDP



Source: World Bank

Share of sector in GVA



Source: World Bank

The ECB follows suit in tapering asset purchases

Similar to the Fed's tapering of asset purchases, the ECB also announced scaling back of its Pandemic Emergency Purchase Program in its December monetary policy review. In stated it will decrease its purchases in the first quarter of 2022, before winding down net purchases by March. Unlike the Fed though, which has signalled multiple rate hikes in 2022, the ECB does not expect to raise rates before October 2022.

Inflation in the euro area climbed to 5% in December from 4.9% in the previous month. While still at a record high, the on-year 0.1pp rise is lower than the 0.9pp jump seen over October-November. Energy prices showed the highest on-year increase among the sub- indices: up 26.5% on-year (compared with 27.5% in November). Food inflation rose, as well, becoming the second-largest contributor to headline inflation at 3.2% (vs 2.2% in the previous month). Services inflation slowed 0.3pp to 2.4%.

Europe's unemployment rate continued to trudge lower — 7.2% in November vs 7.3% in the previous month. Compared with October, the number of persons unemployed decreased 2.2 lakh. Among major member countries, the unemployment rate of Germany and France declined 0.1pp to 3.2% and 7.5%, respectively. Italy and Spain saw slightly faster declines of 0.2pp to 9.2% and 14.1%. Countries such as the Netherlands and Austria, which had instituted complete lockdowns in November owing to surge in Covid-19 cases, saw similar declines in unemployment by 0.2 pp.

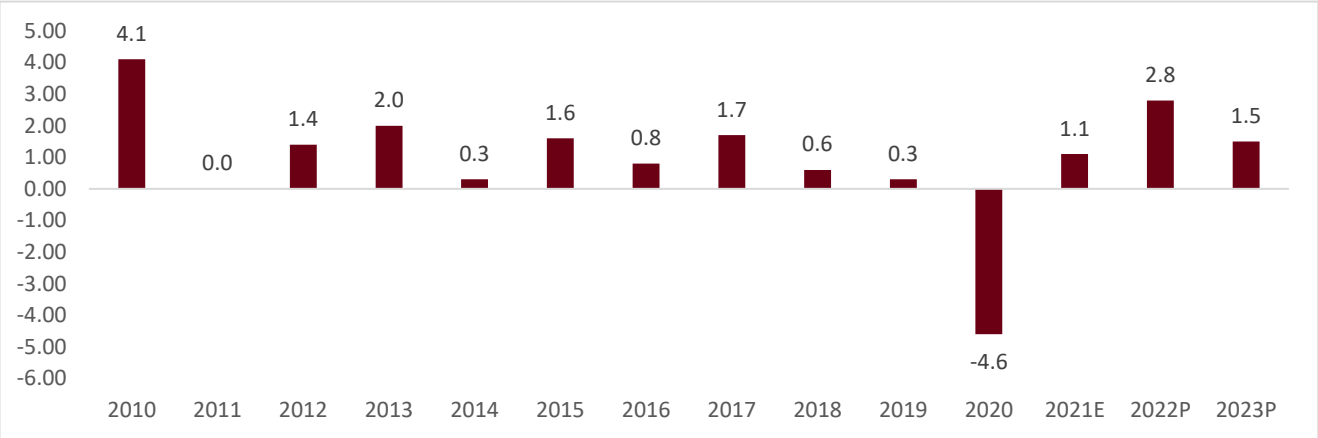
Euro area trade surplus narrowed on-year to €3.6 billion in October from €29.8 billion in the year-ago period. Imports increased 24.1% on-year, while exports grew by a much slower 7.3%. Among trading partners, exports and imports from China grew the highest on-year in January-October 2021, followed by the US and the United Kingdom (UK).

Japan

GDP growth is set to accelerate from CY2021's mild rebound, with higher household spending on the back of a release of pent-up consumer demand driving the upturn, bolstered by higher capital spending and robust government consumption. The resurgent pandemic and the potential for more stringent restrictions remain key

downside risks to the outlook. The economy is expected to be expanding 2.8% in CY2022, which is unchanged from last month's forecast, and 1.5% in 2023.

GDP growth (annual %)



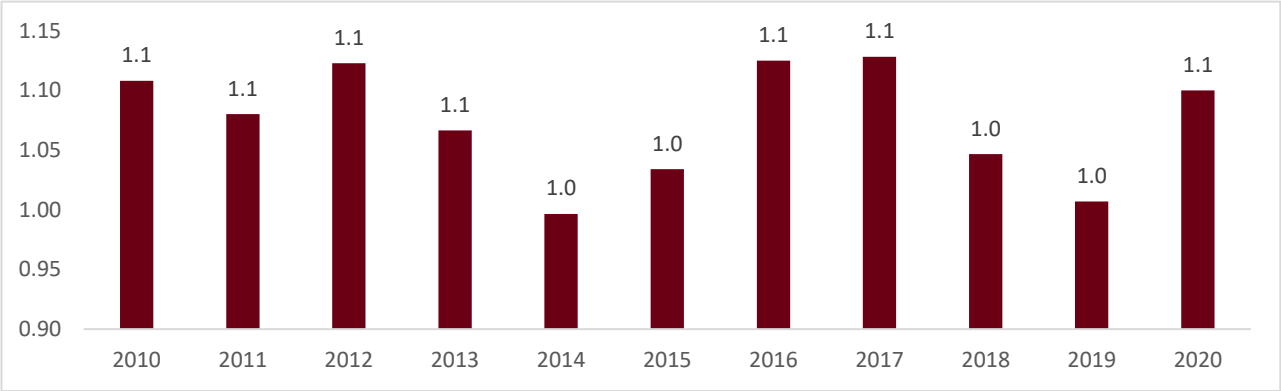
Source: World Bank

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agriculture Sector

- The Japanese agricultural sector accounts for 1.1 percent of the country's GDP. Farming in Japan focuses on crop production, with livestock farming playing a minor role in agricultural activities.
- The agriculture sector contributes only 1.1% to the country's GDP, and as low as 12% of the land is suited for agriculture in the country. As a highly industrialized country, Japan's agriculture equipment industry is also quite developed. However, to fully utilize the limited arable land, the Japanese agriculture equipment market is expected to witness a surge during the forecast period. To sustain its population, compiled with a low level of arable land, Japan strives toward utilizing its agricultural land to its fullest.
- According to the World Bank, total agricultural land in Japan is 12.26 % of the total land. This land is challenging to meet the food demands of the Japanese population with limited agricultural land. This causes the urgency to increase farm productivity, which can be achieved by farm mechanization.

Agriculture Value added percentage of GDP

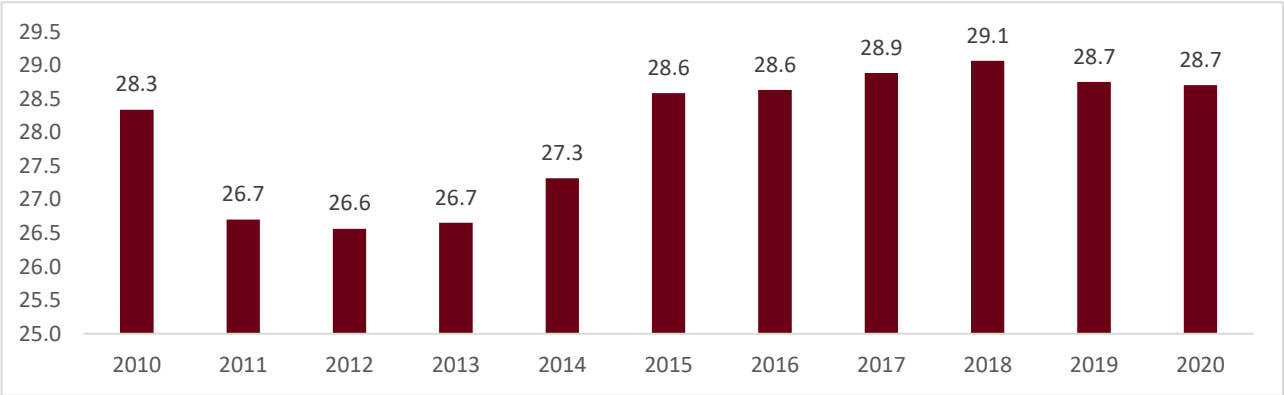


Source: World Bank

Industrial Sector

- Industrial sector contributes approximately 29% to the country's GDP.
- On the manufacturing side, the PMI increased slightly to 54.6 in January from 54.3 in the prior month. The reading reflected stronger increases in new orders and output and marked the twelfth consecutive month of improving conditions.
- Economic activity tumbled in CY2020 as COVID restrictions restrained consumption and investment.
- Government support and reopening of economy led to a partial bounce back, but difficulties in containing infections held back growth in second half of CY2021.
- Employment contracted sharply and weak wage growth depressed household income.
- However, Growth is expected to regain momentum as vaccination coverage increases.
- Recovery in Industrial production coupled with government support will lift investment

Industry, value added percentage of GDP



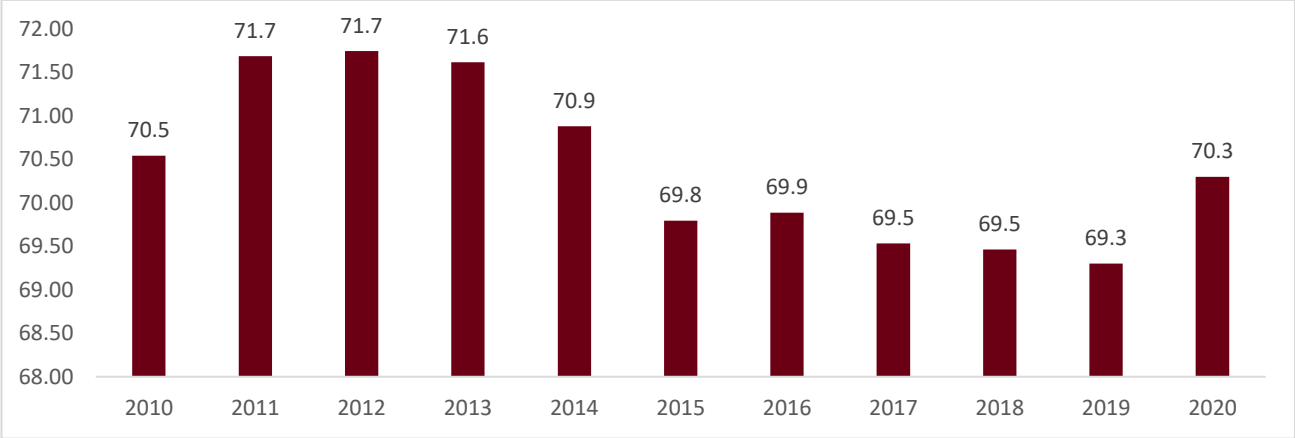
Source: World Bank

Service Sector

- Service sector contributes approximately 70% to the country's GDP
- The services PMI dropped to 46.6 in January from 52.1 in December, on the back of a fall in demand and declining staffing levels due to the reimposition of restrictions amid the spread of the Omicron variant.

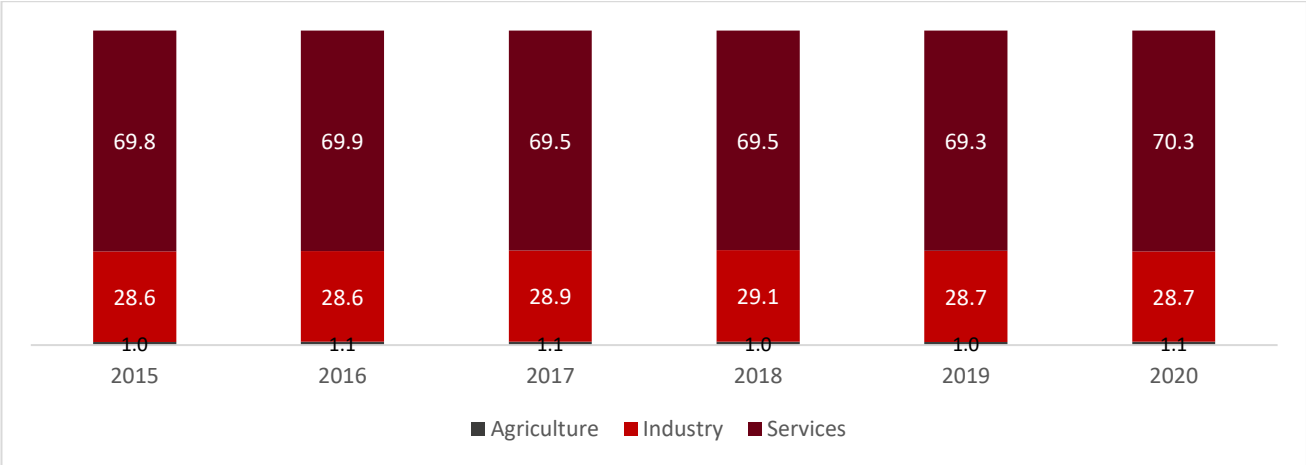
- Private sector firms reported that the surge in Covid-19 cases from the more transmissible Omicron variant had hindered client confidence, most notably in customer-facing industries across the service sector as restrictions were re-introduced across various prefectures including the capital Tokyo.

Services, value added percentage of GDP



Source: World Bank

Share of sector in GVA



Source: World Bank

Japan's economy picking up, states official policy planning agency

In its December economic report, Japan's Cabinet Office stated the economy is showing signs of recovery with the Covid-19 situation easing in the country. Private consumption and corporate profits are showing signs of revival, but supply-side constraints and input costs continue to weigh on short-term prospects. However, the situation is extremely fluid, as January saw cases surge again in the country.

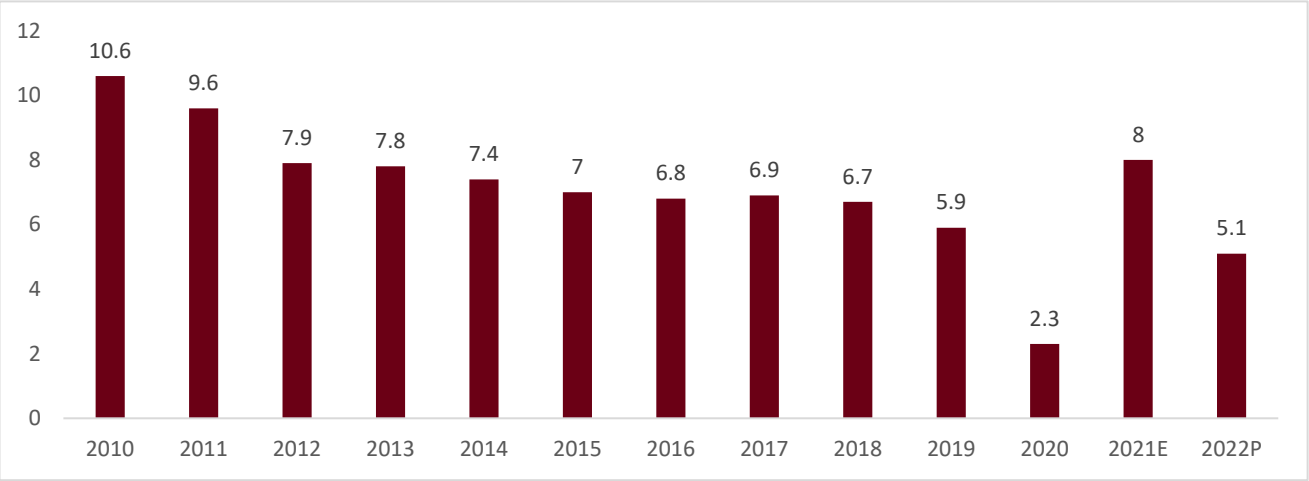
Japan's CPI-linked inflation rose 0.6% on-year in November, up from 0.1% in the previous month. Even as inflation persists in western AEs, Japan's economy was in deflation for most of 2021. Consumer-linked prices have only begun inching up since the fourth quarter. The increase in prices in November was driven by an acceleration in fuel prices (9.2% in November vs 6.4% in October). Food inflation, which has the highest weight in overall inflation,

accelerated to 1.4% on-year from 0.7% in the previous month. Core inflation remained in the negative zone but moderated 0.1pp compared to the previous month (at -0.6%).

China

Real GDP growth is expected to reach 8.0 percent this year—0.5 percentage points lower than previously projected. Growth is projected to moderate to 5.1 percent in CY2022, closer to its potential, reflecting less favourable base effects, diminished support from exports, and the government's continued deleveraging efforts. Although full-year growth is projected to slow in CY2022, momentum is expected to pick up, aided by a more supportive fiscal stance following the rapid withdrawal of fiscal policy support in CY2021. The recent cut in the reserve requirement ratio (RRR) and lending rate also signal a more accommodative monetary policy stance, although financial sector de risking efforts are expected to continue. Although the momentum is expected to pick up, the outlook is subject to domestic in addition to global downside risks. Renewed domestic COVID-19 outbreaks, including the new Omicron variant and other highly transmittable variants, could require more broad-based and longer-lasting restrictions, leading to larger disruptions in economic activity. A severe and prolonged downturn in the real estate sector could have significant economy-wide reverberations.

GDP growth (annual %)



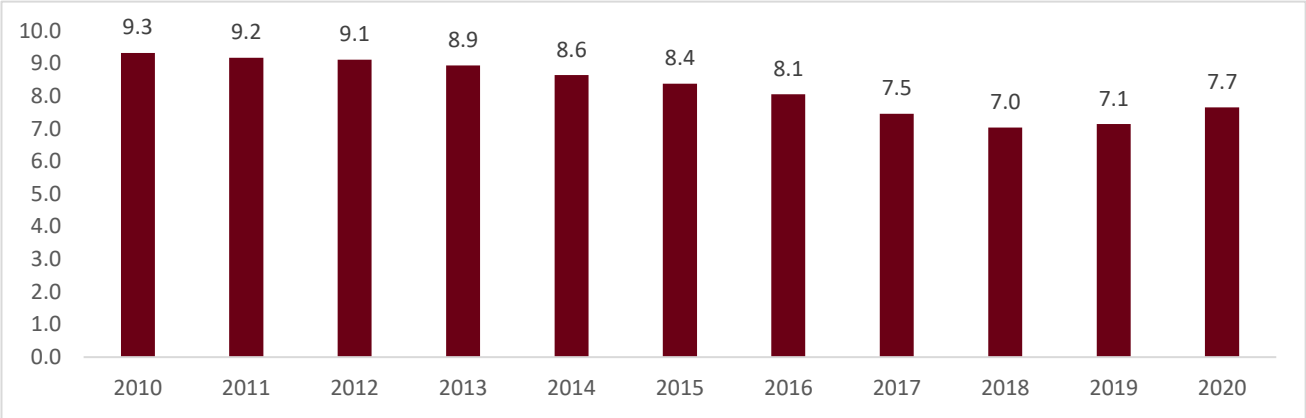
Source: World Bank

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agriculture Sector

- Agriculture now contributes less than 8% of its GDP, China remains the world's largest agricultural producer, followed by India.
- This percentage is much higher than in other developed countries such as the United States, the United Kingdom, and Japan, where agriculture makes up about 1% of GDP.
- Over time, the percentage of GDP represented by agriculture has shrunk.
- From CY2010 to CY2020 agriculture declined from 9.3% to just 7.7%.
- China is a global producer of rice, cotton, pork, fish, wheat, tea, potatoes, corn, peanuts, millet, barley, apples, cotton, oilseed, pork, fish, and more. Government support and low labour costs help its agricultural products stay profitable, though a fragmented transportation network and a lack of sufficient cold-storage infrastructure act as a dampener.

Agriculture Value added percentage of GDP

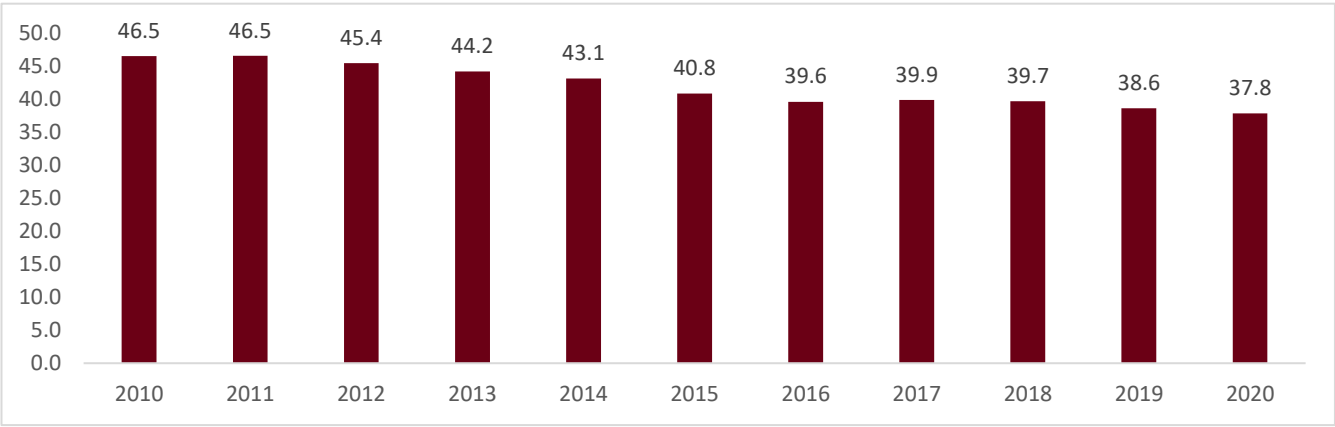


Source: World Bank

Industrial Sector

- The industry sector, which includes construction, mining, manufacturing, electricity, water, and gas, accounted for 37.8% of China's GDP in CY2020.
- The trend is lower, in part due to the corresponding growth of the service sector. But manufacturing remains a powerful contributor to the nation's income.
- China is a world leader in industrial output, including mining and ore processing, processed metals, petroleum, cement, coal, chemicals, and fertilizer. It's also a leader in machinery manufacturing, armaments, textiles, and apparel.
- Add to that, China is a top manufacturer of consumer products, a leader in food processing, and a major maker of telecommunications equipment.
- It's a growing manufacturer of automobiles, train equipment, ships, aircraft, and even space vehicles, including satellites.

Industry, Value added percentage of GDP

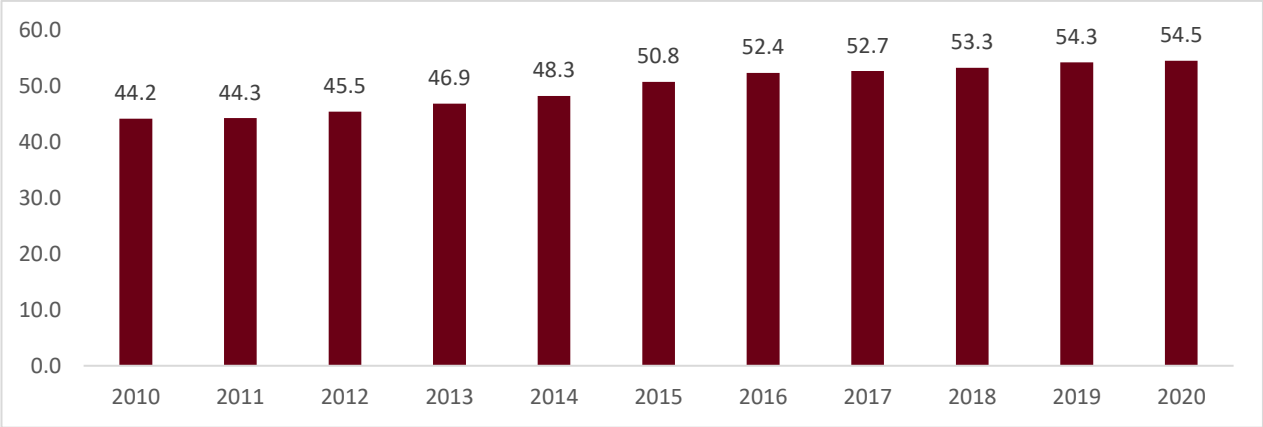


Source: World Bank

Service Sector

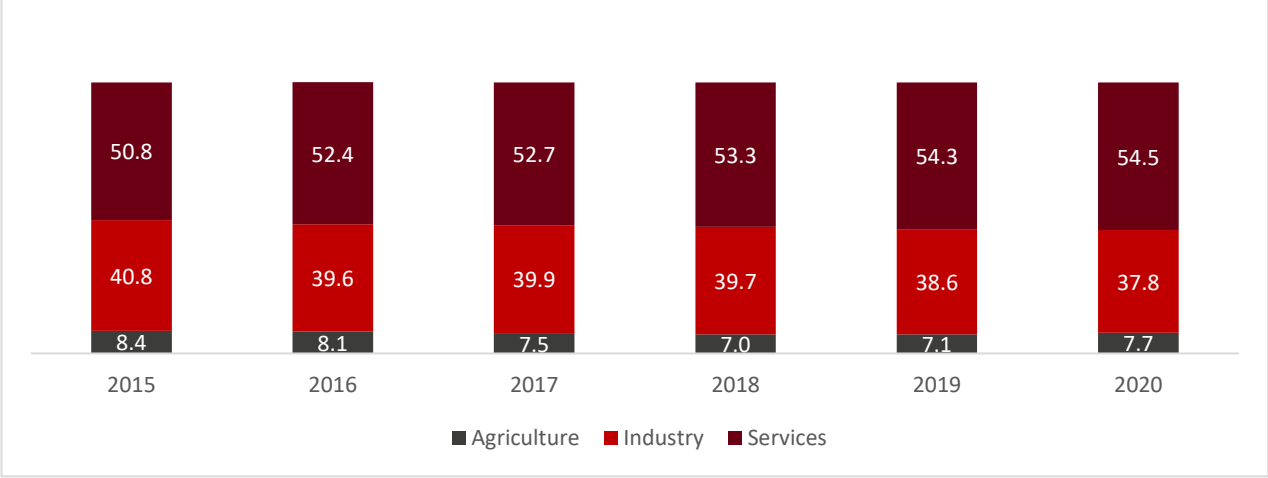
- China's service sector has doubled in size over the last two decades to account for 54.5% of GDP in CY2020. In sheer size, it has surpassed the industry sector since CY2013.
- Within the service sector are transport, storage, and shipping, wholesale and retail trades, hotel and catering services, financial services, real estate, and a mishmash of services categorized as "other."

Services, Value added percentage of GDP



Source: World Bank

Share of sector in GVA



Source: World Bank

China's zero-Covid-19 policy risks supply chain logjam

The rapid spread of omicron has wreaked havoc around the world, but China's case counts are low in comparison, possibly owing to its strict zero-Covid-19 policy. Already, some of its provinces are under complete lockdown to contain omicron. While the highly transmissible variant poses a challenge to the policy, it also compounds economic uncertainty globally: supply chain disruptions affected trade and inflation in CY2021. Further disruptions owing to restrictions in China, a major global value chain player, could aggravate the existing logjam.

Manufacturing in China is slowly expanding, as indicated by the Purchasing Managers' Index (PMI). The index rose to 50.3 in December 2021 from 50.1 in November 2021, above the expansion threshold of 50. Sub-indices of output and buying levels increased, while those of new orders, export sales, and employment continued to contract, but fell at slower rates (remained below 50). With renewed lockdowns at the start of the year in CY2022, manufacturing activity is likely to remain subdued.

Inflation in China decelerated rapidly in December 2021 from the previous month to 1.5% on-year vs 2.3% in November 2021. The sequential decline in inflation (-0.3% vs 0.4% in the previous month) was a contributing factor to the slowdown in on-year inflation. Food prices were tepid after rising in November to 1.4% (vs 1.6% in), following easing of supply disruptions. Non-food inflation too slowed to 2.1% (compared with 2.5% earlier), with prices rising for all components, with prices moderating for both transportation and communication, and housing.

India

India's GDP to grow 9.2% in fiscal 2022 and at an average of 6.6% over fiscals 2022-26. India is likely to emerge as one of the fastest-growing major economies.

Focus on driving investment rather than consumption, which would enhance the economy's productive capacity. In fiscal 2022, the government has focused on increasing capex at a time when revenue realisation is likely to remain weak.

The Union Budget 2021-22 has also underlined the government's focus on medium-term growth trajectory. The government has set a glide path to reduce fiscal deficit to 4.5% of GDP by fiscal 2026 from 6.8% in fiscal 2022. This underscores the government's continued focus on expenditure over the medium term

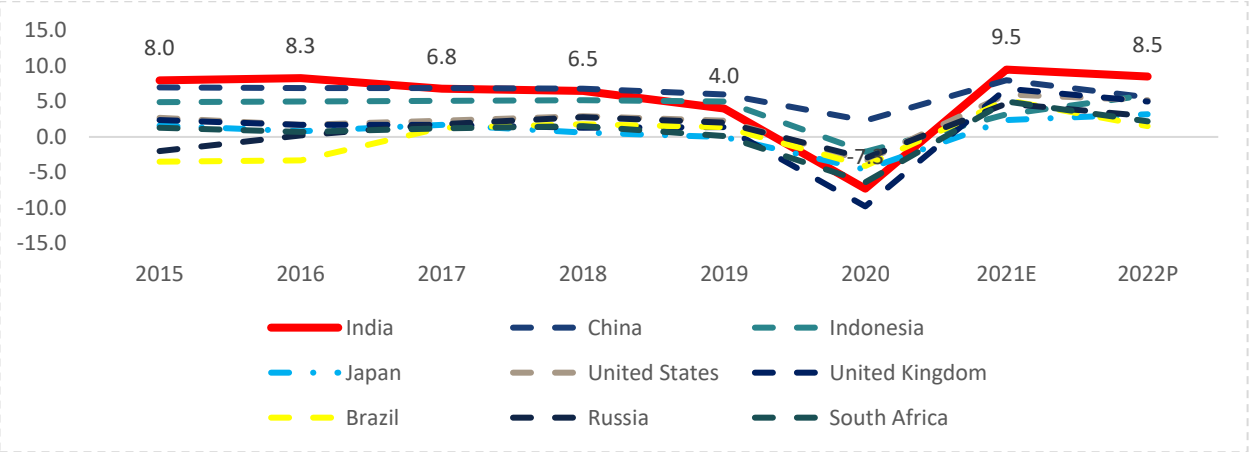
India is one of the fastest-growing economies in the world, with annual growth of around 6.7% over fiscals 2015-20. Over the past four fiscals, India's macroeconomic situation has gradually improved: the twin deficits (current account and fiscal) have narrowed, and the growth-inflation mix has improved, and durably so. Both fiscal and monetary policies are more prudent, focusing on raising the quality and not just the rate of growth. The government has adopted an inflation-targeting framework that provides an institutional mechanism for inflation control while modernising central banking. Fiscal policy has managed to stay mildly growth-focused while managing a gradual reduction in the deficit. The upshot is that India's macroeconomic variables are a lot more stable, and with

Rapid urbanisation, rising consumer aspirations and increasing digitisation, coupled with government support in the form of reforms and policies, are expected to support long-term growth. According to the IMF, India is likely to emerge as the fastest-growing country among major global economies in the CY2021, FY2022 and CY2022 period as well.

Per-capita income is estimated to have grown 3.1% in fiscal 2020 compared with 5.8% in fiscal 2019. In fiscal 2021, per-capita income declined 8.2% owing to GDP contraction amid the pandemic impact.

However, per-capita income is forecast to improve in line with GDP growth. This will be an enabler for domestic consumption. According to the IMF's estimates, India's per-capita income (at constant prices) is expected to increase at 6.7% CAGR over fiscals 2020-25.

India is one of the fastest-growing major economies (GDP growth, % on-year)



Note: GDP growth is based on constant prices; P: projected

Source: IMF (World Economic Outlook – October 2021 update), IMF data mapper

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agriculture Sector

- The agriculture sector experienced buoyant growth in past two years, accounting for a sizeable 18.8% (2021-22E) in Gross Value Added (GVA) of the country registering a growth of 3.6% in 2020-21 and 3.9% in 2021-22
- It is estimated that India's agriculture sector accounts only for around 14 percent of the country's economy but for 42 percent of total employment.
- Minimum Support Price (MSP) policy is being used to promote crop diversification.
- Net receipts from crop production have increased by 22.6%
- Allied sectors including animal husbandry, dairying and fisheries are steadily emerging to be high growth sectors and major drivers of overall growth in agriculture sector.

Industrial Sector

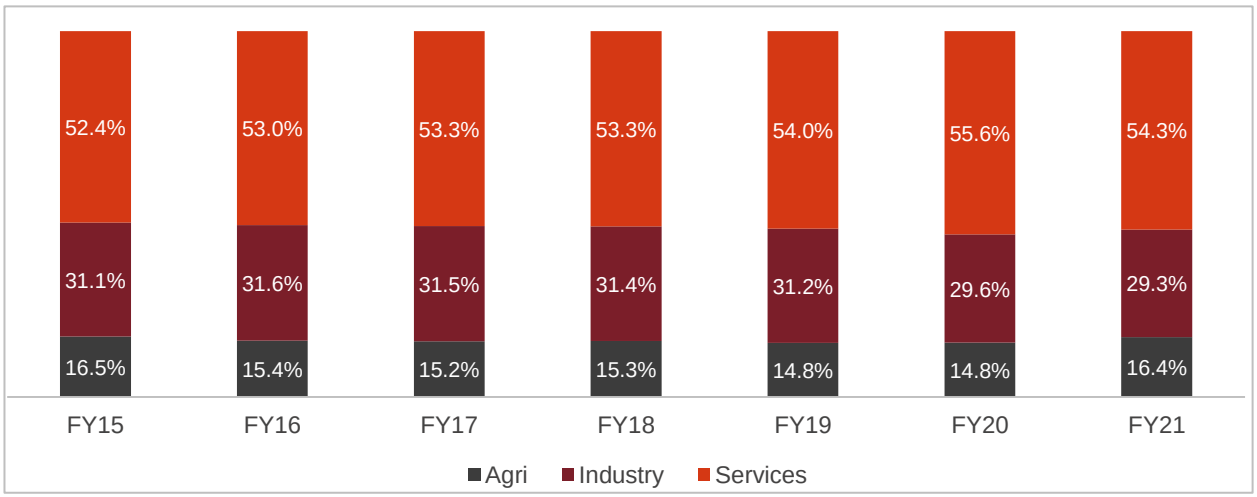
- Index of Industrial Production (IIP) grew at 17.4 percent (YoY) during April-November 2021 as compared to (-)15.3 percent in April-November 2020.
- · Capital expenditure for the Indian railways has increased to Rs. 155,181 crores in 2020-21 from an average annual of Rs. 45,980 crores during 2009-14 and it has been budgeted to further increase to Rs. 215,058 crores in 2021-22 – a five times increase in comparison to the 2014 level.
- · Extent of road construction per day increased substantially in 2020-21 to 36.5 Kms per day from 28 Kms per day in 2019-20 – a rise of 30.4 percent.
- · Net profit to sales ratio of large corporates reached an all-time high of 10.6 percent in in July-September quarter of 2021-22 despite the pandemic (RBI Study).
- Introduction of Production Linked Incentive (PLI) scheme, major boost provided to infrastructure-both physical as well as digital, along with measures to reduce transaction costs and improve ease of doing business, would support the pace of recovery.

Service Sector

- GVA of services crossed pre-pandemic level in July-September quarter of 2021-22; however, GVA of contact intensive sectors like trade, transport, etc. still remain below pre-pandemic level.

- Overall service Sector GVA is expected to grow by 8.2 percent in 2021-22.
- During April-December 2021, rail freight crossed its pre-pandemic level while air freight and port traffic almost reached their pre-pandemic levels, domestic air and rail passenger traffic are increasing gradually – shows impact of second wave was much more muted as compared to during first wave.
- Services exports surpassed pre-pandemic level in January-March quarter of 2020-21 and grew by 21.6 percent in the first half of 2021-22 - strengthened by global demand for software and IT services exports.
- India has become 3rd largest start-up ecosystem in the world after US and China. Number of new recognized start-ups increased to over 14000 in 2021-22 from 733 in 2016-17.
- 44 Indian start-ups have achieved unicorn status in 2021 taking overall tally of unicorns to 83, most of which are in services sector.

Share of sector in GVA at constant prices



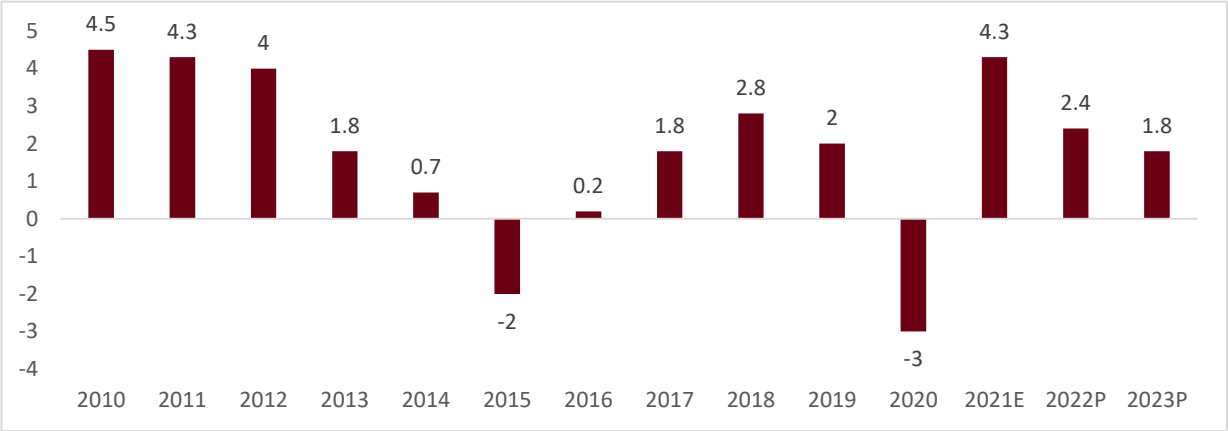
Source: RBI; CRISIL Research

Russia

Growth in Russia is forecast at 2.4 percent in CY2022, on the back of a continually strong oil sector, before slowing down to 1.8 percent in CY2023. With vaccination rates still low, COVID-19 control measures may be called for next year, which will weigh significantly on growth.

Uncertainty around inflation remains high. Should inflation prove more persistent than expected, or if the economy faces headwinds, including from the Federal Reserve's planned unwinding of quantitative easing in the United States, monetary policy may need to be tightened for longer, which may also adversely affect the growth outlook.

GDP growth (annual %)



Source: World Bank

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agriculture Sector

- GDP From Agriculture in Russia increased to 1407.10 RUB Billion in the third quarter of CY2021 from 631.30 RUB Billion in the second quarter of CY2021.
- The agricultural sector, which includes forestry, hunting, fishing, farming, and livestock production, is small and makes up about 5% of GDP.
- Harsh weather and tough geographic conditions make cultivation of land arduous and restricted to a few small areas of the nation. This is one of the main reasons behind the minimal role of the agricultural sector in Russia's economy in terms of its contribution to GDP.
- The agricultural sector is small—just under 5% of Russia's GDP. But it provides employment to almost 6% of the population. The agrarian sector is characterized by the coexistence of both the formal sector, represented by large producers for commercial purposes, and the informal sector, where small landholders produce for self-sustenance. The sector includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production.

Industrial Sector

- The contribution of Russia's industrial sector to its GDP has remained stable, averaging about 35% over the years. The industrial sector comprises mining, manufacturing, construction, electricity, water, and gas and currently provides employment to around 27% of the Russian population. Russia has an array of natural resources, with a prominence of oil and natural gas, timber, deposits of tungsten, iron, diamonds, gold, platinum, tin, copper, and titanium.
- Major industries in the Russian Federation have capitalized on the country's natural resources. One of the prominent industries is machine building, which suffered heavily after the disintegration of the Soviet Union as there was a severe shortage of capital.
- Next is the chemical and petrochemical industry which contributes about 1.5% to Russia's GDP.
- Going by importance, the fuel and energy complex (FEC) is one of the most crucial for the Russian economy. It comprises the mining and production of energy resources, processing, delivery, and consumption of all types of energy. The FEC complex not only supports multiple sectors in the economy, but its products are also Russia's main exports.

- The other competitive Russian industries include mining and metallurgy, aircraft building, aerospace production, weapons and military machinery manufacturing, electric engineering, pulp-and-paper production, the automotive industry, transport, road, and agriculture machinery production

Service Sector

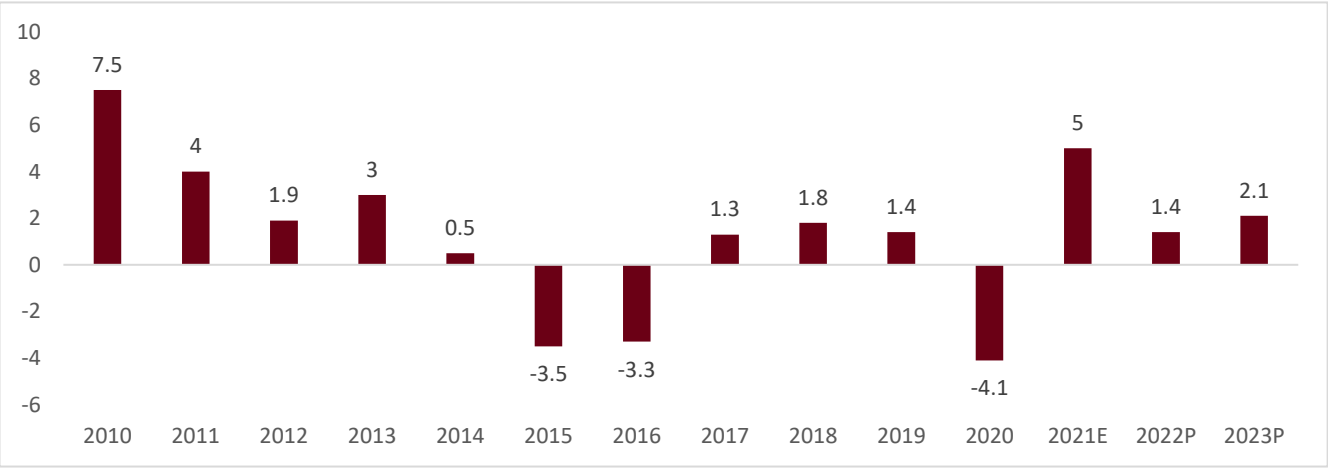
- The service sector's contribution to Russia's GDP has increased over the years from 38% in CY1991 to 57% in CY2001. The service sector comprises almost 62% of the country's GDP as of CY2020 and employs the most people in the country—more than 67% of the population.
- The important segments of the Russian service sector are financial services, communications, travel and tourism, advertising, marketing and sales, real estate, healthcare and social services, art and culture, IT services, wholesale, and retail trade and catering. It is often pointed out that as the crisis that accompanied the fall of the Soviet Union devastated agriculture and industry, it gave services a chance to pick up.

Brazil

GDP growth is projected to reach 5% in CY2021, but to slow down to 1.4% in CY2022 and 2.1% in CY2023. The vaccination campaign has accelerated and economic activity, underpinned by private consumption and investment, restarted as restrictions were lifted. Exports have benefited from the global recovery, the robust demand for commodities and a weak exchange rate. However, supply bottlenecks, lower purchasing power, higher interest rates and policy uncertainty have slowed the pace of recovery. The labour market is recovering with some delay and unemployment remains above pre-pandemic levels.

Inflation has risen significantly in recent months, prompting the central bank to increase policy rates from 2% to 7.75%. Continued tightening of monetary policy is projected over CY2022 to curb inflation dynamics and to keep inflation expectations anchored. Fiscal reforms can also play an important role in containing inflationary pressures. Strengthened fiscal rules would increase market confidence about the government's commitment to keep sustainable finances. More efficient public spending would create fiscal space for growth-enhancing policies and a more inclusive social protection programme.

GDP growth (annual %)



Source: World Bank

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Agriculture

- Brazil's transition from a net food importer to one of the largest exporter of agricultural products in the world has been spectacular. Technically, since agriculture represents 4.4% of Brazil's economy, it cannot be called an agricultural country, but the importance of the sector is far beyond what statistics.
- The country's agricultural sector supports its fast-growing agribusiness sector, which has been an essential component of Brazil's economic progress over the years.
- Several factors have helped increase and diversify the production and exports from the agriculture and agribusiness sectors. Examples include modern technology and agricultural research, government policies funding agriculture, and the development of new frontiers for farming.
- The agriculture sector provided more than 9% of the country's total employment as of CY2019.
- Some of the most significant agriculture produce and exporting items are coffee, soybeans, sugar, beef, chicken, orange juice, and corn.

Industry

- Brazil has advanced industries in the fields of petroleum processing, automotive, cement, iron and steel production, chemical production, and aerospace. Other than these, the food and beverage industry is a very crucial part of the manufacturing sub-sector. The availability of cheap labour and abundance of raw materials has helped Brazil in its industrial development.

Service Sector

- The services sector is the largest sector in Brazil contributing almost 65% to its gross domestic product. The decreasing share of agriculture and industry over the years was taken up by the service sector, which has contributed more than 50% of the country's GDP
- The service sector is the biggest employer for the country's workforce.
- Workers are employed in various departments and services like hospitality industry, financial services, repair shops, information technology, as well as bureaucracies at the national and local level as well as public utilities and special agencies.

2. Global 3-Point Linkage (3PL) Market: Key End User Segments and Geographies

2.1 Executive Summary

The world market for 3-point linkages (3PL) - estimated at USD 305-320 million in 2020 - is expected to grow at nearly 6-8% per cent in 2020-2025, buoyed by robust growth in tractor production volumes in North America, India and Europe, steady growth in China and Japan. In 2020, nearly 47 per cent of the global production of tractors takes place in India, followed by 15 per cent in China.

3-point linkages (3PL) is a system attached to hitch implements to tractors. The three-point linkage most often refers to the way ploughs and other implements are attached to an agricultural tractor. The three points resemble either a triangle, or the letter A. Three point attachments is the simplest and the only statically determinate way of joining two bodies in engineering.

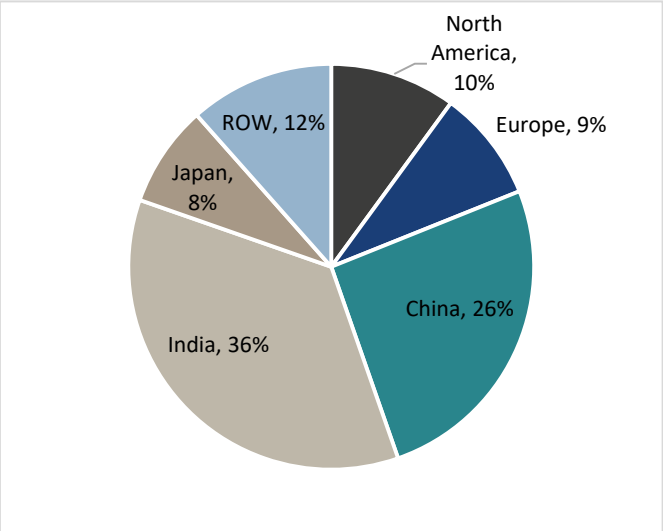
The three-point linkage systems consist of different assemblies that are attached to an agricultural tractor. It forms a group of assemblies allowing attaching an implement like a plough to the tractor at 3 coupling points forming a triangle.

It connects the implement in a manner to the tractor that the tractor and implement becomes one unit allowing the tractor to operate the implement. The 3-point linkage transfers the entire load which can be a multiple of the implement weight between the tractors and implement.

3PL was standardised following a global industry-wide agreement among tractor and implement manufacturers in the 1960s. Hence, major driver of 3PL demand is tractors, which is, in turn, a function of agriculture growth. Higher agriculture growth boosts farm incomes, resulting in higher tractor sales.

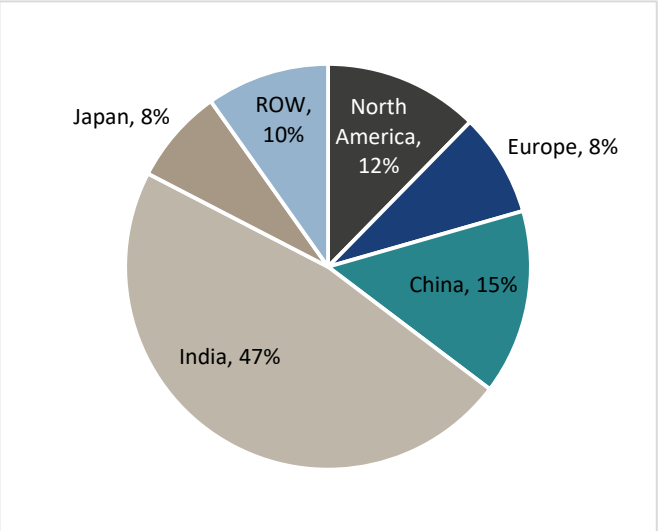
The structure of 3PL industry is fragmented in few geographies, whereas organised in other geographies. 3PL manufacturers are generally private players. Therefore, it is difficult in mapping the industry players and evaluate competitive benchmarking. Major tractor OEMs are developing technically intensive products, processes and applications which has led to higher mechanization of agricultural tractors. This is expected to aid the growth of 3PL industry.

World Tractor Production (2016) -Geography-wise split (17.2 lakh units)



Source: Markets & Markets, Off-highway, CRISIL Research

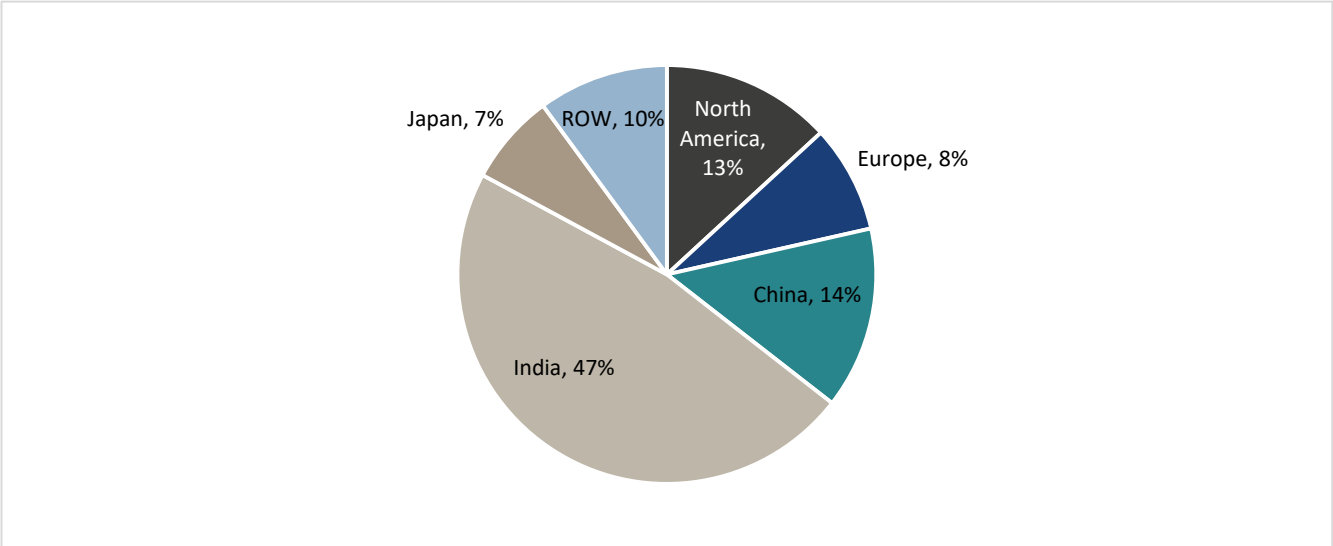
World Tractor Production (2020) – Geography-wise split (18.2 lakh units)



Source: Markets & Markets, Off-highway, CRISIL Research

Note: ROW includes tractor production in all the remaining geographies barring the five major geographies mentioned above

World Tractor Production (2025P) – Geography-wise split (21.9 lakh units)



Source: Markets & Markets, Off-highway, CRISIL Research

Note: ROW includes tractor production in all the remaining geographies barring the five major geographies mentioned above

Compound Annual Growth Rates (CAGR) - Tractors

CAGR	NORTH AMERICA	EUROPE	JAPAN	CHINA	INDIA	TOTAL
Review (2016-2020)	6.8%	-0.5%	-0.2%	-11.7%	8.8%	1.4%
Outlook (2020-2025)	5.1%	4.1%	2.3%	2.8%	3.8%	3.8%

Source: Industry, CRISIL Research

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

During 2016-2020, the world tractor production saw a marginal growth on the back of a slowdown in major geographies like Japan and China coupled with the cyclical nature of the tractor industry. China's arable land declined for the fourth consecutive year primarily due to new construction, natural disasters and environmental requirements, as well as changes in agricultural production, leading to a decline of 11.7% in tractor production during the same period. However, tractor production is expected to pick up across all the geographies and is estimated to grow at nearly 3-5% during 2020-2025 with key driver for the tractor industry being investment in infrastructure projects.

On the other hand, although India and China have a share of nearly 62 per cent of world tractor production their share in global 3PL demand by value is only around 38 per cent. This is primarily due to two key reasons: higher ratio of lower HP tractors in the total population and lower per assembly price of 3PL in these regions.

North America, being one of the most mature tractor markets, contributes around 12 per cent of world tractor demand, and is estimated to contribute almost 19 per cent of the total demand for 3PL in the world in 2020.

The demand for 3PL (which is intricately linked to tractor demand) is set to grow at a steady, healthy pace. During 2020-2025, global tractor production is estimated to grow at a CAGR of 3.8 per cent.

Nearly 75 per cent of the tractors produced in 2025 will be in North America, India and China (with India and China accounting for almost 61 per cent of total tractor output). These geographies are expected to grow at a CAGR of 2-5 per cent during 2020-2025.

On the other hand, European is expected to witness 4.1% growth during 2020-2025 and Japanese tractor markets are predicted to grow marginally by 2.3% during the same period. In 2020, China produced 15 per cent of the world's tractors; whereas in 2016, its share was 26 per cent.

The ROW group (Rest of the world countries), which accounts for around 10 per cent of world tractor production, is also estimated to grow at a CAGR of around 3-5 per cent because of an increase in tractor production in Russia.

Market Segmentation based on Horse Power (HP)

Of the world tractor demand estimated at 1.8 million units in 2020, approximately 70 per cent is contributed by the <60 HP segment, which is driven by India, China, Japan and other developing economies. Whereas remaining 30 per cent of the world tractor demand comes from >60 HP segment driven by the economies in Europe and North America.

However, in the world market for 3-point linkages (3PL), which is estimated at USD 305-320 million in 2020, the contribution of >60 HP segment rises significantly on the back of higher price of 3PL in higher HP tractors.

2.2 Regional Demand of Key User Segment - Agricultural Tractor

North America

North America is one of the leading farm equipment markets in value terms. It is considered a mature market. Compared to other regions, farmers in North America are wealthier and have adequate resources to invest in the agricultural machinery such as tractors. The US and Canada are key exporters of agricultural products in developing countries such as China, where food demand is relatively high due to high population. As a result, farmers' income in North America is relatively better than other parts of the globe.

Corn, wheat, and soybean are the three major crops grown in the US. In 2020, the US was ranked first in corn production. From 2015/16 to 2018/2019, the United States was the leading global producer of soybeans with a production volume of 120.52 million metric tons in 2018/2019. As of May 2020, Brazil overtook the United States as the leading soybean producing country. It is also the third-largest producer of cotton and fourth-largest producer of wheat in the world. The farm income plunged during the last four to five years, as global grain glut pushed down commodity prices.

Several major economic and policy events have occurred since 2018 that helped to shape the U.S. farm income outlook for 2020. These include the U.S.-China trade dispute and subsequent Phase One trade agreement between the two countries, as well as the COVID-19 pandemic and several federal direct payment programs targeting affected producers in response to these events. In addition, the year 2020 saw three major weather events that impacted the U.S. agricultural sector: wet spring conditions in the upper Midwest that resulted in a second year of large prevent-plant acres; an unprecedented Derecho wind storm through the heart of the Corn Belt that damaged several million acres of prime cropland; and a late-season drought across the western Corn Belt. Finally, China began making large-scale purchases of U.S. corn and soybeans in the third and fourth quarter of the year.

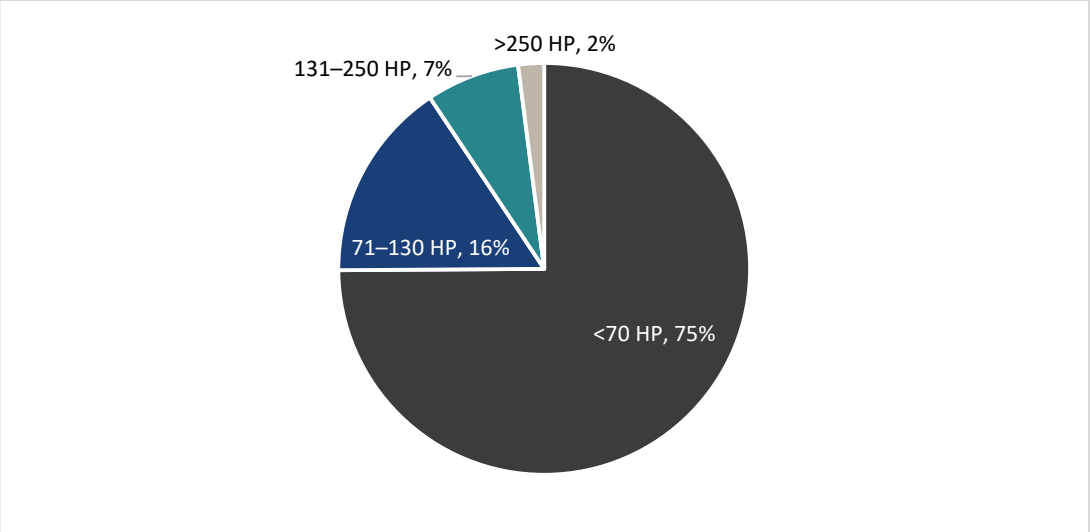
The U.S. Department of Agriculture (USDA) projects that U.S. farm profitability—as measured by net farm income and net cash income—increased substantially in 2020 from 2019 levels. In nominal dollars (not adjusted for inflation), both income measures are projected to attain their highest levels since 2013. Net farm income (calculated on an accrual basis) was projected to rise 43.1% year-over-year in 2020 to $119.6 billion, up $36.0 billion from 2019. Net-cash income (calculated on a cash-flow basis), was projected at $134.1 billion in 2020, up $24.7 billion or 22.6% from 2019.

The year-to-year increase in both net farm income and net cash farm income is primarily due to a substantial increase in direct government payments to a record $46.5 billion in 2020. At this level, government support payments would account for nearly 39% of net farm income—the highest share since the year 2000, when government subsidies accounted for 46% of net farm income. In contrast with federal direct payments to producers, farm income from cash sales of crop and livestock products and other farm-related activities were forecasted to decline by 0.9% in 2020.

The US Department of Agriculture projected higher soyabean (up 16%) and corn (up 4%) production in 2020 versus 2019. Production of wheat, however, is expected to decline by 5% in 2020 versus 2019. Increase in corn, oats, rice, sorghum, and soybean production are driven by year-over-over increases in acreage planted and harvested, and higher yields per acre. Declines in wheat and barley production are driven by year-over-year declines in acreage planted and harvested, and lower yields per acre. Declines in cotton production are driven by declines in acreage planted and harvested.

North America's agricultural equipment market is expected to register a CAGR of about 5.1% over 2020-2025. Tractor sales in North America is a mix of lower and middle HP categories mainly dominated by two-wheel drive tractors. In 2020, approximately 40 per cent of the tractors sold were below 30 HP segment, with tractors above-130 HP contributing only 9 per cent of the North American tractor sales market. During 2016-20, growth of <70 HP tractor sales units was higher as compared to other segments.

North America Tractors Production – Market Segmentation in CY 2020 (225 thousand units)



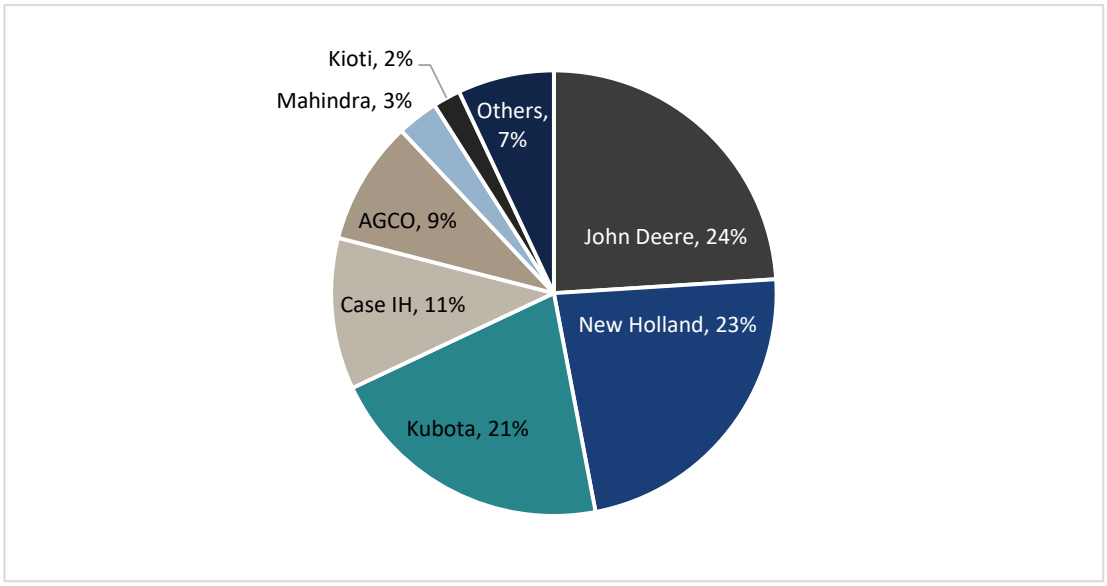
Source: Off-highway, CRISIL Research

USDA distinguishes between family farms—operations where the majority of the business is owned by an operator and individuals related to the operator—and nonfamily farms where an operator and persons related to the operator do not own a majority of the business. Family farms account for more than 97% of all U.S. farms. These farms has

been driving the market for below 40 HP segment. In contrast, the large-farm owners are involved in the cultivation of commodity crops. These farmers are mainly buyers of above-100 HP tractors and 4WD tractors.

US agriculture equipment is a consolidated market, where - John Deere, New Holland, Kubota, CASE IH, and AGCO – are top five players. Alamo Group and Autonomous Tractor Corporation are some of the other regional players in the US market. Autonomous tractors are gaining popularity in the US with John Deere taking the lead. According to a study, autonomy has already made its way in America on more than 70% of the farms through automated guidance.

US Agriculture Equipment Market Share Analysis - By Value (9038 USD Million in CY 2020)



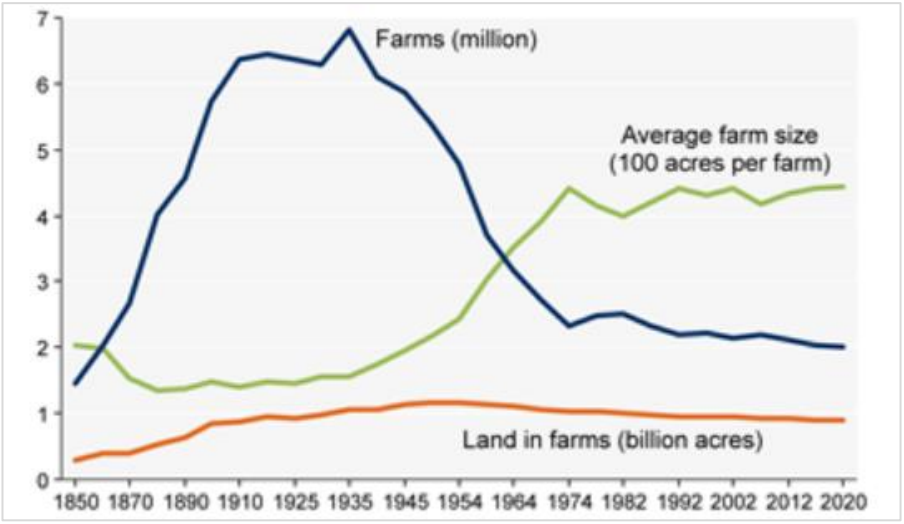
Source: Markets & Markets, CRISIL Research

Key Demand Drivers for Tractors

Continued Consolidation of the Farms

- In the most recent survey, there were 2.02 million U.S. farms in 2020, down from 2.20 million in 2007. With 897 million acres of land in farms in 2020, the average farm size was 444 acres, only slightly greater than the 440 acres recorded in the early 1970s.
- There is a continuous shift towards less than 40 HP tractors. Share of less than 40 HP tractors in the total sales increased from 35% in 2016 to approximately 40% in 2020
- Use of agricultural machinery is enabling the consolidated farms to improve efficiency and helping farmers to generate better profits and higher return on investment versus smaller farms

US – Number of Farms and Average Farm Size



Source: US Department of Agriculture, CRISIL Research

High level of farm mechanisation and labour shortage

- North America represents a high level of farm mechanisation with the US achieving more than 95% of the farm mechanisation. Farm mechanisation across North America is popular owing to the numerous benefits offered, including considerable savings in terms of time and resources, improved efficiency, and increased production
- The shortage of North America's farm labourers, mainly owing to changes in the US immigration policies, is expected to propel the use of mechanised farming techniques and equipment such as farm tractors
- Additionally, precision farming has driven the need for mechanisation among various farm practices, thereby fuelling demand for farm tractors
- Technological developments in agriculture have been influential in driving changes in the farm sector. Innovations in animal and crop genetics, chemicals, equipment, and farm organization have enabled continuing output growth without adding much to inputs. As a result, even as the amount of land and labor used in farming declined, total farm output nearly tripled between 1948 and 2019.

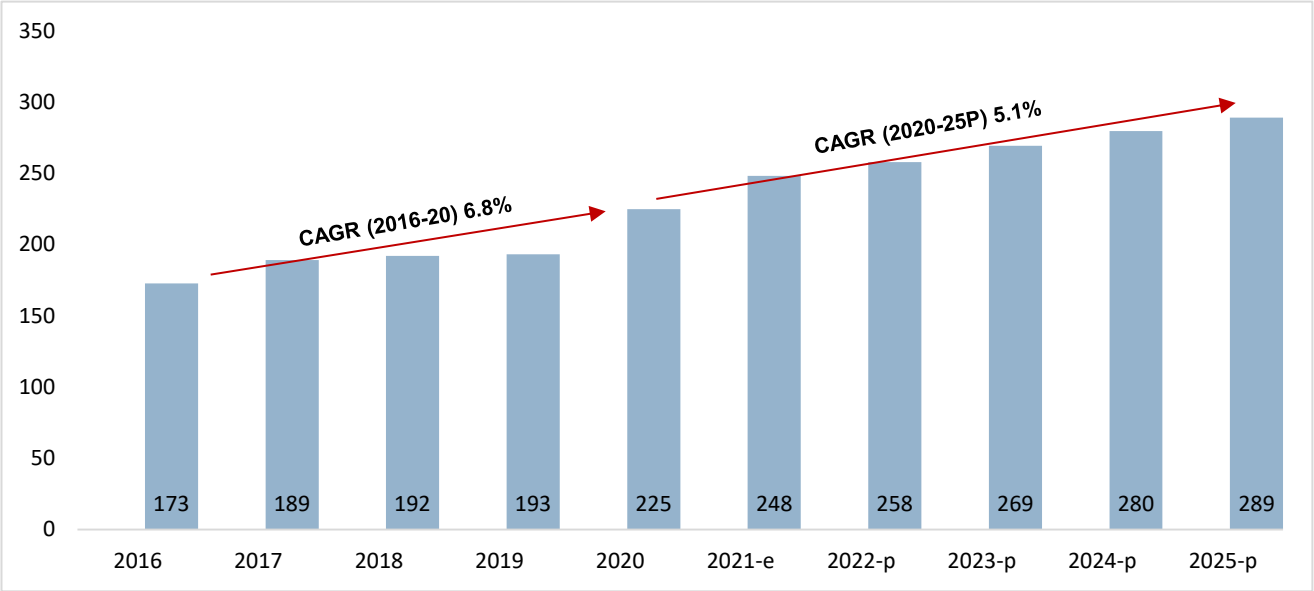
Focus on innovation and new technologies

- The US government has made "adoption of innovative technology" a key focus As part of this, the National Institute of Food and Agriculture (NIFA) launched a "Food and Agriculture Cyber informatics and Tools Initiative" in late 2016. It focuses on increasing collaboration between the government and private companies to capture the agriculture data and to support development in the sector
  - Data and analytics can help farmers hedge against potential losses and smooth out cash flow, which is always a concern in any agriculture operation

Demand Review and Outlook

Over 2016-2020, tractor production in North America recorded a CAGR of 6.8%. Tractor production in 2020 was dominated by less than 70 HP category. It accounted for approx. 75% of the 2020 total production. Further, over 70 HP tractors and 4WD tractors accounted for 23% and 2%, respectively of 2020 total production.

North America Tractor Production Volumes ('000 units)



Source: Off-highway, CRISIL Research

Factors such as trends for crop yields and commodity demand from both domestic and international markets to impact farm income. Despite the initial optimism, the U.S. agricultural picture for 2021 is clouded by several major uncertainties related to potential weather and trade developments. During 2020-2025, North America's tractor production is expected to register a CAGR of 5.1% to reach 289,103 units in 2025.

Europe

Europe is one of the major producers of agricultural products. The harvested production of cereals (including rice) across the EU was 286.5 million tonnes in 2020. This was 12.9 million tonnes less than in 2019, the equivalent of a 4.3 % decline, and 21.4 million tonnes less than the record 307.9 million tonnes recorded in 2014. France harvested 57.5 million tonnes of cereals in 2020, one fifth (20.1 %) of the EU's total harvested production. Germany harvested 43.3 million tonnes (15.1 % of the EU total), Poland a further 35.5 million tonnes of cereals (12.4 % of the EU total) and Spain harvested 26.3 million tonnes (9.2 % of the EU total).

The overall EU decline in the harvested production of cereals in 2020 was underpinned by steep falls in France (19.2 %, or 13.7 million fewer tonnes) and Romania (-36.3 %, or 11.0 million fewer tonnes). However, there were much higher levels in Poland (up 22.5 %, or 6.5 million tonnes) and Spain (up 32.3 %, or 6.4 million tonnes).

The EU harvested 119.1 million tonnes of common wheat and spelt in 2020, the equivalent of 41.6 % of all cereal grains harvested. This was 12.7 million tonnes less than in 2019, a decrease of 9.7 %. One reason for this was the weather and the other was the marked reduction in area harvested (down 5.9 % to 20.8 million hectares, in large part due to the adverse weather conditions in Autumn which hindered sowing).

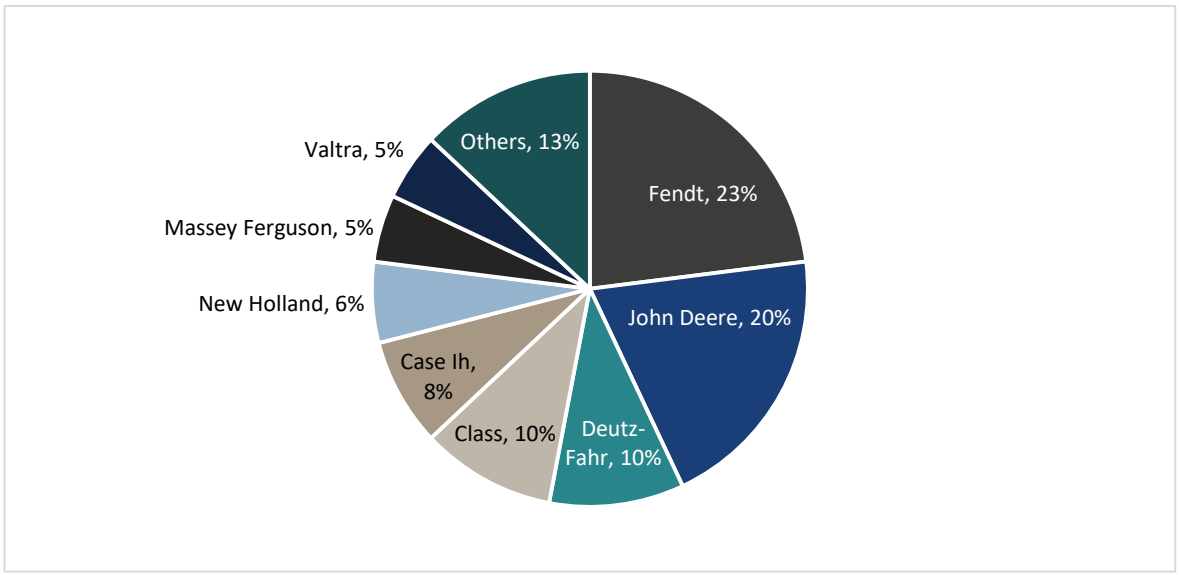
In 2020, the output price of cereals in the EU rose by an average 3.7 % (in nominal terms), in part reflecting the overall lower supply of cereals (compared with 2019). The provisional average price of wheat and spelt (+5.5 %) and grain maize (+6.3 %) were higher, but there were declines for barley (-3.4 %), oats and summer cereal mixtures (-5.0 %) and rye and maslin (-5.6 %).

People working in agriculture accounted for about 4.2 % of total employment in the EU, corresponding to 9.7 million persons. Agriculture is a particularly big employer in Romania, accounting for just less than one in every four persons (23.0 %) employed in the country, as well as in Bulgaria (17.5 % of total employment), Greece (10.7 %) and Poland (10.1 %). Seven in every ten (71.5 %) farm managers on the EU's 10.5 million holdings were male and a majority (57.9 %) were 55 years of age or more. Only about one in every ten (10.6 %) farm managers was a young farmer under the age of 40 years and this share was even lower among female farmers (8.6 %).

According to the European Committee of Farm Machinery Manufacturer's Associations (CEMA), the European agricultural machinery market is currently growing and corresponds to the past peak level witnessed in 2012. Key factors driving the market include: (1) improved productivity through mechanisation, (2) optimised supply chain, and (3) labour shortage. Further, innovative technologies and precision farming are also shaping the positive market outlook for the market.

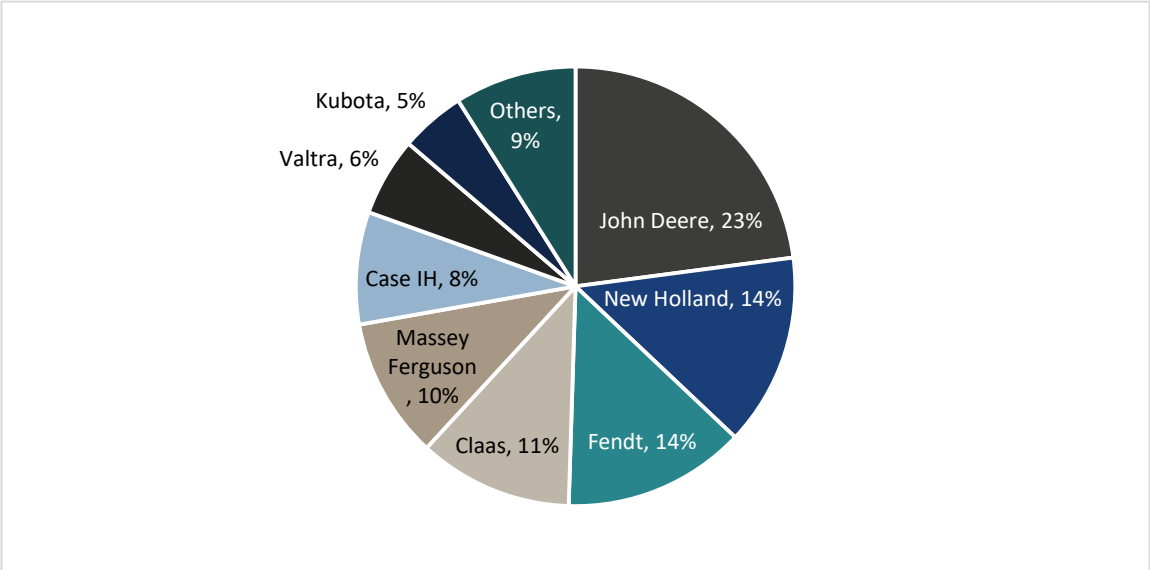
Majority of the tractors sold in Europe are over 70 HP. The European tractor market is highly competitive with key players competing in terms of cost, brand appeal, horsepower, utility, and economic efficiency.

Germany Agriculture Equipment Market Share Analysis - By Value (2834 USD Million in CY 2020)



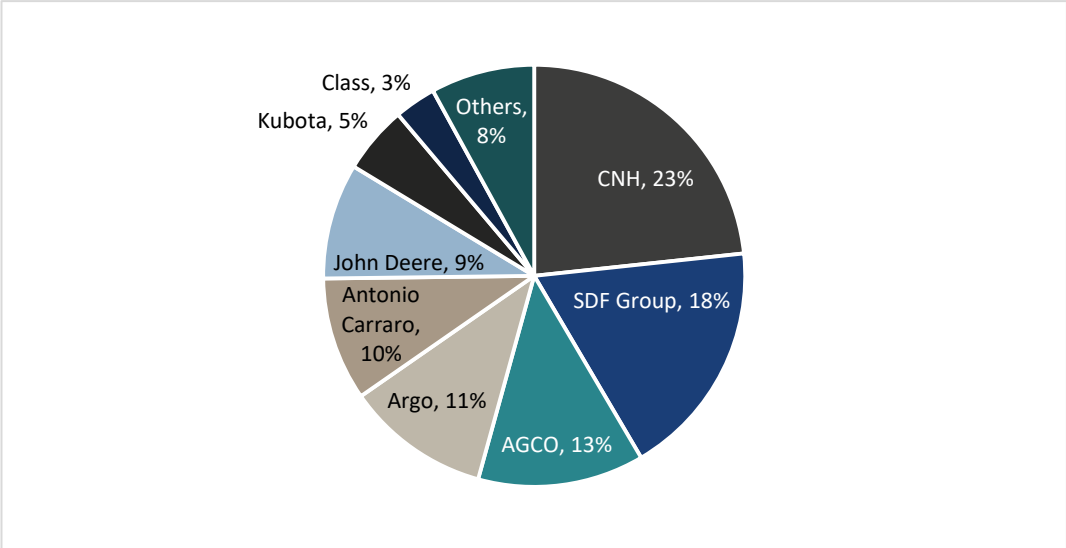
Source: Markets & Markets, CRISIL Research

France Agriculture Equipment Market Share Analysis - By Value (2377 USD Million in CY 2020)



Source: Market & Markets, CRISIL Research

Italy Tractor Market Share by Manufacturer- (1202 USD Million in CY 2020)



Source: Ministry of Transport/Trattori, CRISIL Research

Tractor companies are investing resources and acquiring other companies to strengthen their presence in Europe. Key developments include:

- In July 2018, Kubota Corporation announced its plans to invest €55 million in a new R&D Centre in Europe. The new site will be located in Crépy-en-Valois, France and will be fully operational in 2020
- In April 2018, Tractors and Farm Equipment Limited (TAFE) acquired Serbian tractor and agricultural equipment brand Industrija Masina i Traktora (IMT). The IMT brand of tractors that used to service Eastern Europe, Northern Africa and the Balkans would open up new potential for TAFE to expand further in these regions

- Mahindra and Mahindra is also leveraging on acquisitions to expand its presence in Europe and the Middle East. The company acquired Erkunt Traktor Sanayii AS, a Turkish tractor maker and its foundry business in 2017. Earlier, Mahindra and Mahindra acquired a Turkey-based farm equipment company Hisarlar Makina Sanayi ve Ticaret Anonim Şirketi (Hisarlar)
- China's Foton Lovol Group acquired Italian tractor company Goldoni in 2016 to develop itself as a global brand. With this acquisition, the company added 38-75 HP models to the range of its offerings. The company plans to invest in the factory in Migliarina di Carpi (Modena) and develop new ranges of Goldoni tractors

Key Demand Drivers for Tractors

Continued shift towards large farms

- Europe is witnessing a consolidation of farms with an increase in share of larger farms in the arable land. Key countries with ongoing national land consolidation programme include Poland, Germany, Czech Republic, Slovakia, Slovenia, Lithuania, Serbia, etc.
  - Land consolidation has also been introduced in a number of countries including Estonia, Latvia, Hungary, Romania, Bulgaria, Croatia, etc., however these countries do not have a national land consolidation programme as such
- In the region, largest farms are found in Czech Republic, Denmark, Great Britain, Germany, France, and Finland
- Tractors accounts for over 42% of the investment by European farmers in new machinery and equipment. Farmers who have consolidated their farmlands or increased their farm area tend to buy new tractor with more horsepower
- Moreover, farmers with larger holdings look for tractors with better technologies to increase the productivity and overall farm income

Technological innovation to develop high efficiency products

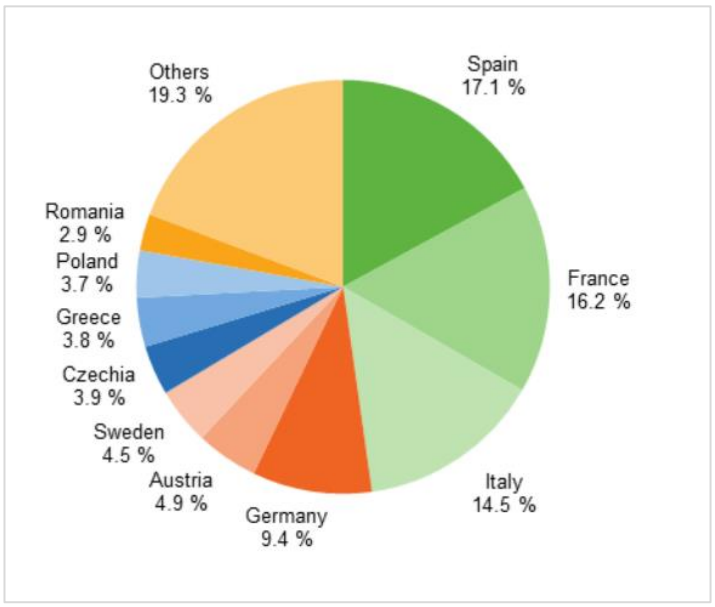
- Tractor manufacturers are increasingly incorporating technologies such as data analytics, telematics, remote sensing, GPS, and mobile technology to make farming more precise and sophisticated. Technology is also helping farmers to reduce costs. For instance, auto steering enables farmers to reduce the overlaps by field equipment
- Alternate fuel tractors are also gaining popularity in the market. Increase in prices of conventional fuels and rising environmental concerns is resulting in the adoption of alternate fuel tractors in the market. Demand of alternate fuel tractors is expected to further gain in the future
- These benefits are stimulating the uptake of usage of technologies. This in turn is resulting in the increasing demand of tractors with latest technologies

Higher food consumption and adoption of organic products

- Population growth across the EU has augmented the demand for innovative and sustainable agricultural practices to increase land productivity and mitigate the effects of climatic and chemical changes on arable lands. As a result, deployment of tractors remains the key factor to support sustainable agricultural activities
- Further, organic farming is gaining popularity in Europe. The total organic area in the EU-27 was nearly 13.8 million hectares (ha) in 2019, up from 13 million hectares in 2018. The increase in organic area between 2012 and 2019 was 46 %. The total organic area is the sum of the 'area under conversion' and the 'certified area'. Before an area can be certified as 'organic', it must undergo a conversion process, which may take 2-3 years depending on the crop.

- Although the organic food consumption includes imported products, the increasing number of organic producers in Europe with higher income than conventional farming indicates a likelihood of the rising demand for tractors among other agri-equipment

Share of Total Organic Area (fully converted and under conversion), EU-27, 2019

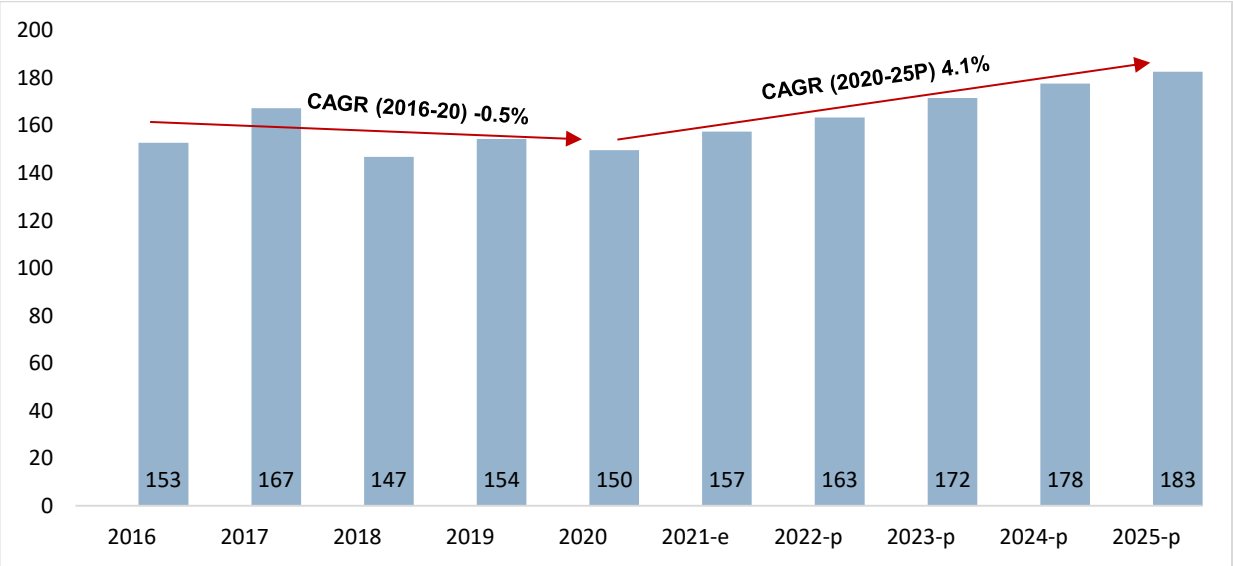


Source: Eurostat

Demand Review and Outlook

During 2016-2020, tractor production in Europe recorded a CAGR of -0.5%. Tractor production in 2020 is dominated by over 70 HP category. It accounted for about 76% of the total production in 2020. However, 4WD tractor production is not popular in Europe.

Europe Production Volumes of Tractors ('000 units)



Source: Markets & Markets, CRISIL Research

Factors such as shift towards larger farms, income of the farmers, technological innovation, etc. will play an important role in shaping up the market. During 2020-2025, tractor production in Europe is expected to register a CAGR of 4.1% to reach 182,643 units in 2025.

Japan

Japan's agricultural sector is relatively small and slowly contracting. Over the past decade, Japan has reduced its support to agriculture, but more recently the change in support levels has been moderate. Support to producers remains high as a share on gross farm receipts (41% in 2017-19) and is almost 2.4 times above the OECD average. The total support estimate to agriculture represented 0.9% of Japan's GDP in 2017-19, most of which went to direct support to producers. Farmers typically use terrace system to farm in small areas. This system has helped Japan to achieve world-leading yield per hectare.

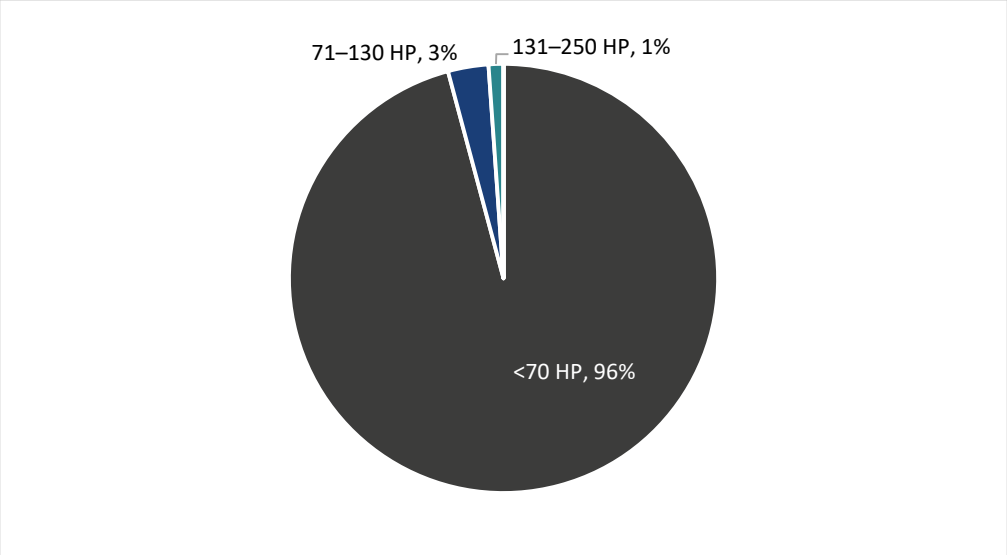
The Basic Plan for Food, Agriculture and Rural Areas, which sets Japan's comprehensive agricultural policy direction for the next 10 years, was revised in March 2020. In response to challenges such as the decrease of farming population and the implementation of new large-scale trade agreements, the plan aims to strengthen the agricultural production base regardless of farm size or its hilly and mountainous condition. Emphasis is also placed on sustaining rural areas. Finally, the Basic Plan addresses responses related to the COVID-19.

Domestic production is not able to fulfil the agricultural product requirements of the population. As a result, the country is dependent on imports of agricultural products to meet the food consumption. Japan is one of the leading net importers of agricultural products. In 2020, around 6.2 trillion Japanese yen worth of agricultural commodities were imported to Japan, an increase from about 5.6 trillion yen in 2011. Agricultural imports make up the majority of primary sector imports to Japan, double the amount of forestry and fishing commodities.

The country is facing acute labour shortage in agriculture and other sectors. The government is working on a plan to attract more foreign blue-collar workers to the country. However, no target has been set by the government yet regarding the number of foreign workers to be granted visa under this plan. Local media, however, put the figure at more than 500,000 people by 2025.

In Japan, tractor sales is a mix of lower and middle HP categories mainly dominated by two-wheel drive tractors. In 2020, approximately 85% of the tractors sold were below 30 HP segment, with tractors above-70 HP contributing only 4% of the tractor sales market.

Japan Tractors Production – Market Segmentation (138 thousand units in CY 2020)



Source: Off-highway, CRISIL Research

Key tractor companies operating in Japan in terms of popularity include the following:

Tractor Brand
Kubota Corporation
Yanmar Holdings Co. Ltd
ISEKI & CO., LTD.
Mitsubishi Mahindra Agricultural Machinery CO., LTD.
John Deere (Deere & Company)
New Holland HFT Japan
Mahindra & Mahindra
Agrale
Massey Ferguson
Kukje Machinery Company Limited

Source: Markets & Markets, CRISIL Research

Agriculture machinery companies are acquiring stakes in other countries to grow their presence in the international markets. In 2017, Yanmar Holdings Co. more than doubled its stake in International Tractors Limited (ITL) to 30%. The company is actively working with ITL to develop new products for markets such as the US, Europe, and Thailand. The companies are leveraging their mutual strengths to produce advance tractors that are equipped with engines complying with future-emission standards.

Key Demand Drivers for Tractors

Aging population and labour shortage

- Over the last decade, Japan's population has aged more and more, to the point where more than a quarter of Japanese were 65 years and older in 2020. Population growth has stopped and even reversed, since it's been in the red for several years now. According to Japan's National Institute of Population and Social Security Research, 28.4% of the population is 65 years of age or older in 2020
- The estimated number of people aged 65 or older in Japan stood at a record high of 36.4 million in 2021, an increase of 220,000 from a year before, as per the internal affairs ministry.
- The labour shortage in agriculture sector is worsening with each passing year. In 2020, approximately 2.1 million people were employed in the agricultural, forestry and fishery industry in Japan. In 2011, the number of people employed in the agricultural, forestry and fishery industry was close to 2.5 million.
- Aging population and labour shortage in the country is likely to push the farmers to invest in the agriculture equipment thereby boosting the tractor demand

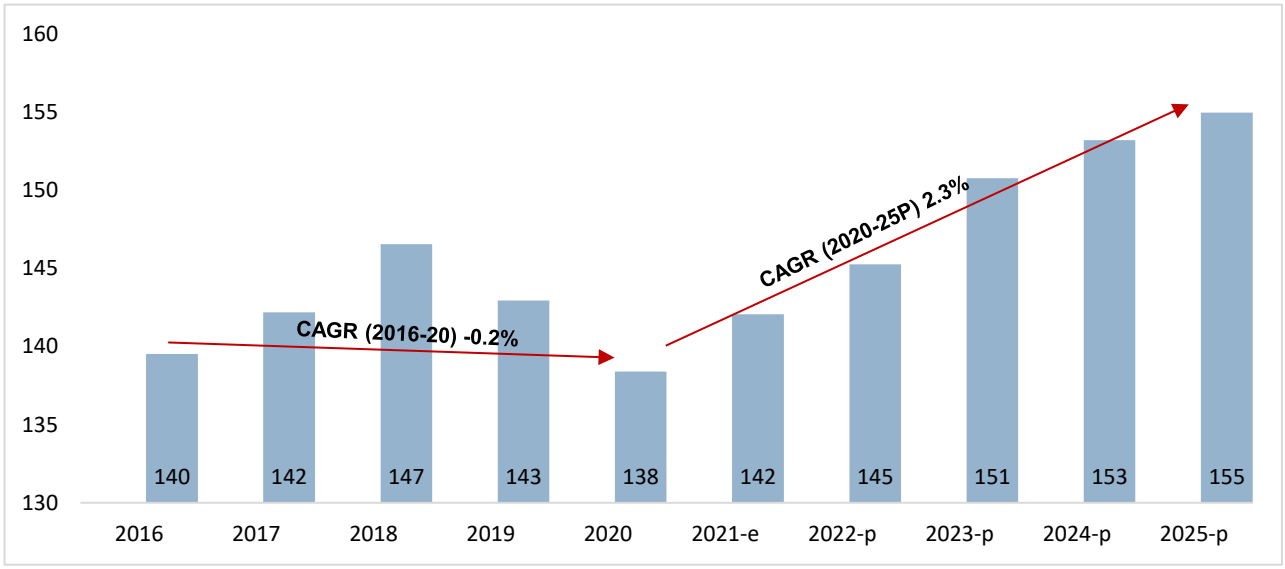
Focus on innovation and adoption of new technologies

- The Japan autonomous farm equipment industry is expected to witness around 11% growth rate through 2027 due to rising workforce issues in the sector. Players in the domain are constantly emphasizing on improving their solution offerings to establish a differentiated market positioning and cater to a large set of customers. These factors have encouraged companies to introduce new features in the product line for tackling labor shortage issues.
    - For instance, in February 2021, Yanmar Agribusiness upgraded its autonomous tractor range with full autonomous work. The company has included multi-frequency antennas and advanced GNSS satellite features, thus improving positioning, RTK coverage & precision of the equipment. It will also support in addressing the aging farming population problems of the sector.
- These innovations and technological developments are expected to result in purchase of new tractors by the farmers, thereby driving market growth

Demand Review and Outlook

Over 2016-2020, tractor production recorded a CAGR of -0.2%. Tractor production in 2020 is dominated by less than 60 HP category. Further, production of over 60 HP tractors and 4WD tractors is quite limited in Japan.

Japan Production Volumes of Tractor ('000 units)



Source: Off-highway, CRISIL Research

Factors such as technological innovation, driverless tractors, etc. will play an important role in shaping up the market. However, during 2020-2025, Japan's tractor production is expected to register a marginal CAGR of 2.3% to reach 154,964 units in 2025.

China

China is the world's second-largest economy and is home to one-fifth of the global population. China's arable land, which represents 10% of the total arable land in the world, supports over 20% of the world's population. Of this approximately 1.4 million square kilometers of arable land, only about 1.2% (116,580 square kilometers) permanently supports crops and 525,800 square kilometers are irrigated. In China, land ownership is different as compared to the western countries. State owns the land and farmers can retain control of their land allocations themselves. Farmers can also transfer those rights to a cooperative and become employees of the cooperative.

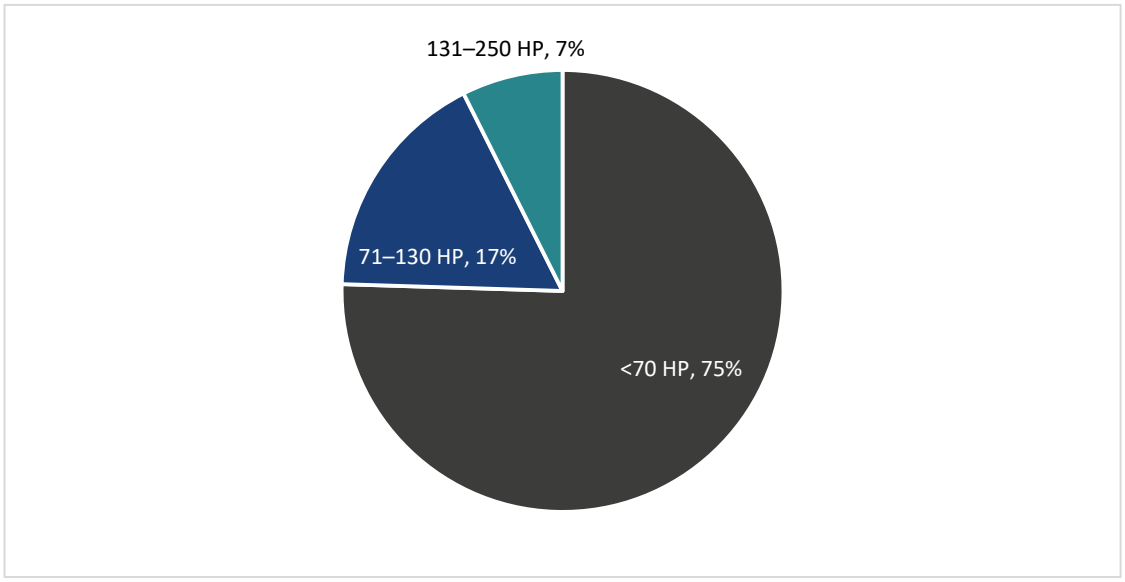
Corn, rice, and wheat are the main crops produced in the country. In the past few years, corn has overtaken rice as primary domestic crop. In 2020, around 260.7 million metric tons of corn were produced in China. Corn's share of harvested grain and oilseed area increased from 15% to 34% between 1972 and 2020, or by 0.39 percentage point per year.

China is now the world's largest agricultural importer, surpassing both the European Union (EU) and the United States in 2019 with imports totaling $133.1 billion. What's more, the composition of China's imports is also rapidly changing. Whereas bulk commodities once dominated, higher-valued consumer-oriented products are now surging ahead, eclipsing the former for the first time in 2019. While implementation of the U.S.-China Economic and Trade (Phase One) Agreement and the economic response to Covid-19 currently overshadows the trade landscape, the biggest challenges facing U.S. agricultural exports in China are more competition from other suppliers and U.S. agriculture's ability to meet increasingly diverse Chinese import needs.

Tractor sales in China is dominated by <70 HP tractors. In 2020, approximately 75% of the tractors sold were below 70 HP segment. Tractors above-130 HP contributed only 7% of the China tractor market. High-HP tractors and

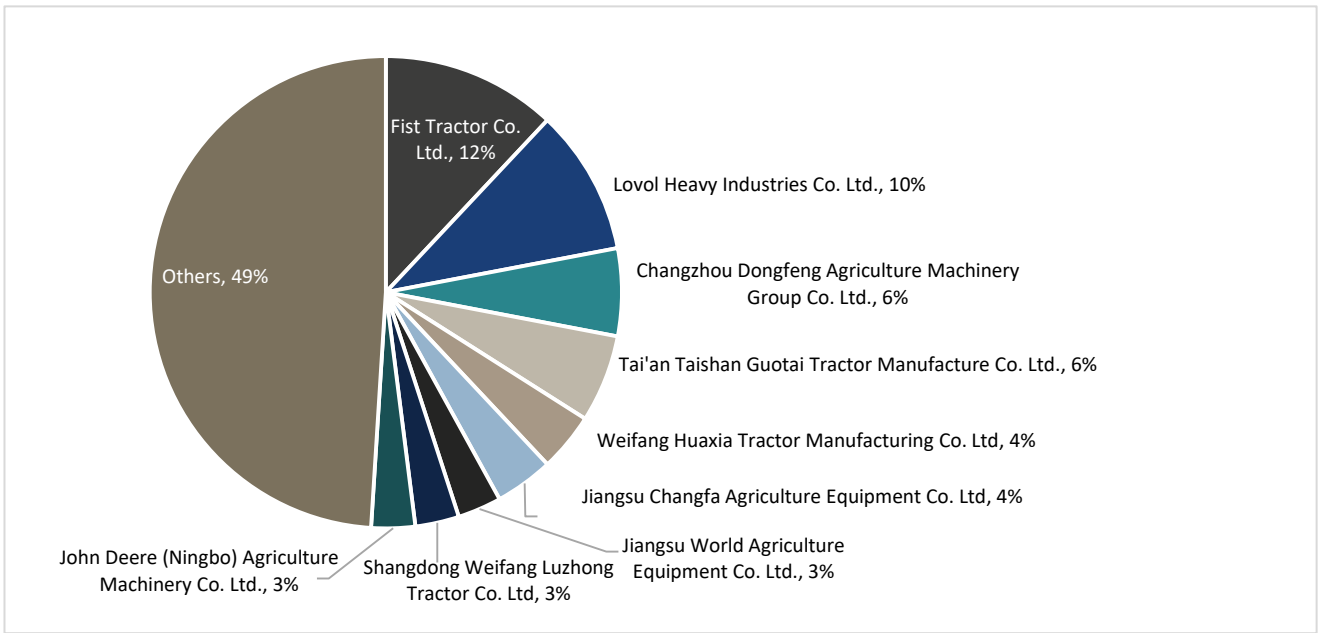
combines are widely used in Northern China as farm size are larger in the region. However, such tractors are not suitable for southern regions as farm size is small.

China Tractors Production – Market Segmentation (269 thousand units in CY 2020)



Source: Off-highway, CRISIL Research

China Agriculture Equipment Market Share Analysis - By Value (2575 USD Million in CY 2020)



Source: Markets & Markets, CRISIL Research

Agriculture machinery companies are investing resources to expand their presence in China.

- India's Sonalika International Tractors Ltd. (ITL) entered the Chinese market in 2019. They announced its entry into the world's largest auto market China through a joint venture with over $400 million Shandong Luyu Heavy Industry Co. As part of the JV agreement, signed between the two partners, Sonalika will also set up an assembly plant for engines in China
- Mahindra & Mahindra announced to re-enter Chinese farm equipment market in June 2018. The re-entry was part of the company's plan to generate more than 50% of its business from international markets.
- Japan's Kubota commenced operation of a new tractor and combine harvester plant in China in November 2017. The 29,000 sq. meter plant, located in Jiangsu Province, has per-year capacity to produce 10,000 tractors and 10,000 wheel-type combine harvesters

Key Demand Drivers for Tractors

Subsidies to support higher level of mechanisation

- China is one of the leading spenders on agricultural subsidies in the world. In 2021, China will hand over a one-off subsidy of 20 billion yuan ($3.1 billion) from its central finance budget to farmers to cope with rising costs of production materials due to spiking commodity prices.
- During the last decade, Organisation for Economic Co-operation and Development (OECD) has reduced the agricultural subsidies as a percentage of GDP. In contrast, China has increased the agricultural subsidies as a percentage of GDP over the same period
- Chinese government is increasingly directing funds to improve the underlying agricultural system by subsidising the cost of machinery, and increasing the efficiency and productivity of the agricultural sector
- The government has also introduced 'Made in China 2025' scheme that will focus on 10 key sectors for new technologies. As part of this plan, it is expected that China will produce 60% of tractors and harvesters used on Chinese farms by 2025
- Agricultural mechanisation level in China was about 65% in 2016 and the country has exceeded 70% mechanisation level in 2019

Urbanisation and decline in agriculture workforce

- According to the 'National New-type Urbanisation Plan (2014-2020)', China aimed to move 100 million people from the country's farming regions into cities by 2020. Further, it aims to move 250 million people to cities by 2025 to support its economic growth
- Percentage of China's workforce employed in agriculture declined from about 37% in 2010 to about 24% in 2020 and it is expected to decline further with government focus being on urbanisation
- As the country focuses on urbanisation, there emerges a shortage of labour, resulting in the need to use automation to displace repetitive tasks while gaining efficiencies

Farm consolidation on the rise

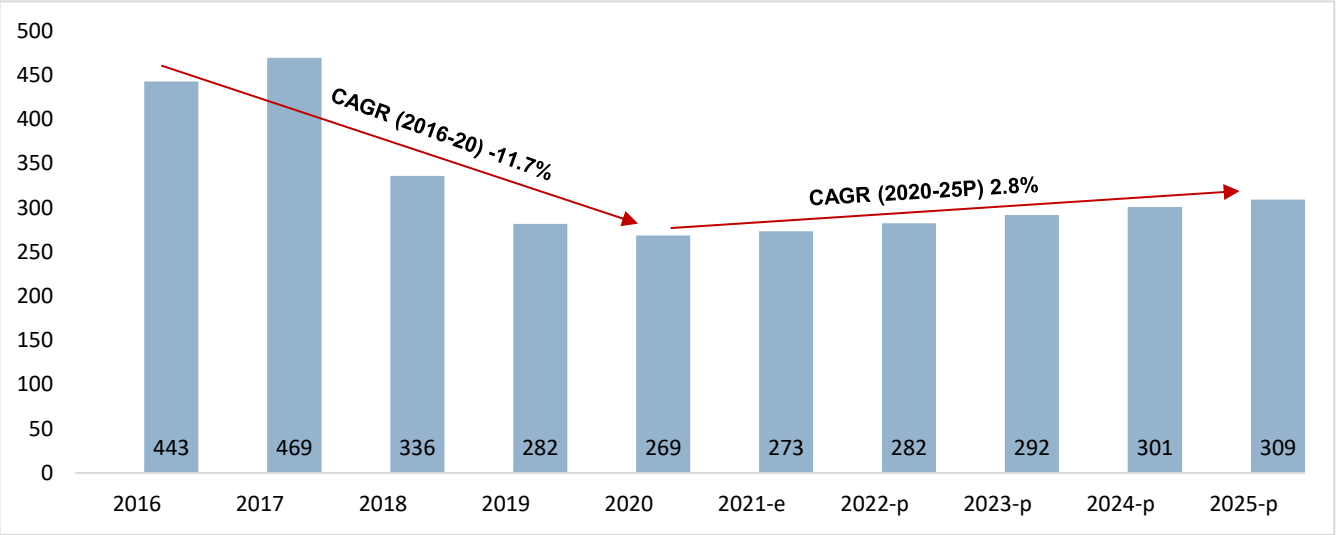
- Land consolidation is used as a tool for land use management in China. According to the 13th Five-year Plan (2016-2020), the country's land is divided into nine zones for consolidation
- China will spend around $247.0 billion (1.7 trillion yuan) to increase the quality of arable land and promote urbanisation. As part of the plan, China's focus will be on farm consolidation and use of modern farming technologies to achieve higher yield

- The high-yield farmland incorporates use of modern technology and hence it will be driving the tractor market in the region

Demand Review and Outlook

During 2016-2020, China's tractor production registered annual decline of 11.7%. The less than 70 HP tractors dominate the tractor production in China. It accounted for 75% share in 2020. However, 4WD tractor production is not popular in China.

China Production Volumes of Tractor ('000 units)



Note: Production volumes does not include <30HP segment tractor units as data was NA from trusted sources for the same

Source: Off-highway, CRISIL Research

Factors such as farm consolidation, government subsidies and decline in agriculture workforce will play an important role in shaping up the market. During 2020-2025, China's tractor production is expected to record a CAGR of 2.8% to reach 308,914 units in 2025.

India

Comparatively adolescent by world standards, India's tractor market has expanded at a spectacular pace in last few years.

For a long time since Independence, the market was dominated by mid-sized tractors with engine capacity of 30-40 horse power (HP). But it has diversified in recent years, which is evident in the rising demand for both bigger (over 50 HP) and smaller (below 20 HP) tractors.

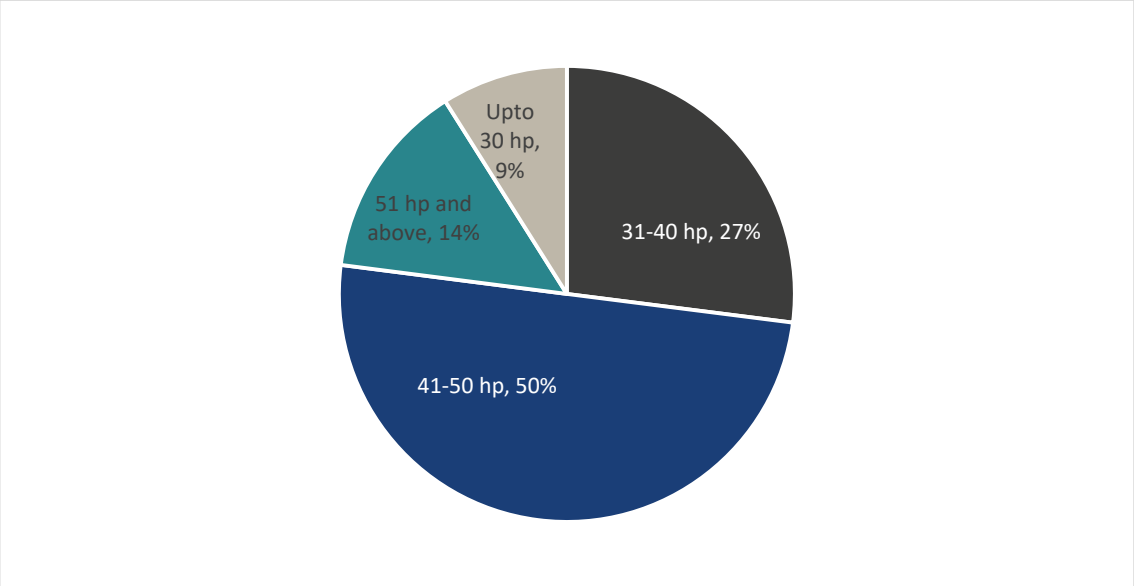
With growing need for greater precision in farm operations, especially in areas where intensive multi-crop farming is performed, demand for tractors of different sizes and utility values is bound to increase.

Average size of tractors in India is 35 HP, which is much smaller than in US and Europe. In last five years, we can see a clear trend of farmers moving towards >51 hp segment. As of fiscal 2020, This segment grew by more than 75% as compared to fiscal 2015. 41-50 hp segment share has also been increasing marginally in the past five years. However, 31-40 hp segment's share has been declining in the past five years.

Another factor driving demand for higher HP tractors is upgradation by farmers to allow mechanisation with rotary tillers and similar equipment. Significant demand had been generated by applications in haulage and construction.

Mechanisation will be further fuelled by increasing shortage of labour. A new trend is evolving – tractors of less than 15 HP are being launched by manufacturers for farming smaller plots. Within segments, the domestic tractors market is dominated by 31-40 HP and 41-50 HP segments.

Proportion of tractor sales in India (862 thousand units in CY 2020)



Source: TMA, CRISIL Research

Structure of tractors industry has remained largely static, with Mahindra & Mahindra (M&M) retaining its leadership position with 37% market share, and Tractors and Farm Equipment Ltd (TAFE) coming a distant second (17%) in 2021.

Global players who are present in India (like John Deere and New Holland India (NHI)) are also likely to provide strong competition to the well-established players in future, as they have strengthened their Indian product portfolio and distribution network.

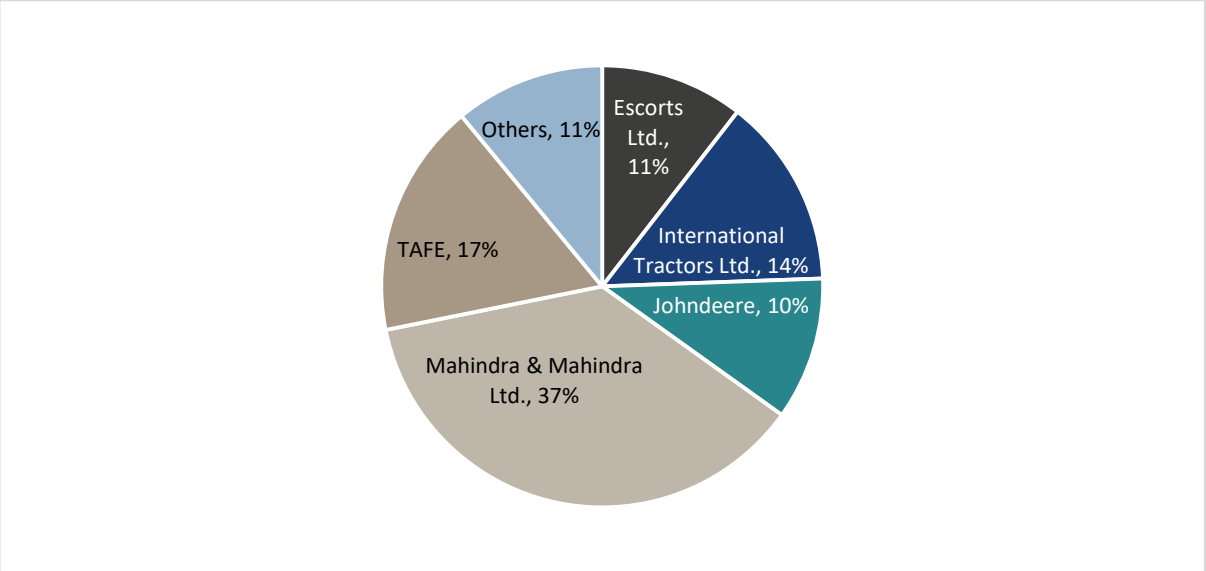
Over past five years, Escorts gained market share of over 200 bps to reach 11%, while International Tractors Limited gained market share of around 220 bps to reach 14% in 2021. In addition to its contribution to the domestic tractor market, John Deere is also one of the major exporters.

Players such as John Deere and New Holland are using India as a base to export to North America and Europe, which primarily use high-horsepower tractors. International Tractors Ltd's (ITL) growing exports have also contributed to a shift towards the higher horsepower segment. ITL, manufacturing higher and lower horsepower tractors, is continuing to expand its overseas footprint by launching tractors in 90-120 HP range for developed markets.

However, over past five years, major exporter John Deere lost market share of over 270 bps to register 18.2% market share in fiscal 2021, while ITL now leads with 24.8% share of the export market.

Small players like Force Motors, VST Tractors and Tillers, and HMT are likely to be marginalised further over the long term, in the domestic tractor industry due to lack of diversified product portfolio, poor pan-India distribution network, and weak cost structure.

Indian tractor market share (862 thousand units in CY 2020)



Source: TMA, Crisil Research

Key demand drivers for tractors

Tractor demand is mainly driven by farmers' ability to purchase tractors and is affected, both directly

and indirectly, by a number of factors:

1. **Irrigation intensity and monsoons**

   Irrigation plays a vital role in determining demand for tractors. A farmer will prefer to invest in costlier assets such as tractors only when he is assured of receiving essentials for farming such as water supply. The irrigation spends which increased significantly in last two decades have aided both irrigation and cropping intensity, thus leading to higher and stable farm incomes. Irrigation intensity is expected to improve further over the medium term, supporting tractor sales

   - Irrigation intensity in India has improved 5% to around 45% in last one decade
   - However, India continues to have lower irrigation intensity than China (52% irrigation intensity). Hence, dependence on monsoon for farming is relatively higher
   - Continuous deficient monsoons also impact reservoir levels, which, in turn, affect irrigation intensity

2. **Small landholding limits mechanisation advantages**

   - Average land holding size in India is very low at 1.16 hectares (ha) against world average of 3.7 ha, with

about 65% of farmers being marginal farmers (holding less than 1 ha)

- This has deterred tractor demand. Moreover, average landholding size has been declining due to socio-economic factors such as break-up of joint families and division of ancestral land
- Declining landholding size has both positive and negative impact on tractor demand. With division of larger landholdings into smaller ones, number of tractors required is expected to rise
- However, a tractor would become uneconomical for small farmers due to reduction in farm size. But with proportion of landholdings below 2 ha being very high, consolidation of landholdings will drive demand in the long run

3. Availability of credit on the rise

- In India, around 75% of tractors purchased are on credit, so its availability becomes a key demand driver for the industry. Any major change in financing norms directly impacts demand for tractors
- Agricultural credit usage in farm mechanisation has been growing steadily over the years, enhancing farmers' ability to buy tractors. Public sector banks and non-banking financial companies (NBFC) are major financiers
- Over the last decade, cumulative share of public sector banks (PSB), co-operative banks, and regional rural banks has come down from about 75% to 15-20%, with NBFCs now accounting for about 50-55% of the market

4. Minimum support prices of food grains

- Government fixes procurement prices of food grains. These prices affect market prices, as they are used as a base for their calculation. Change in procurement prices directly affects a farmer’s income as it impacts his loan repayment capability
- Government has consistently raised minimum support prices (MSP) of major crops such as wheat, rice, sugar cane and cotton, starting from fiscal 2007. High growth in minimum support prices is unlikely to continue in view of the central government's fiscal constraints and fixing of inflation control emerging as the central pillar of economic policy.
- This has reduced volatility in farm incomes, notwithstanding some fluctuations in agricultural production, arising from deviation in rainfall. However, since fiscal 2015, hike in MSPs has been modest, compared with CAGR of 10-15% in previous seasons.

5. Cropping pattern

- Farmers are being encouraged and educated by state governments to improve farm productivity and increase their incomes
- To improve farm productivity, farmers are practicing multiple cropping
- Use of tractors helps a farmer to complete operations quickly, after which he can move on to the second crop
- Multiple cropping boosts farm yield and thus farm incomes, and lifts demand for tractors

6. Increase in cash crop production

- Extensive cultivation of cash crops has lifted farmer incomes and boosted demand for tractors
- Over the years, cultivation of cash crops has been rising in terms of both land area and share of output

7. Nature of soil

- Smaller tractors are more suitable for soft soil conditions, as conducting agricultural operations in such conditions requires lower-powered tractors
- In India, northern states of Punjab, Haryana and western parts of Uttar Pradesh have relatively soft soil. Hence, demand for small tractors is high in these regions
- In southern and western regions, soil is relatively hard, thus requiring medium and large-sized tractors

8. Crop mix

- Crop mix and nature of crops cultivated have a significant role in determining choice of a tractor
- Medium and large tractors are preferred for cultivation of cash crops such as sugarcane and cotton, entailing high agricultural activity and timeliness of operations
- Similarly, high-power tractors are preferred in case of intensive farming, multiple cropping, land bed preparation, and harvesting as well as when transportation needs to be quick

9. Replacement demand

- Lifespan of a tractor is estimated at 10-15 years, though actual usage could vary, depending on soil and cropping conditions
- Usually, the farmer who is replacing a tractor would want to upgrade to a higher-powered tractor. Hence, given increasing income levels and existing numbers of lower-powered tractors, replacement demand in states such as Punjab and Uttar Pradesh would be high for higher-powered tractors.

10. Purpose of use

- Choice of a tractor depends on whether the customer is a farmer, purchasing the tractor for agricultural purposes, or a contractor, who would use it for commercial purposes such as in construction projects for transportation of goods and materials
- Higher-powered tractors are preferred in construction projects

11. Resale price of tractors

- A tractor is typically replaced after 6-8 years of use. But it is estimated that it continues to be useful for around 18-20 years
- Since a farmer tries to cover margin money payment for a new tractor from sales proceeds of the existing tractor, he takes into account the resale price, which a particular tractor is expected to earn after it has been used for a certain number of years

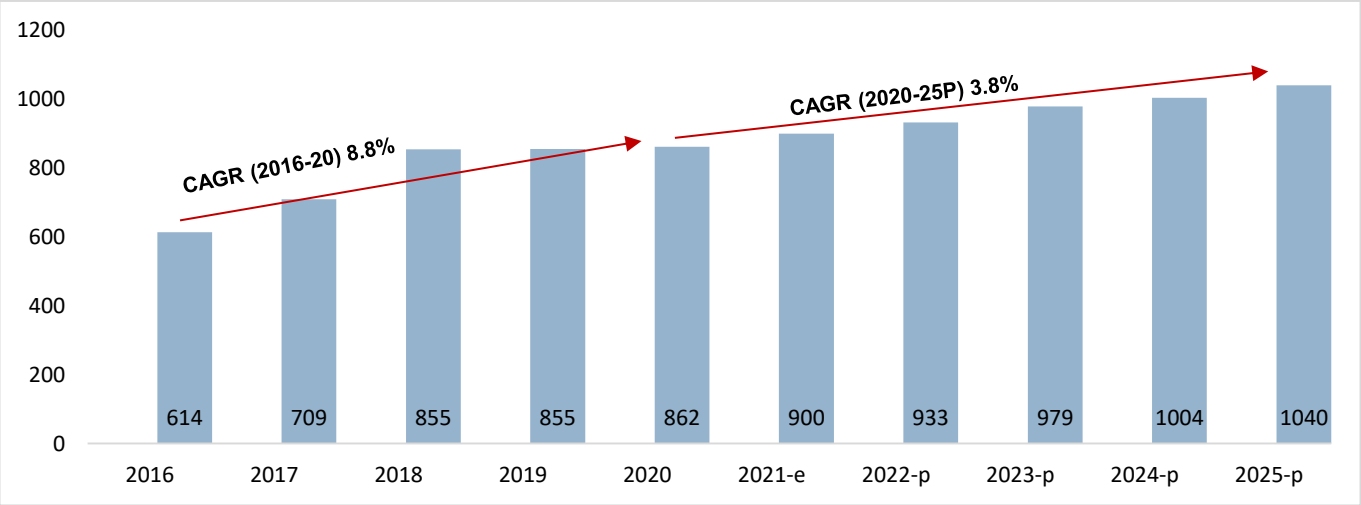
Demand review & outlook

Production volume increased at CAGR of 9% during 2016-2020. Robust growth in domestic sales in 2018 led to high growth in the industry. Post that, the industry expected witnessed strong growth in 2021 as well and has a healthy growth outlook over the medium term, prompting players to expand tractor capacities.

In 2020, tractor production grew by 1%, owing to two consecutive years of near-normal monsoon, government support in various states on account of Covid-19 impact.

Farm incomes were marginally impacted on the back of lower prices for pulses and coarse cereals. However, a record high food-grain production led to higher output in major states, improving farm income for paddy, wheat and sugarcane growers mainly, coupled with increase in government intervention across states, improving tractor demand.

India's tractor production volumes ('000 units)



Source: Off-highway, Crisil Research

Tractor production is projected to grow 3.8% in 2021, with normal monsoon expected to result in healthy growth for the cropping cycle and improved farmer sentiment. Government's increasing focus on rural activities has significantly boosted agricultural demand for tractors. However, rising tractor prices amid price hikes taken by OEMs due to rising commodity inflation; higher inventory at dealer's end to impact sentiments in the coming year. Credit availability continues to be stable with NBFCs strengthening their focus on tractor financing.

Tractor sales in the east and south, which together account for one-third of total sales, are expected to grow faster than in north and west in next three years. In the south, higher investments in irrigation infrastructure and a low base will boost tractor sales. In the east, high crop yields and commercial demand will drive up sales.

As most of the agricultural machinery is locally manufactured in India, factors such as the crop prices, monsoon departure, and government support will shape the market in the future. Over 2020-25, tractor production in India is expected to increase at a CAGR of 3.8%.

Rest of the World

Russia

Russia has transformed its agriculture sector significantly during the last two decades. The sector has evolved from a modest level of production to a significant contributor to the economy and the country's share as global producer of agricultural products is growing. Russia's export of agricultural products and foodstuff has grown sixteen-fold since 2000. In recent years, agriculture has been one of the fastest growing segments of the economy. Russia as the largest country by landmass worldwide is also in possession of a vast area for agricultural activity. Given the climate characteristics of the region, fruit and berry production is somewhat limited. However, grain and livestock farming are broadly developed, which is reflected in the country's high self-sufficiency levels for such products. Furthermore, Russia listed fourth by wheat production globally as of 2019/20.

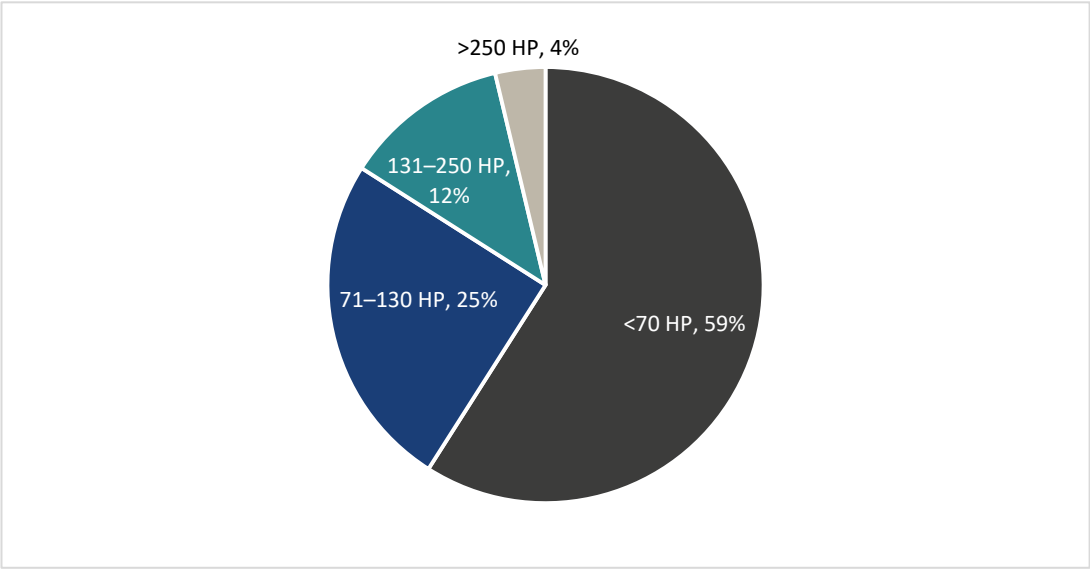
The agricultural export share in the total exports from Russia ranged from five to six percent over the past years. Wheat was and is projected to remain the most exported agricultural commodity in the future. As for imported grain, most of which was corn, its share in agricultural imports was the lowest compared to others.

Russia experiences extreme temperatures in winter and summer, and summer precipitation is low. Many regions of Russia experience six months of snow cover each year and in these places the subsoil can often be frozen permanently. The most fertile regions are in the southern parts of the country between Kazakhstan and Ukraine called chernozem ("black earth") in Russian. Just over 7% of the country's total land is arable, 60% of which is used for cropland and the remainder for pasture. According to a study by Kansas State University, compared to the late 1980s, average temperatures in Eurasia's grain-growing regions are set to rise by 1.8 degrees Celsius by 2020 and 3.9 degrees Celsius by 2050. The expected increase in temperature combined with new technologies will enable Russia to turn an additional 57 million hectares of land into agricultural land.

There is a high need to modernise agricultural equipment in the country. However, high credit costs inhibit equipment sales growth. The government is attempting to alleviate the obstacles and stimulate equipment sales by offering subsidies.

In Russia, <70 HP tractors were the most popular and accounted for approx. 60% of total tractors sales. Further, the market share of <130 HP tractors is 25%, followed by >130 HP tractors with a 16% market share in 2020.

Russia Tractors Production - Market Segmentation (24 thousand units in CY 2020)



Source: Markets & Markets, CRISIL Research

Key tractor companies operating in Russia in terms of popularity include the following:

Tractor Brand
Minsk Tractor Works (Belarus) (MTZ)
Peterburgsky Traktorny Zavod (PTZ)
Kharkiv Tractor Plant (khTZ)
John Deere (Deere & Company)
CLAAS KGaA mbH
New Holland Agriculture
Case IH
Deutz-Fahr (SDF)
Yanmar Holdings Co., Ltd.

Source: Markets & Markets, CRISIL Research

Key Demand Drivers for Tractors

Replacement of old fleet of tractors

- It is estimated that approx. 60% of the tractors in Russia have exceeded their service life (10-12 years). A tractor in Russia covers 237 hectares compared to 38 hectares covered in the US and 14 hectares covered in France. As a result, a tractor in Russia is estimated to travel more than six times as far as a tractor in the US
- According to former Russian agriculture minister Alexander Tkachov, Russia is facing a deficit of 180,000 tractors. A majority of the units already in use nationwide are either nearing the end of their service lives or have already sailed past that date
- Replacement of the old fleet is expected to drive the tractor market in Russia

Subsidies and loans to support mechanisation

- The Russian ministry of agriculture wants to keep the agriculture production trend intact in the country. Loans and subsidies are provided to farmers to enable them to purchase farm equipment fitted with the latest technology
- As part of the subsidy programme, the Russian government is providing subsidies to cover part of the cost for tractors, combines, and forage harvesters.
- A gradual increase in agricultural subsidies was expected in Russia, given the data at hand. Following 30 billion Russian rubles increase of the subsidy budget from 2016 to 2018, agricultural subsidies were planned to grow further and amount to 377 billion Russian rubles by 2024.

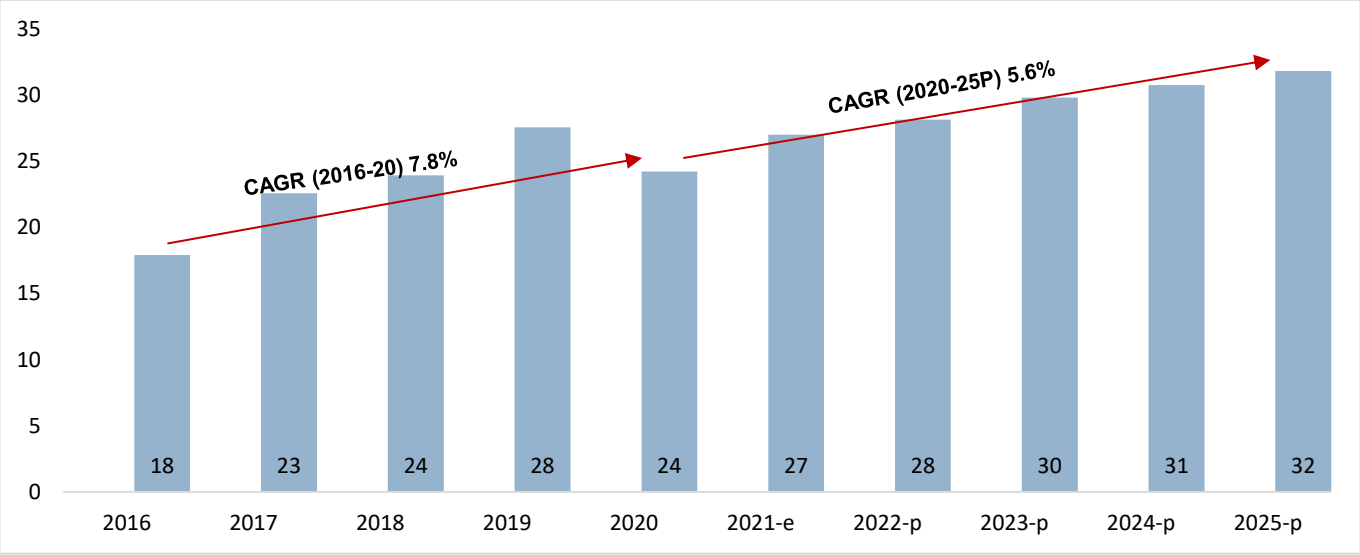
Government focus on local production of agriculture equipment

- The Russian government is focusing on increasing the domestic production of agriculture equipment. The government targets to produce 80% of agriculture machinery in Russia by 2021 from the current level of over 50%
- The government also targets to increase the export of agriculture equipment by 13 times over 2017-30. To achieve this target, it is actively offering incentives to agriculture equipment companies to facilitate them undertake local production
- This focus of the government is expected to positively impact the agricultural machinery market in Russia

Demand Review and Outlook

Over 2016-20, tractor production in Russia increased at an annual rate of 7.8% to 24,230 units in 2020. Tractor production was dominated by less than 70 HP category in 2020. The segment accounted for more than 55% of the total production in 2020. Further, greater than 70 HP tractors and greater than 130 HP tractors accounted for approx. 25% and 16%, respectively, of total production in 2020.

Russia Production Volumes of Tractor ('000 units)



Source: Markets & Markets, CRISIL Research

Factors such as replacement of old fleet, government focus on localised manufacturing, government subsidies, etc. are expected to drive local production of tractors in Russia. Over 2020-25, tractor production in Russia is expected to increase at a CAGR of 5.6% to 31,846 units in 2025.

Brazil

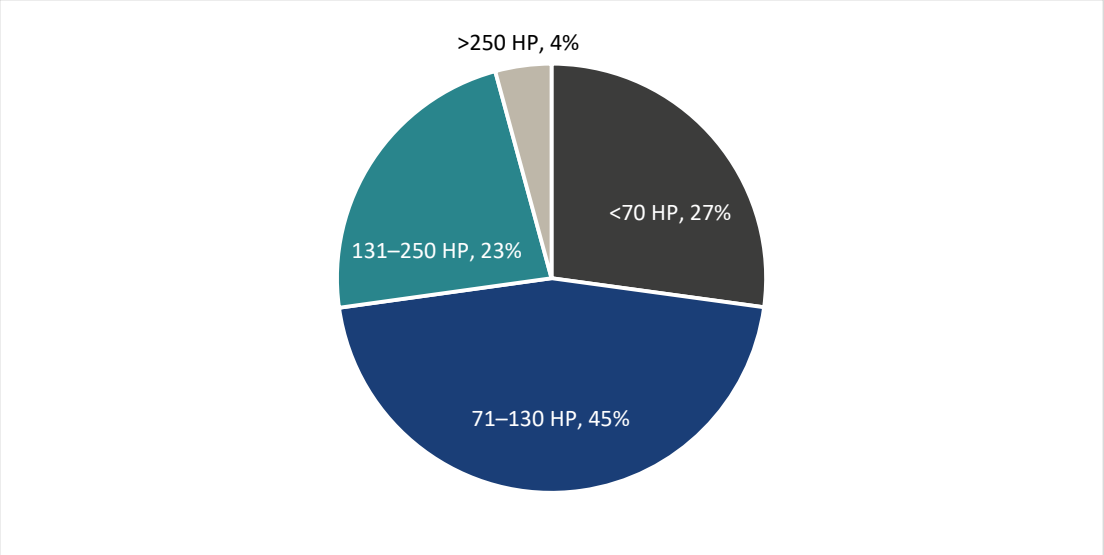
Brazil is the largest economy in Latin America and a key contributor to the region's growth. The country has transformed itself from a net importer of agricultural products in 1970s to a net exporter. The decline in commodity prices, high credit costs, and a comparatively young fleet of tractors have inhibited tractor sales growth in Brazil over the last few years.

Agriculture equipment manufacturers expect growth in 2021 primarily due to rising grain prices and an increase in the production of soybean. Export of soybean from Brazil is expected to increase from ~83 million metric tonnes in 2020 to ~140 million tonnes by 2040. Over the last two years, Brazil's central bank reduced the interest rate by approx. 800 basis-points.

Brazil is one of the largest exporters of agriculture goods, including soybeans. In 2020, exports of soybean from Brazil reached nearly 83 million metric tons, an increase of 12 percent when compared to the previous year. This is also the second highest figure reported in the decade. In turn, Brazilian soybean exports were valued at approximately 28.6 billion U.S. dollars that year.

Brazil is the largest market for farm equipment in the South American region. Most of the equipment is manufactured locally. 70-130 HP tractors are the most popular in Brazil and accounted for approximately half of the total tractors sold in Brazil in 2020. They were followed by <70 HP tractors with a 27% share in tractor sales in 2020.

Brazil Tractors Production – Market Segmentation (36 thousand units in CY 2020)



Source: Industry, CRISIL Research

Key tractor companies operating in Russia in terms of popularity include the following:

Tractor Brand
New John Deere
Massey Ferguson
Valtra (AGCO)
Agrale S.A.
CNH Industrial Brasil Ltda. – CASE
New Holland Agriculture

Source: Markets & Markets, CRISIL Research

After growing sales by 39% in 2020 over 2019, Mahindra has announced it will seek new partners for dealerships in Brazil to fill the current demand. Case IH is seeking to increase its presence in Rio Grande do Sul, the southernmost state of Brazil and the largest tractor market in the country. The company announced a partnership with Ferrarin, a dealership that serves 78 municipalities in the state. The multinational group is no longer represented by the company RGS there and sought a replacement with a dealership with more stores in the region.

German shortline manufacturer Horsch announced in March an investment of R$200 million ($35.3 million) in a factory in Curitiba, state of Parana, located in the South of Brazil, after 7 years in the country

The Brazilian sprayer manufacturer Jacto also announced in March it will expand with the addition of a second factory. The plant will also be located in Pompeia, a state of Sao Paulo. The new facility will have approximately 1.03 million square feet, while the first factory has just 419,000 square feet.

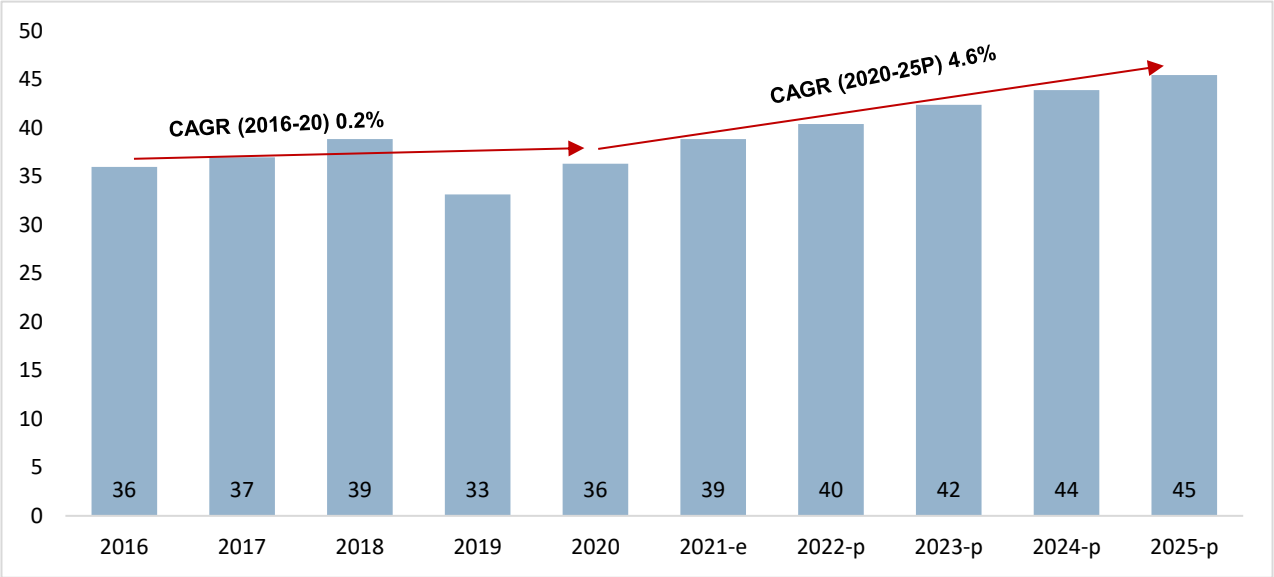
Key Demand Drivers for Tractors

- Agribusiness is one of the main activities in Brazil and contributes significantly to the Brazilian economy. This has led to more investments, leading to the growth of the market of agricultural machinery and implements in the country. The increasing wage of labor and the growing land consolidation created a demand for the agricultural mechanization. This factor, in turn, is expected to boost the sales of tractors.
- The recent trade war between the United States and China promoted many US-based companies, such as AGCO Corporation, to expand their operations in Brazil to manufacture low-horsepower tractors, in order to avoid a 25% tariff on Chinese products. This factor, in turn, is expected to drive the growth of the market for tractors in the country
- According to the Brazilian Department of Agriculture, around 70% of the farmers own 500 acres or more in the country. Manual plowing, harvesting, and other operations are found to be unfeasible and time-consuming. This has led farmers to opt for tractors and other types of machinery to address the challenges, such as cost, accuracy, and shortage of labor . As a result, the purchase of tractors has shown a positive trend over the year. Increasing land consolidation and cost of production creates the need for mechanization so as to increase productivity. This factor compels the farmers in Brazil to purchase tractors, leading to the increased sales of the tractors.

Demand Review and Outlook

Over 2016-20, tractor production in Brazil grew at an annual rate of 0.2% to 36,310 in 2020. Over 70 HP tractors dominate tractor production in Brazil. They accounted for 72% of total production in 2020. Production of less than 70 HP tractors is lower in the country.

Brazil Production Volumes of Tractors ('000 units)



Source: Markets & Markets, Industry, CRISIL Research

As most of the agricultural machinery is locally manufactured in Brazil, factors such as the price of soybean and corn, global agriculture trade flows, and implementation of emission requirements will shape the market in the future. Over 2020-25, tractor production in Brazil is likely to increase at a CAGR of 4.6% to 45,451 units in 2025.

2.3 Market Size and Outlook by Region

World Market

The world market for 3-point linkages (3PL) is estimated at USD 305-320 mn in 2020, grew at a CAGR of around 2 per cent during 2016-2020.

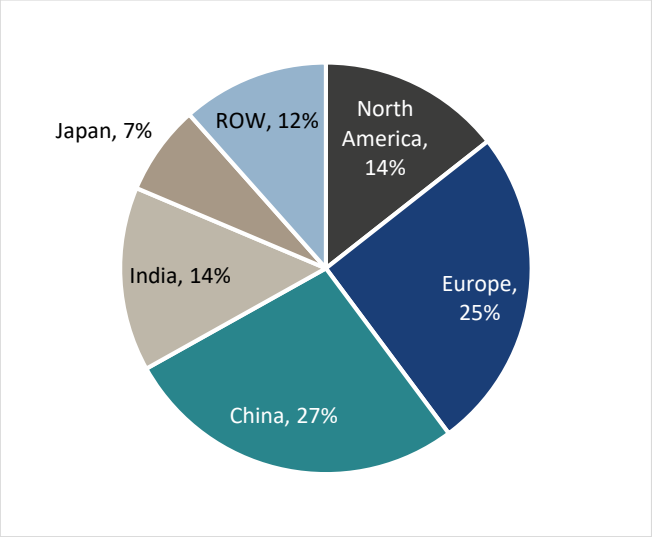
Europe, contributing nearly 8 per cent of the world tractor volume, is one of the key demand geographies for 3PL - contributing almost 26 per cent of the world demand for such parts in value.

India and China together account for around 62 per cent of world tractor production but generate an estimated demand of only 38 per cent for 3PL by value. This is primarily due to

- higher ratio of lower HP tractors in the total population
- lower prices of 3PL in these regions

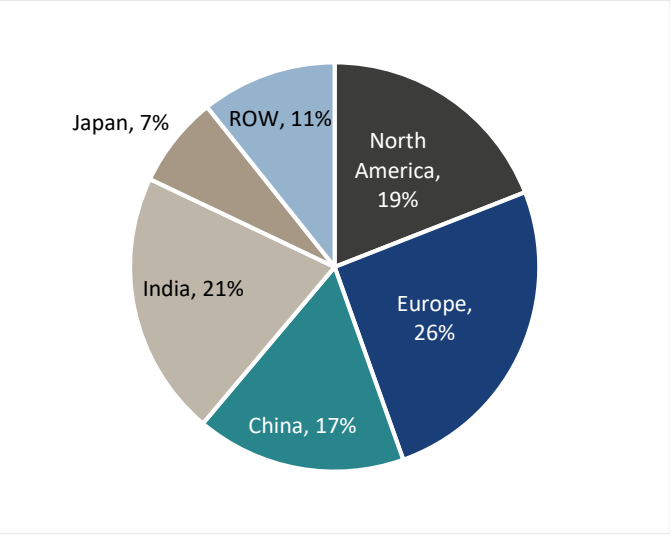
North America being one of the most mature tractor markets contributes around 12 per cent of world tractor demand and is estimated to contribute around 19 per cent of the total demand for 3PL in the world.

World 3PL Market (375-395 mn USD) in 2016



Source: Off-highway, CRISIL Research

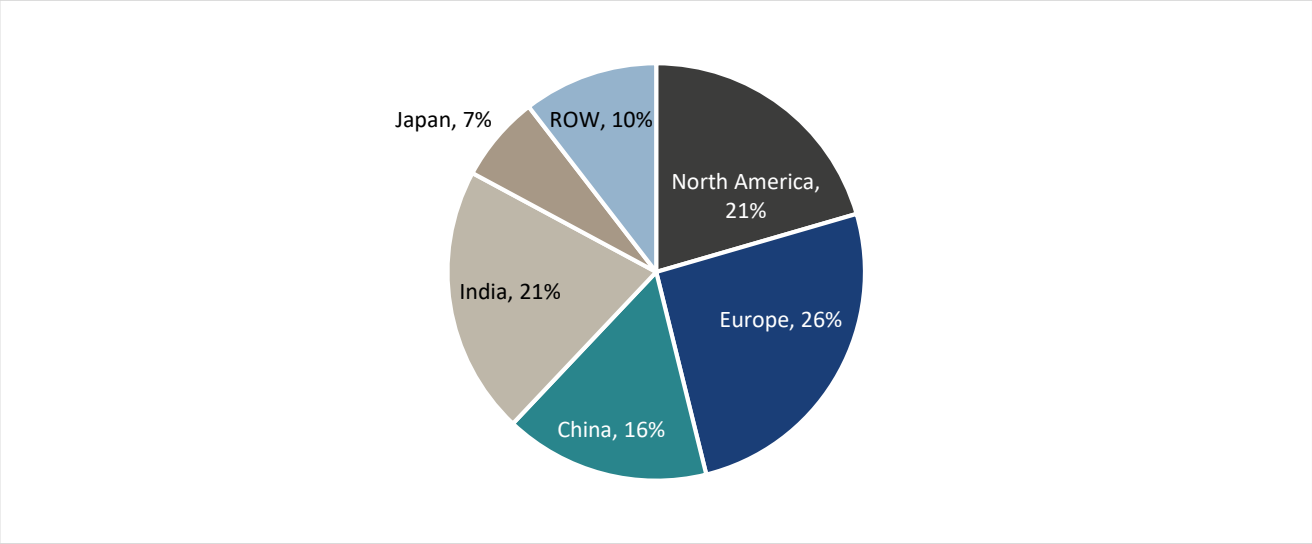
World 3PL Market (305-320 mn USD) in 2020



Source: Off-highway, CRISIL Research

Note: ROW includes tractor production in all the remaining geographies barring the five major geographies mentioned above

World 3PL Market (430-450 mn USD) in 2025P



Source: Off-highway, CRISIL Research

Note: ROW includes tractor production in all the remaining geographies barring the five major geographies mentioned above

In 2020, the tractor market witnessed a moderate growth of around 2 per cent as demand in major markets, China and Europe, de-grew owing to Covid-19 impact. During 2016-2020, India registered a 9 per cent CAGR while China declined by 12 per cent in tractor demand. In the near future, tractor demand is expected to pick up in India and China leading to increase in market share of these geographies to slightly more than 1/3rd of worldwide 3PL demand.

Tractor demand from North America and Europe, the two important 3PL markets contributing close to 45 per cent of world demand, is estimated to grow at a CAGR of around 6-9 per cent between 2020 and 2025.

Introduction to 3 Point Linkages

In the 1960s, tractor and implement manufacturers agreed on the three-point hitch as the one standard system to hitch implements to tractors. Most tractors are equipped with a 3-point linkage system and they are classified according to ISO 730 in 4 categories 1-4 depending on the engine rating.

The three-point linkage most often refers to the way ploughs and other implements are attached to an agricultural tractor. The three points resemble either a triangle, or the letter A. Three point attachments is the simplest and the only statically determinate way of joining two bodies in engineering.

The three-point linkage systems consist of different assemblies that are attached to an agricultural tractor. It forms a group of assemblies allowing attaching an implement like a plough to the tractor at 3 coupling points forming a triangle.

It connects the implement in a manner to the tractor that the tractor and implement becomes one unit allowing the tractor to operate the implement. The 3-point linkage transfers the entire load which can be a multiple of the implement weight between the tractors and implement.

The parts are highly loaded and exposed to fatigue as well as wear and tear in particular in the joints due to movement under high load condition.

Three-point linkages are composed of three movable arms. The two lower arms—lower links or draft links—are controlled by the hydraulic system, and provide lifting, lowering, and even tilting to the implement. The upper centre arm—called the top link—is movable, but is not powered by the tractor's hydraulic system and acts like a connecting rod. Each arm has an attachment device to connect implements to the hitch.

The hitch lifting arms are powered by the tractor's own hydraulic system. The hydraulic system is controlled by the operator, and usually a variety of settings are available. A draft control mechanism is present in all three-point linkage systems.

The draft of the implement, the amount of force it is taking to pull the implement, is sensed through a load sensing device and providing a feedback signal to the hydraulic system which automatically raises or lowers the arms slightly when the draft increases or decreases.

The features of a 3-point linkage design are highly dependent on the market they have to service. There are fundamental differences in the features of an entire system and the design of the components interfacing with the implement. The design features can be classified as:

- **Standard:** Basic design of all components with simple joints to connect the implement to the tractor. It is used on low HP tractors and in the economy segment.
- **Telescopic:** In this design the lower links do not have standard ball joints at the interfacing joining the implement but a device which allows to disengage a slip end which then can be joined to the implement by having the tractor only positioned in a certain proximity to the implement. In this configuration the top link is usually a standard design with basic ball joints at the implement end.
- **Quick Coupler:** The lower links are equipped with a claw allowing the operator to remain on his operator station and to connect or disconnect an implement from his seat. This has significant advantages in regard to safety and comfort, in particular considering the size and weight of implements connected to a tractor.
- **Frame Coupler:** This is a version of a quick coupler using an A frame / single piece joining with the implement. This configuration ís primarily a North American specification and a limited relevance globally.

Further, there are five different linkage sizes, called categories. The higher category linkages have sturdier lift arms and larger connector pins. There is some flexibility in the tractor HP at which one category linkage ends and the next begins. Globally 3PL industry follows ISO: 730.

Compound Annual Growth Rates (CAGR) – 3PL

CAGR	NORTH AMERICA	EUROPE	JAPAN	CHINA	INDIA	TOTAL
Review (2016-2020)	9.6%	2.4%	2.8%	-9.5%	12.1%	2.3%
Outlook (2020-2025)	8.7%	7.2%	5.4%	6.2%	7.0%	7.1%

Source: Industry, CRISIL Research

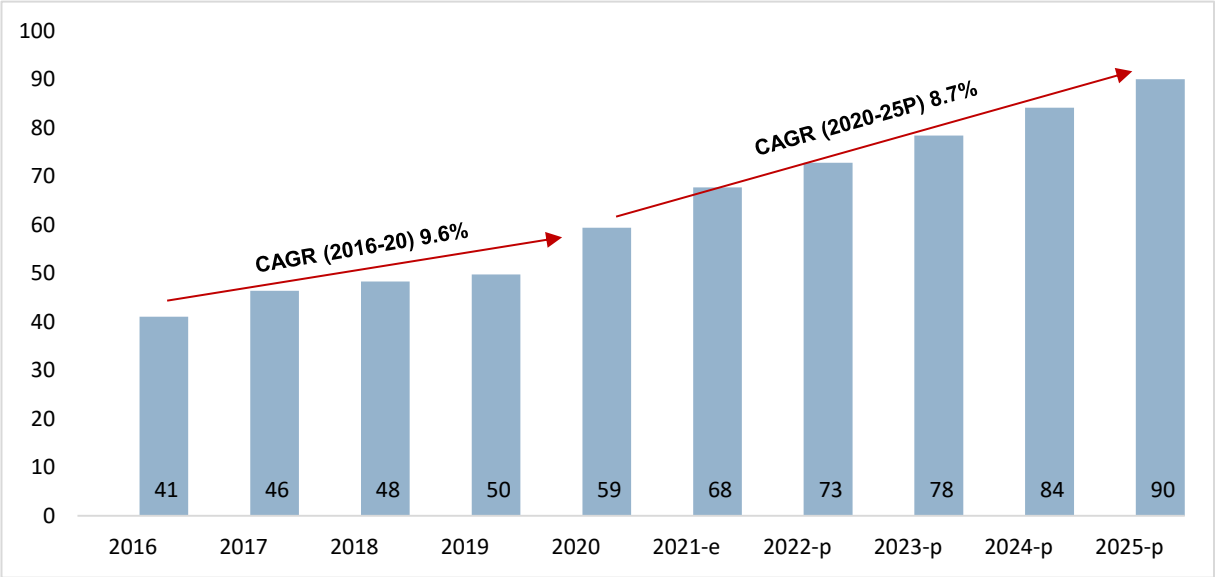
Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

Geography- wise 3PL market

North America

During 2016-2020, tractor production in North America increased at a CAGR of 6.8% to 225 thousand units in 2020. Less than 70 HP category tractors dominate the tractor production in North America with 75% share in the total production in 2020. 3PL Market in North America increased over 2016-2020 primarily due to growth in the number of tractors.

North America 3PL Market Value in ($ millions)



Source: Off-highway, CRISIL Research

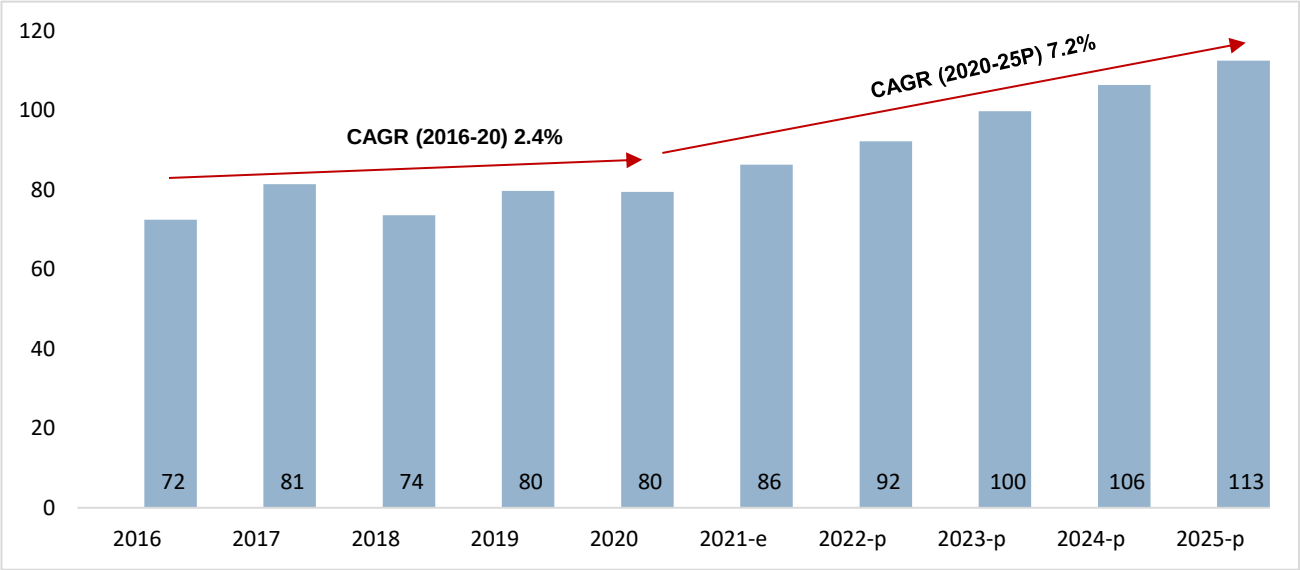
Outlook

During 2020-2025, tractor production in North America is expected to record a CAGR of 5.1% to reach 289 thousand units in 2025. Expected growth in the tractor production due to consolidation of farms, technological innovation and labor shortage is estimated to increase the demand of 3PL. As a result, 3PL market in North America is expected to increase at a CAGR of 8.7% to $90 million in 2025.

Europe

Over 2016-2020, tractor production in Europe decreased marginally at a CAGR of 0.5%. Underlying growth in the tractor volume and higher proportion of over 60 HP tractors resulted in the high share of Europe in the global 3PL market. 3PL market in Europe increased at a CAGR of 2.4% over 2016-2020 to $80 million in 2020.

Europe 3PL Market Value in ($ millions)



Source: Off-highway, CRISIL ReSearch

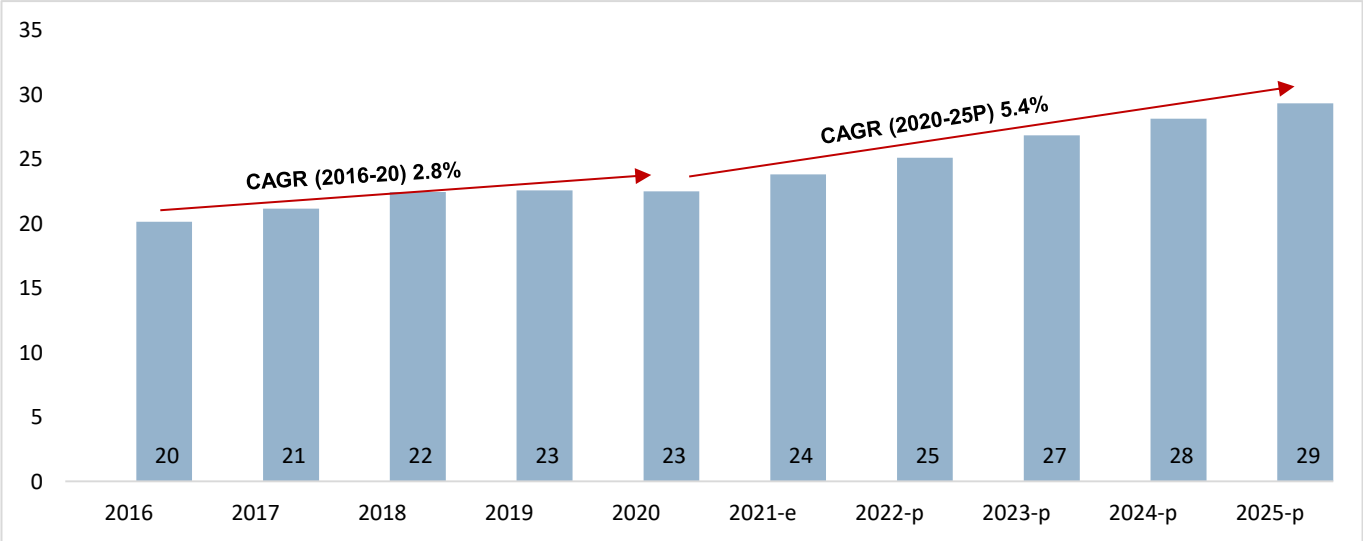
Outlook

Over 2020-2025, tractor production in Europe is expected to register a CAGR of 4.1% to reach 183 thousand units in 2025. Expected growth in the tractor production due to shift towards larger farms, technological innovation, and increase in the income of farmers will drive the demand of 3PL. As a result, 3PL market in Europe is expected to increase at a CAGR of 7.2% to $113 million in 2025.

Japan

Over 2016-2020, tractor production recorded annual decline of 0.2%. Underlying decline in the tractor volume and but increase in 3PL prices resulted in the stable share of Japan in global 3PL market. The market in Japan increased at an annual rate of 2.8% over 2016-2020 to $23 million in 2020.

Japan 3PL Market Value in ($ millions)



Source: Off-highway, CRISIL Research

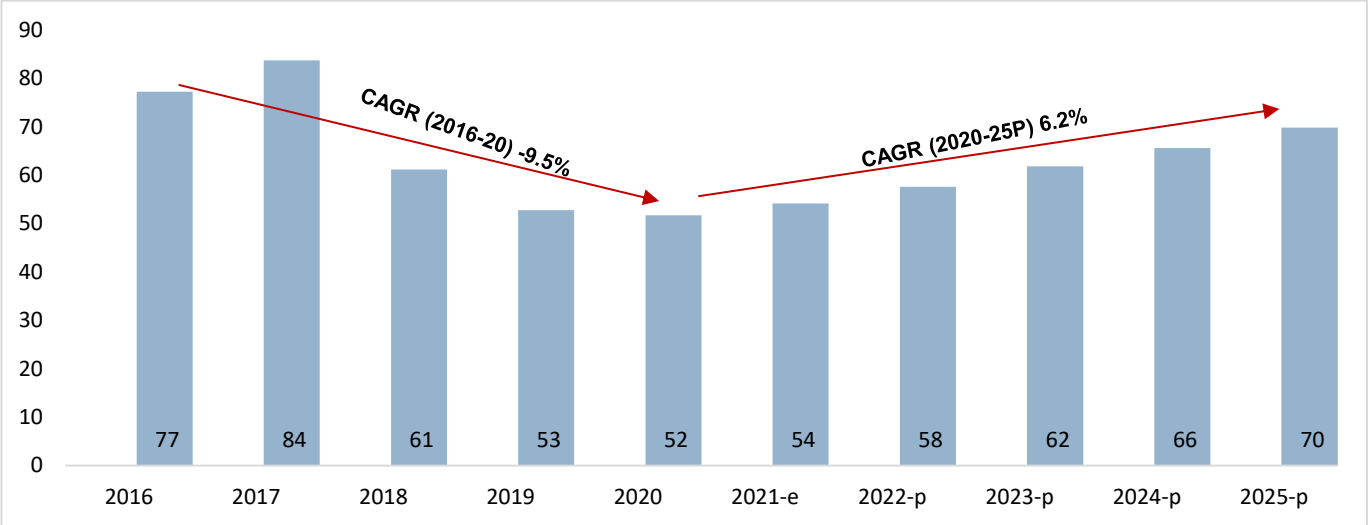
Outlook

Over 2020-2025, tractor production in Japan is expected to register an annual growth of 2.4% to 155 thousand units in 2025. The growth in Japan will be slower compared to the US and Europe. However, factors such as labor shortage, aging population, and technological innovation will impact the tractor market. During the same period, 3PL market in Japan is expected to increase at a CAGR of 5.4% to $29 million in 2025.

China

During 2016-2020, China's tractor production registered annual decline of 11.7%. The less than 70 HP tractors dominate the tractor production in China. Underlying decline in the tractor volume resulted in the decline of 3PL market in China. It declined at the annual rate of 9.5% over 2016-2020 to $52 million in 2020.

China 3PL Market Value in ($ millions)



Source: Off-highway, CRISIL Research

Outlook

During 2020-2025, China's tractor production is expected to record a CAGR of 2.8% to reach 309 thousand units in 2025. Expected growth in the tractor production due to government subsidies, shortage of labor due to urbanisation, and farm consolidation will increase the demand of 3PL. As a result, 3PL market in China is expected to increase at a CAGR of 6.2% to $70 million in 2025.

India

More than half of India's work force is still reliant on the agricultural sector for employment. Furthermore, there has been continuous fragmentation in land holdings and average size of land holdings has declined from 1.33 hectares in 2000-01 to 1.16 hectares in 2010-11.

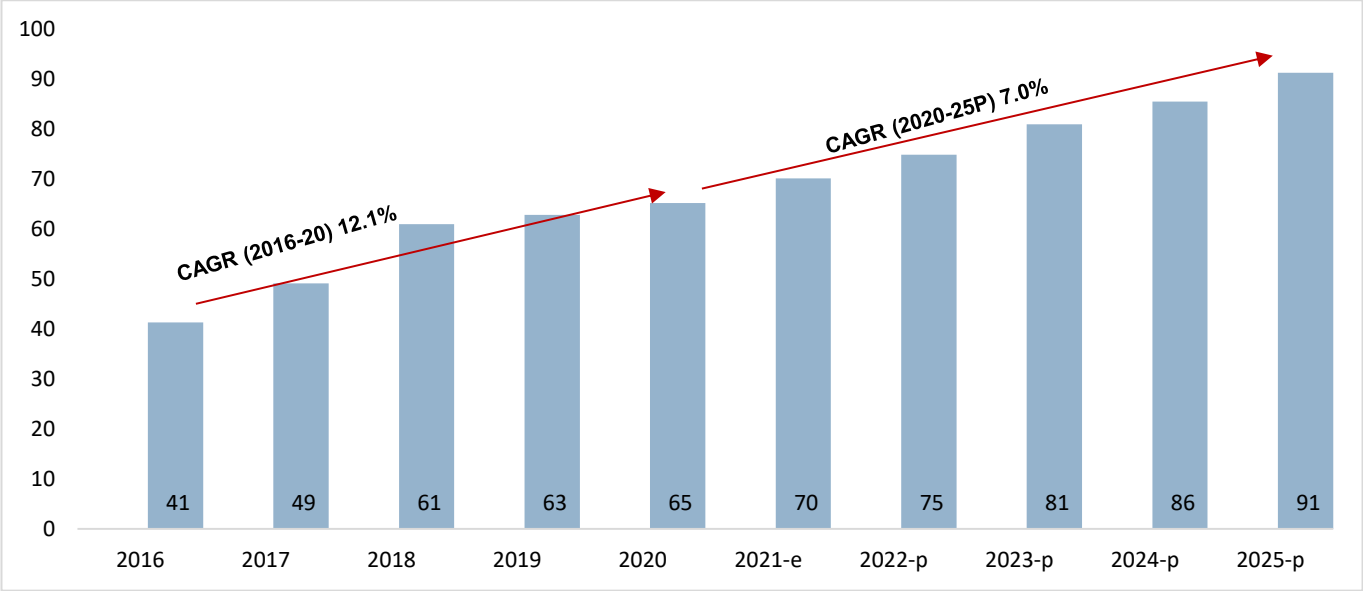
Tractors were predominantly used in land preparation and haulage. Tractor applications are now extending to other farming activities such as cultivation, seeding, inter-cultivation, weeding, and spraying. Increased multi-cropping and

commercial usage of tractors is propelling tractor demand. Thus, there is potential not only to improve crop productivity but also to increase farm mechanisation in the country.

Production volume of tractors rose at CAGR of 8.8% between 2016 and 2020, on the back of a high growth in the industry. Growth of tractor sales has helped to increase demand for 3PL. During 2016-2020, the 3PL market value grew at CAGR of 12%.

The 3PL industry has surged on the back of a strong growth in overall tractor production and increase in average price of 3PL parts in the market.

India's 3PL market value in millions USD



Source: Off-highway, Crisil Research

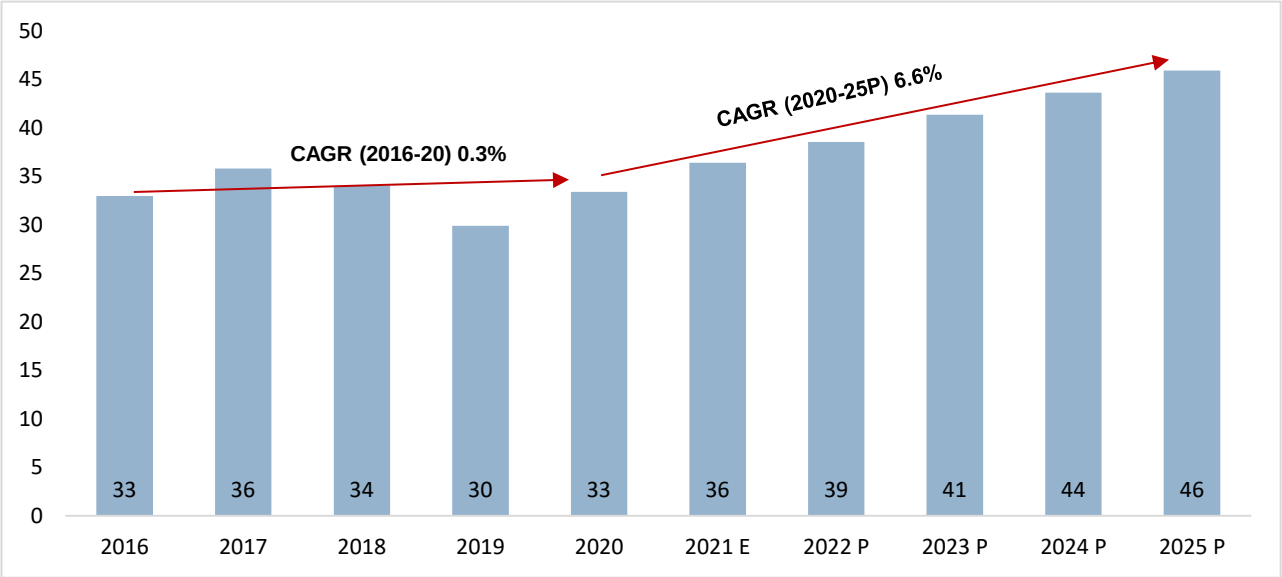
Outlook

Between 2020 and 2025, with increasing mechanisation in India's agriculture sector, supply of tractors is expected to increase at CAGR of around 4%, coupled with rise in average price of 3PL parts in the market, due to hike in raw material cost. This will lift demand for 3PL at CAGR of around 7%.

Rest of the World

During 2016-2020, tractor production for rest of the world declined at an annual rate of 2.6%. Over 60 HP tractors dominate the tractor production in Russia and Brazil. However, during 2020-2025 the rest of the world tractor production is expected to grow at a CAGR of 4-6%, which is estimated to increase the 3PL market for rest of the world at a CAGR of 6-8%.

Rest of the World 3PL market value in millions USD



Source: Crisil Research

Russia

During 2016-2020, tractor production in Russia grew at an annual rate of 7.8%. Over 60 HP tractors dominate the tractor production in Russia. 3PL market in Russia also grew at an annual rate of 8% over 2016-2020 to $6 million in 2020

During 2020-2025, Russia's tractor production is expected to record a CAGR of 5.6 % to reach 32 thousand units in 2025. During the same period, 3PL market in Russia is expected to increase at a CAGR of 8.9% to $9 million in 2025.

Brazil

During 2016-2020, tractor production in Brazil grew at an annual rate of 0.2% to 36 thousand units in 2020. Over 70 HP tractors dominate the tractor production in Brazil. 3PL market in Brazil declined at an annual rate of 3.4% over 2016-2020 to $14 million in 2020.

During 2020-2025, Brazil's tractor production is expected to record a CAGR of 4.6% to reach 45 thousand units in 2025. During the same period, 3PL market in Brazil is expected to increase at a CAGR of 7.7% to $21 million in 2025.

3. Global Precision Machine Part (PMP) Market: Key End User Segments and Geographies

3.1 Executive Summary

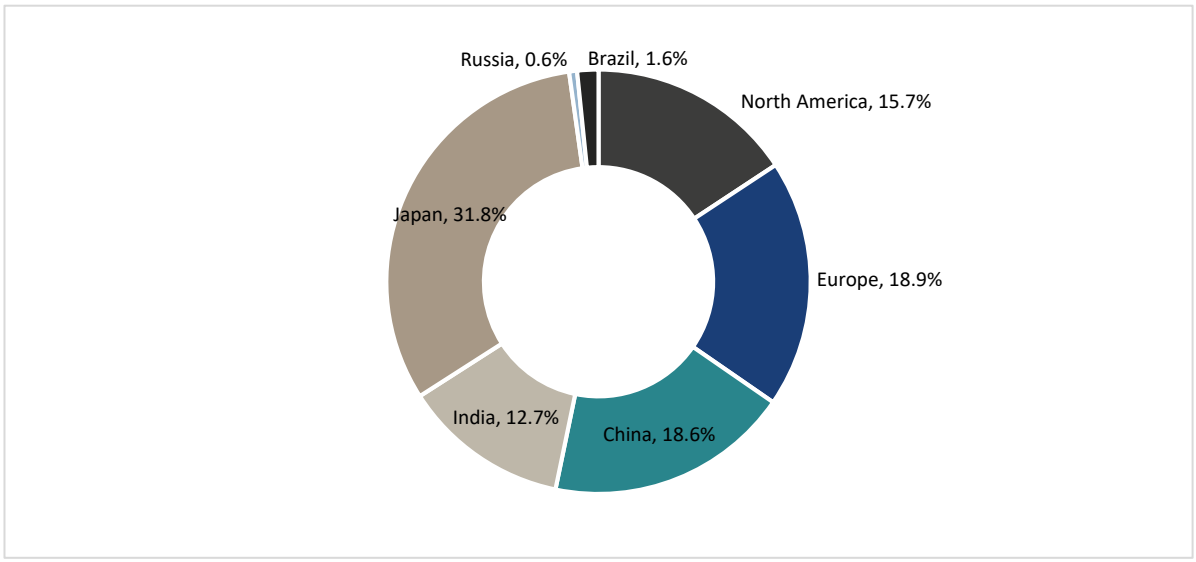
Precision components are highly precise machinery parts manufactured based on custom specifications of customers, used for industrial and machine-based companies in different applications, like CNC turning. The precision components generally produced with a diversity of materials including metals such as stainless steel, brass, copper, bronze, aluminum, steel, titanium, specialized alloys, etc., to ensure stability and functions of engineering. They are a group of products that are components requiring stringent material and manufacturing specifications and controls. These include among others, precision machined components eg. pins, bushes used in articulated joints across the construction, forestry and mining equipment.

The structure of PMP industry is fragmented in few geographies, whereas organised in other geographies. PMP manufacturers are generally private players. Therefore, it is difficult in mapping the industry players and evaluate competitive benchmarking.

Depending on the usage, pins and bushes are made up of different grades of alloy. Raw materials such as bronze, steel, copper, etc. are used. However, steel is the main raw material used. They are manufactured using machining, forging, etc. These products are generally outsourced for manufacturing.

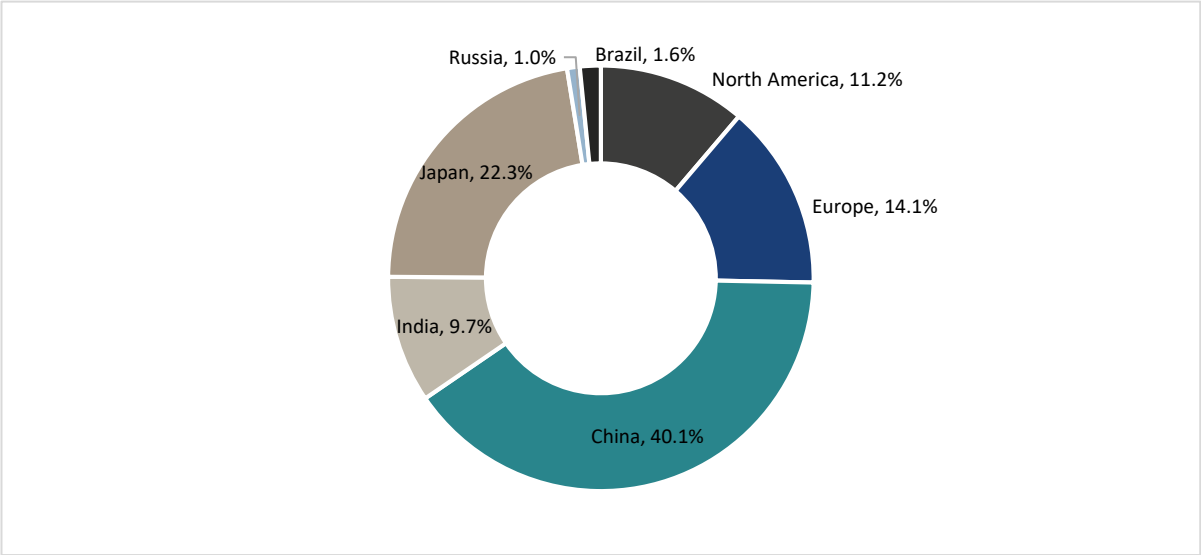
Our current study focuses on mapping the market for such precision machined components for articulated joints in the designated geographical regions covered below.

Worldwide PMP for articulated joints (AJ) Market (USD 321 mn) in 2016



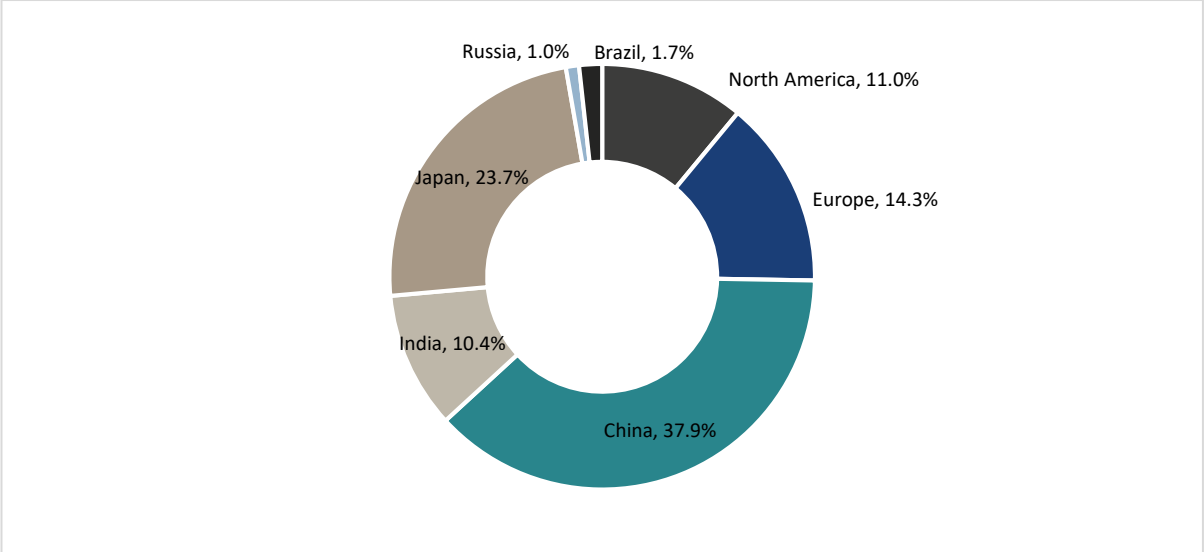
SOURCE: CRISIL Research

Worldwide PMP for articulated joints (AJ) Market (USD 520 mn) in 2020



Source: CRISIL Research

Worldwide PMP for articulated joints (AJ) Market (USD 762 mn) in 2025P



Source: CRISIL Research

Compound Annual Growth Rates – PMP

Compounded Annual Growth Rates (%)	North America	Europe	Japan	China	India	Russia	Brazil	Total
Review (2016-20)	3.8%	4.9%	3.3%	36.7%	5.4%	26.8%	12.3%	12.9%
Outlook (2020-25)	7.5%	8.2%	9.2%	6.7%	9.5%	8.8%	10%	7.9%

Source: Industry, CRISIL Research

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

China and Japan occupy almost half of the PMP market

Global market of the above defined precision machined parts (PMP) for articulated joints was an estimated USD 520 million in 2020, with 80 per cent and above of the demand from four key geographies China, Japan, Europe and North America. The demand for such products is expected to grow at a healthy 7-9% per cent CAGR in the 5-year period 2020-2025, powered by strong volume growth in construction equipment production in key markets such as Japan and Europe.

PMP production (value) during 2020-25 is expected to grow at a good pace even on a high base in certain geographies. Growth is expected to be seen mainly from Japan (8-10% CAGR between 2020-25), and India (9-11% CAGR between 2020-25). Higher volume growth of construction equipment in North America, due to increase in government investments in various infrastructure development projects such as re-building roads and bridges, modernizing public works systems and boosting broadband internet, among other major improvements to the nation's infrastructure. In India, growth observed is probable to be motivated by the occurrence of online retail amenities, accessibility of machinery on a rental basis, increasing government funds in infrastructure development, augmentation in capital investments.

Major OEMs are developing technically intensive products, processes and applications which has led to higher mechanization of the construction equipment. This is expected to aid the growth of PMP industry.

In 2020, China occupies the major share (40%), and it has seen fastest growth (>30%) amongst other geographies in last 5 years (2016-20).

Construction equipment industry is cyclical in nature

Construction equipment for building construction and construction machinery used in construction projects. Construction equipment refers to heavy-duty vehicles specially designed for executing construction tasks, most frequently involving earthwork operations.

Proper use of appropriate equipment contributes to the Economy, Quality, Safety, Speed, and Timely completion of the Project. Construction equipment is an integral part of any construction process. It is not always desirable or possible for the Contractor to own each and every type of Construction Equipment required for the Project.

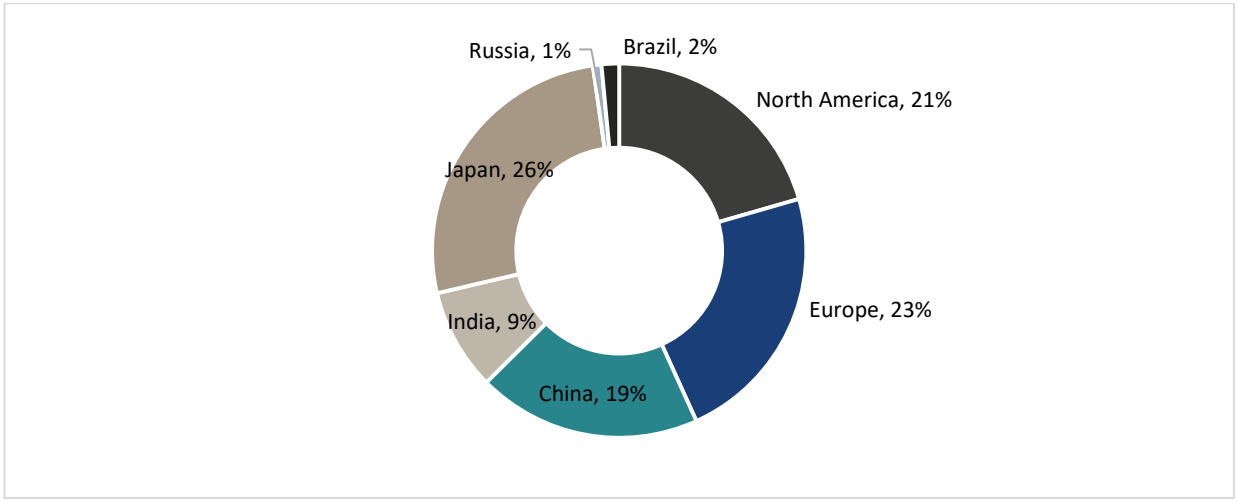
The basic operations involved in the construction of any Project are Excavation, Digging of large quantities of earth, Moving them to reasonably long distances, Placement, Compacting, Leveling, Dozing, Grading, Hauling, etc. You can find below the construction equipment used in India and abroad.

The slowdown in overall economic activity in most key global economies during the 2014 to 2016 had impacted construction equipment industry. At a global level, construction equipment industry saw a growth of marginal 1% from 2013 to 2017. After a decline from 2014 to 2016, the industry had peaked in 2017 for most of the geographies. The momentum has continued for most of the geographies through 2020, however growth has been highest in China.

Construction equipment volume demand to remain stable in next five years

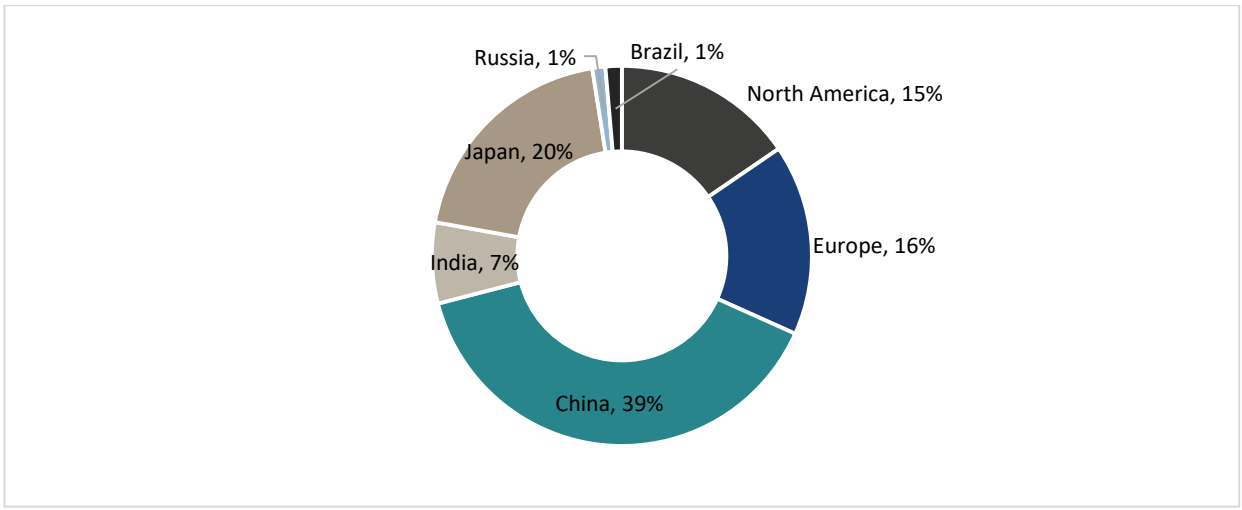
Key driver for the construction equipment industry is the investment in infrastructure projects. From 2021-2025, growth is expected to be driven by North America, Europe and India due to higher expected investment in infrastructure projects. However, stable growth in major geographies such as China and Japan to limit the growth of construction equipment industry at 2-4% from 2021 to 2025.

Worldwide Construction Equipment Production Market (763 thousand units) in 2016



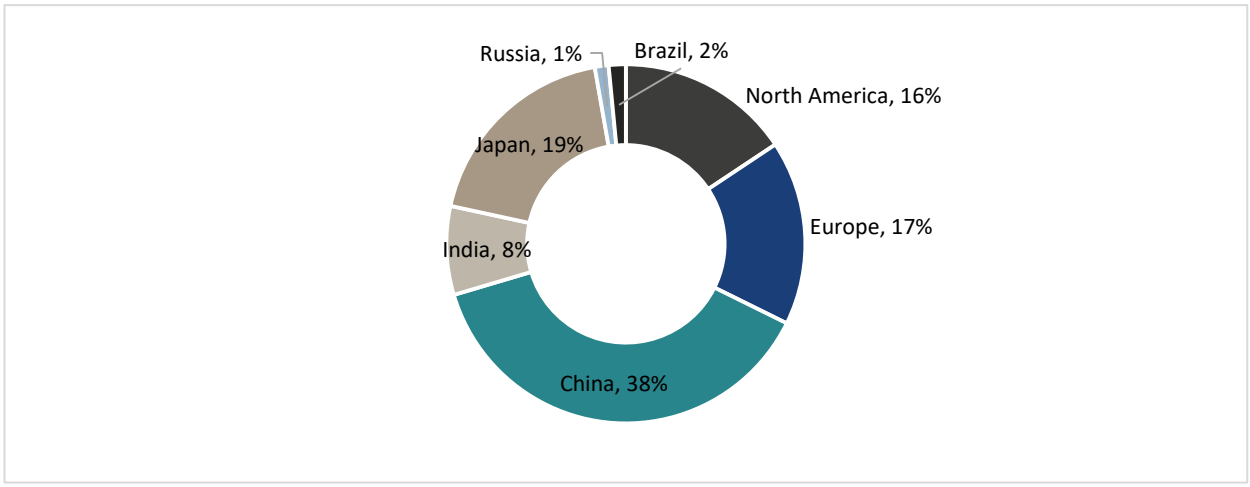
SOURCE: Off-highway, Markets & Markets, CRISIL Research

Worldwide Construction Equipment Production Market (1080 thousand units) in 2020



SOURCE: Off-highway, Markets & Markets, CRISIL Research

Worldwide Construction Equipment Production Market (1275 thousand units) in 2025P



SOURCE: Off-highway, Markets & Markets, CRISIL Research

Compound Annual Growth Rates – Construction Equipment

Compounded Annual Growth Rates (%)	North America	Europe	Japan	China	India	Brazil	Russia	Total
Review (2016-20)	1.6%	0.4%	1.3%	30.2%	2.6%	6.7%	20.6%	9.1%
Outlook (2020-25)	4.6%	4.8%	3.1%	3.5%	8.2%	6.9%	7.3%	4.2%

Source: Industry, CRISIL Research

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

In volume terms, China currently in 2020 occupies the highest proportion (39%) of the global construction equipment production. After growing fastest by 30% from 2016-2020, we expect the volumes to grow marginally in the range of 1-3% from 2021-25. A stable growth is expected due to higher investment in building highways, airports, etc. China's Belt and Road Initiative is expected to benefit the construction equipment market in India.

The European construction equipment industry de-grew by 11% in 2020 on account of the COVID-19 pandemic expansively affecting the European construction equipment industry. The negative influence is primarily on original equipment manufacturers (OEMs). The outbreak of COVID-19 and the subsequent shutdowns affected the construction industry in several countries. The negative impacts of the pandemic are visible in various major project timelines.

The increasing focus on infrastructure and the development of automation in the construction and manufacturing processes is expected to have a significant impact on the market growth. The road construction machinery market witnessed significant growth in the recent past, owing to the increased road development programs undertaken by the central and state governments, especially in Asia-Pacific.

The construction industry is getting smarter. Digitalization, connectivity, and automation are driving the development forward, leaving a substantial impact on construction projects. Moreover, renting companies geared up in investing in new technologies to cope with the growing demand for advanced construction machinery and replace the older ones with new or upgraded machinery fleet.

3.2 Regional Demand of Key User Segment – Construction Equipment

North America

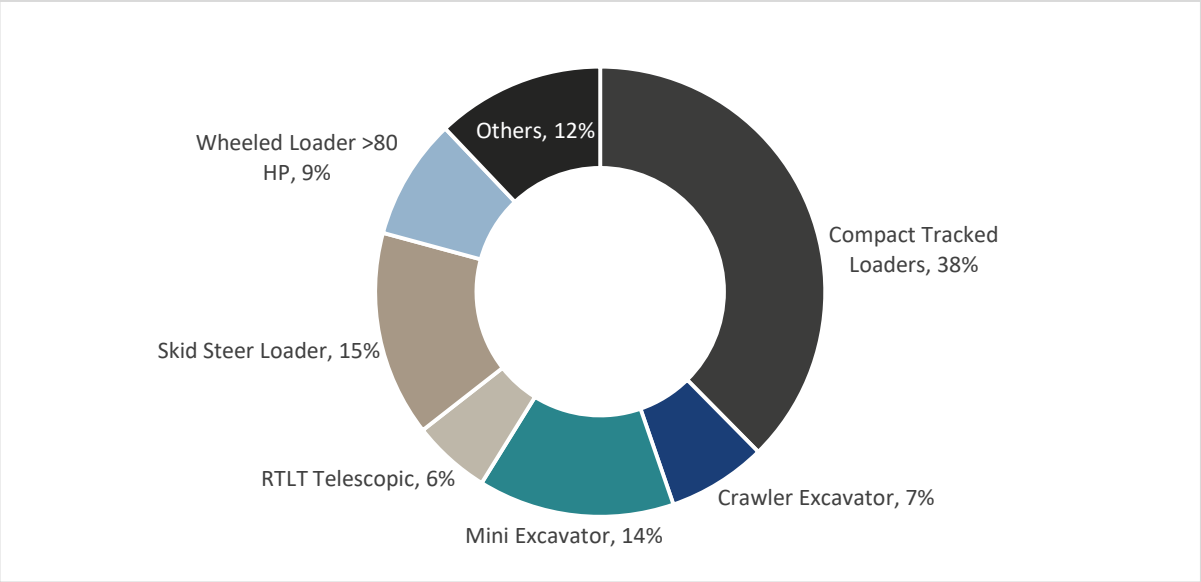
North America is one of the leading markets for construction equipment globally. In terms of sales volume in 2020, it is amongst the top 5 geographies for construction equipment market. The construction equipment market declined in 2020 on account of the Covid-19 pandemic. Equipment sales increased in 2021 with a strengthening economy and the need to renew an aging fleet of equipment. Annual value of construction in the US touched historically high levels in 2019.

A distinguishing feature of the North American market is that despite being a developed region, it generates strong demand for large-scale earthmoving equipment, such as crawler dozers. This is because compared to other

developed markets such as Europe and Japan, residential and non-residential construction in North America often involves a high element of earthmoving on virgin land.

Compact tracked loaders dominate the market (38% market share in the total production in 2020), followed by skid steer loader (15%), mini excavators (14%) and more than 80 HP wheeled loaders (9%). The top four categories account for about 75% of construction equipment production volume in 2020.

North America Construction Machinery – Unit Production by Category (%), (167 thousand units in CY 2020)



Note: Others include backhoe loaders, motor graders, asphalt finishers, RTLTs – masted, rigid dump trucks, less than 80 hp wheeled loaders, articulated dump trucks, wheeled excavators, and crawler loaders.

Source: Off-highway, CRISIL Research

Key construction equipment companies operating in North America include Bobcat, Caterpillar, Deere & Company, JCB, Case New Holland, Manitou Group, Sumitomo Heavy Industries, Hyundai Heavy Industries, Hitachi Construction Machinery, Kobelco Construction Machinery, Komatsu and Volvo Construction.

Companies are leveraging organic and inorganic measures for growth. In December 2017, Deere & Company completed acquisition of Wirtgen Group to expand its global construction business. John Deere partnered with Telogis, A Verizon Company, to derive key data and insights from the connected John Deere construction equipment. In March 2017, Telogis launched a technology that enables John Deere construction customers to connect and optimise their jobsites and work.

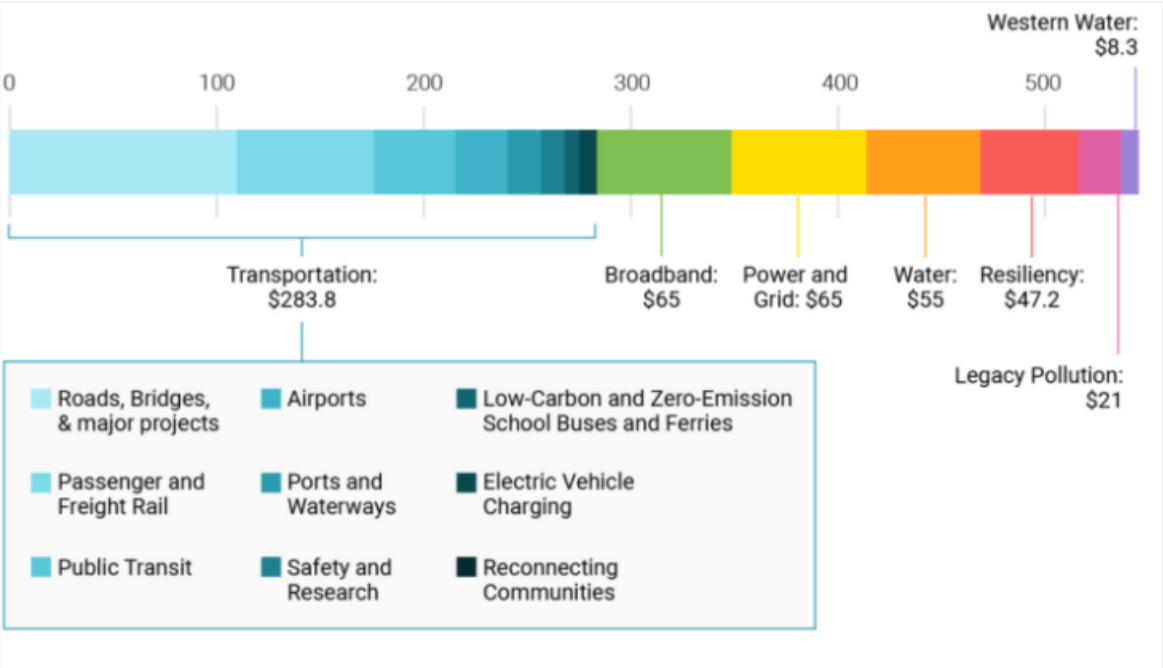
Key Demand Drivers for Construction Equipment

Focus on infrastructure development

- The US government has passed a $1 trillion bipartisan plan in Nov 2021 to rebuild roads and bridges, modernize public works systems and boost broadband internet, among other major improvements to the nation's infrastructure.

- The bill would provide $110 billion to repair the nation's aging highways, bridges and roads. According to the White House, 173,000 total miles of America's highways and major roads and 45,000 bridges are in poor condition. And the almost $40 billion for bridges is the single largest dedicated bridge investment since the construction of the interstate highway system
- The $39 billion for public transit in the legislation would expand transportation systems, improve accessibility for people with disabilities and provide dollars to state and local governments to buy zero-emission and low-emission buses. The Department of Transportation estimates that the current repair backlog is more than 24,000 buses, 5,000 rail cars, 200 stations and thousands of miles of track and power systems.
- The bill would provide $66 billion to improve the rail service's 457-mile-long Northeast Corridor as well as other routes.
- The bill would spend $7.5 billion for electric vehicle charging stations, which the administration says are critical to accelerating the use of electric vehicles to curb climate change. It would also provide $5 billion for the purchase of electric school buses and hybrids, reducing reliance on school buses that run on diesel fuel.
- The legislation's $65 billion for broadband access would aim to improve internet services for rural areas, low-income families and tribal communities.
- To protect against the widespread power outages that have become more frequent in recent years, the bill would spend $65 billion to improve the reliability and resiliency of the nation's power grid. It would also boost carbon capture technologies and more environmentally friendly electricity sources like clean hydrogen.
- The bill would spend $25 billion to improve runways, gates and taxiways at airports and to improve terminals. It would also improve aging infrastructure at air traffic control towers.
- To improve the safety of the nation's drinking water, the legislation would spend $55 billion on water and wastewater infrastructure. The bill would include $15 billion to replace lead pipes and $10 billion to address water contamination from polyfluoroalkyl substances, or PFAS — chemicals that were used in the production of Teflon and have also been used in firefighting foam, water-repellent clothing and many other items.

Top line above-baseline spending in Infrastructure Investment and Jobs Act (USD billions)



Source: Bipartisan Infrastructure Investment and Jobs Acts Summary

Growth in construction equipment rental market

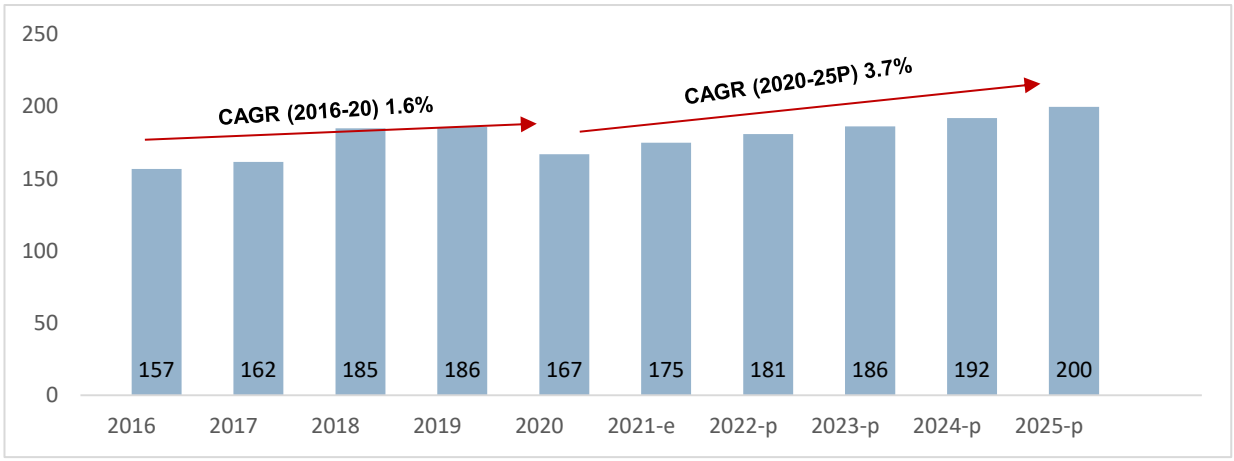
- Penetration of construction equipment rental is expected to experience a positive trend, as customers become more used to the flexibility of this model
- According to ARA's Rental Penetration Index, which calculates the percentage of construction equipment in use in the US that is owned by rental companies, penetration of construction equipment in the US rental market stands at 50-55% in 2020
- North America construction equipment rental market size exceeded USD 40 billion in 2020. Growing popularity of advanced and fuel-efficient construction equipment due to their cost-effectiveness and standard safety features is driving the regional market growth. Several construction companies are switching to rental options to cater to the rising construction activities
- Further, construction/industrial rental equipment revenue is expected to increase at a CAGR of 4.5% over 2021-27.

Demand Review and Outlook

Annual value of public construction in the US increased at a CAGR of 3.7% over 2016-2020. The low growth was primarily due to the decline in construction activities for healthcare, power, public supply, water supply, and sewage and waste disposal. Over 2016-20, construction equipment production in North America recorded a marginal CAGR of 1.5% to 167,010 units in 2020. The share of compact tracked loader in total production increased from 26% in 2016 to 42% in 2020. During the same period, the share of skid steer loaders and crawler dozers in total production declined.

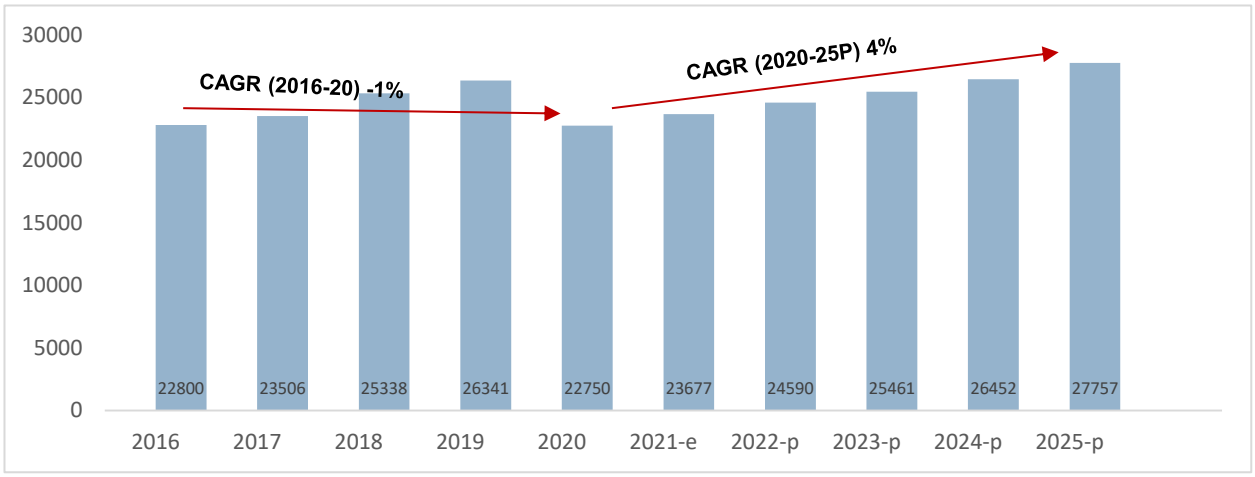
Driven by economic recovery, US construction spending is expected to grow to 6.9% of GDP in 2021 from 6.5% of GDP in 2016. This will be driven by growth across the residential, non-residential and non-building construction segments. As a result, North America's construction equipment volume is expected to grow. Coupled with change in price of raw material and increasing mechanisation, we expect the construction equipment market to grow at a CAGR of 3.7% over 2020-25 to 199,807 units.

North America Construction Equipment Production Volume ('000 Units)



Source: Off-highway, CRISIL Research

North America Construction Equipment Production Value ($ Million)



Source: Markets & Markets, CRISIL Research

Europe

The construction equipment industry is an important part of the European engineering sector and plays a significant role in the EU economy. Europe is the third largest market for construction equipment worldwide, after China and North America, in terms of sales volume in 2020. Europe is also the third largest market for construction equipment globally, after China and Japan, in terms of production volume in 2020.

Germany, the UK, France, Italy, and the Netherlands are key countries for construction equipment in Europe. Germany, the UK, and France accounted for more than 50% of the total construction equipment sales in 2020.

Looking across the different market segments in Europe, the civil engineering sector is likely to be the least affected by the impact of coronavirus. Expenditure on infrastructure facilities fell by only 3.8% in 2020 and is expected to grow by 5.2% in 2021. In contrast, the building construction sector is seeing bigger reductions in activity.

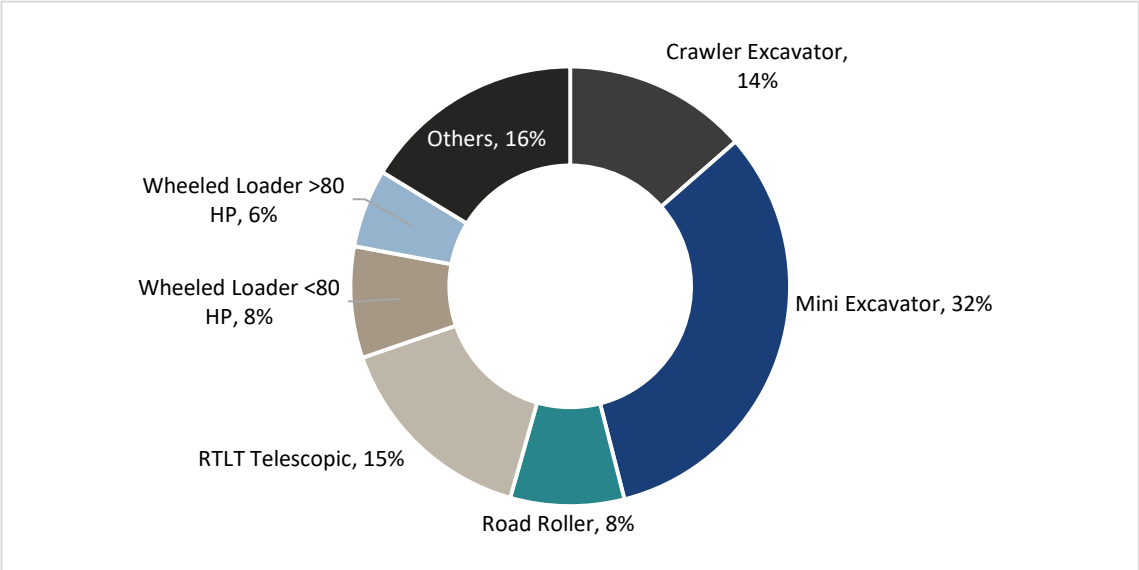
The non-residential construction sector saw a decline of 9.2% in 2020 and will be followed by moderate growth of 2.5% in 2021. The residential sector saw a significant fall of 8.6% in 2020, but the market is expected to regain significant momentum in 2021, with forecast growth of 4.7%. Due to government restrictions and legal uncertainties during the spring last year, many renovation projects were delayed, including some for many weeks. As a result, repair and maintenance activity fell by 7.3% in 2020.

While the major European markets experienced a downturn in rental activity, the latest estimates show that business was better than expected in Northern Europe. A fall of 15% was seen in 2020, but partial recovery is expected in 2021 with 9.5% growth forecast. In terms of future trends, the European Research Area (ERA) expects relative inertia in the construction sector, and anticipates that government policies will provide positive support for a better outlook for the equipment rental industry. The expected reductions in private sector investments will be offset by increases in infrastructure and renovation via public support measures. The ERA expects economic uncertainty and limited CAPEX investments by contractors and end users will encourage increased use of rental equipment.

The depth and duration of the impact within the construction sector suggests that equipment rental revenues will only return to 2019 levels in 2023. For 2020, revenue from construction rental dropped 11%, in relation to 2019 levels. Growth in 2021 is expected to be modest at +1.5%, but a strong recovery is forecast to begin in 2022 with 11.3% growth.

Mini excavators dominate the market (32% market share in 2020), followed by Telescopic RTLTs (15%) and crawler excavator (14%). The top three categories account for more than 50% of construction equipment production volume.

Europe Construction Machinery – Unit Production by Category (%), (176 thousand units in CY 2020)



Note: Others include wheeled excavators, articulated dump trucks, asphalt finishers, crawler dozers, RTLTs – masted, skid steer loaders, crawler loaders, motor graders and rigid dump trucks.

Source: Markets & Markets, CRISIL Research

European construction equipment companies are leveraging inorganic routes to expand their presence as well as product portfolio. Manitou BF recently acquired majority stake of Australian mining and construction Equipment Company. LiftRite to capture higher market share in Australian market. In September 2016, CNH entered into a strategic alliance with Hyundai Heavy Industries for the production and development of mini excavators.

At the same time, companies from other geographies are also focusing on expanding their presence in Europe. Hyundai Construction Equipment established its new European headquarters in Belgium in 2017 to strengthen its presence in Europe.

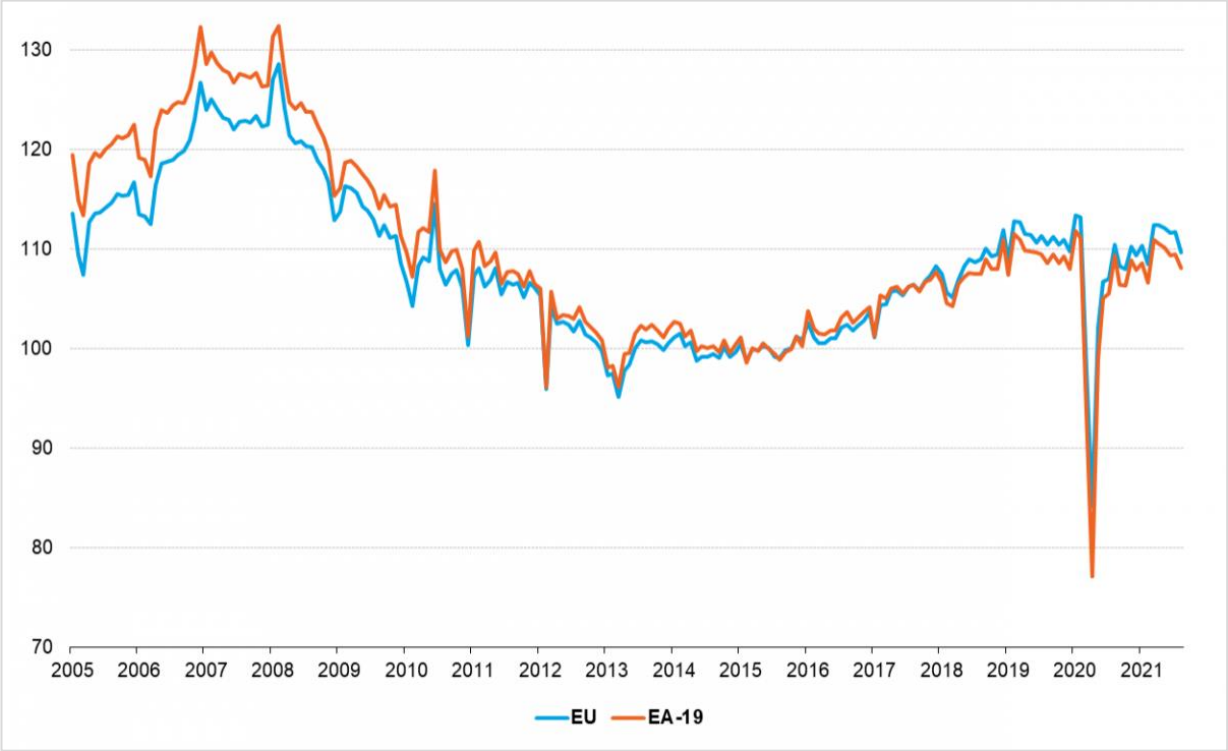
Key Demand Drivers for Construction Equipment

Recovery in the construction sector

Until the end of 2006, construction output in Europe had increased rather steadily; but with the economic and financial crisis output began to decline quite dramatically. Between spring 2008 and early 2013, the level of total construction in the EU had been on a more or less constant decline (apart from a short peak in summer 2010). In total the index lost more than 30 percentage points.

Since spring 2013 the index of construction production in the EU had been relatively steadily increasing and reached over 80 % of the former peak level. However, in March and April 2020, the index declined dramatically and lost almost 30 points in just two months. In May a recovery set in but the index levels are still only at a level which had already been reached in 2005. The development in the EA-19 is quite similar to the development of the EU.

Europe Index of Production in Construction



Note:

EU and EA-19 construction production 2005 - 2021, calendar and seasonally adjusted data (2015 = 100)

1. *The euro area (EA19) includes Belgium, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland*
2. *The European Union includes Belgium, Bulgaria, the Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden and the UK*

Source: Eurostat, CRISIL Research

Steady need for replacement of older construction equipment

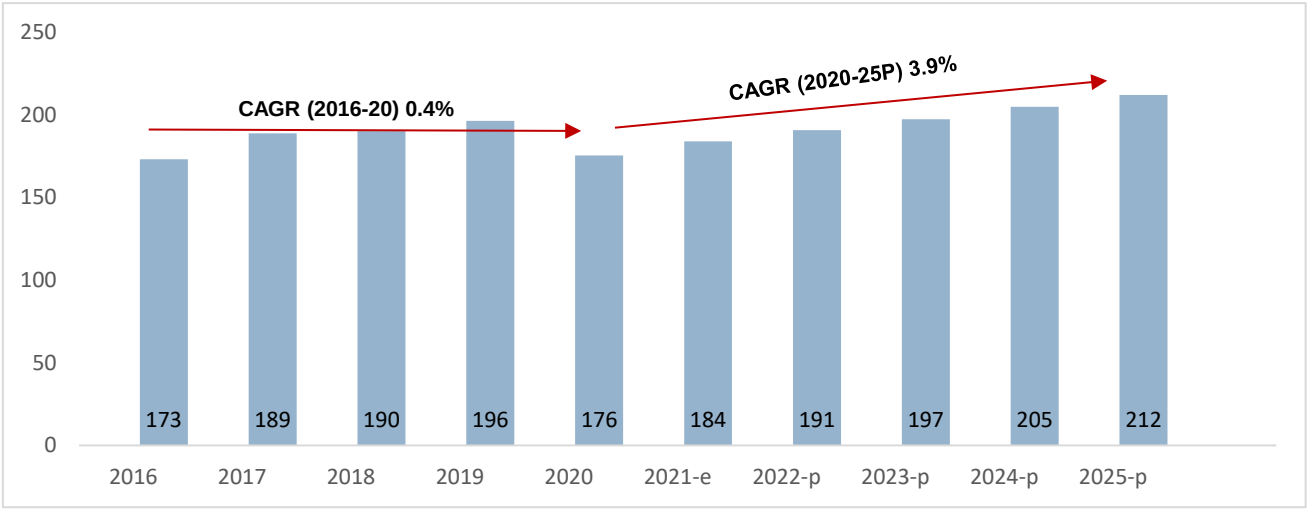
- As a result of a growing need to meet the rising demand for faster and superior-quality infrastructure construction, several construction companies across Europe have started to replace their legacy construction equipment with more energy-efficient and powerful equipment
- A few companies are now developing high-efficiency construction equipment with better control systems. This construction equipment is equipped with high-power motors and various other hydraulic and pneumatic components that help construction companies to improve their operational efficiency
- The effective replacement of legacy construction equipment increases the ease of operation and convenience of handling heavy machinery. For instance, electronic monitoring capabilities are incorporated into construction equipment to improve its operational efficiency
- Need to replace old construction equipment and advancement in technology is expected to drive the market

Demand Review and Outlook

After declining in 2020, the European construction equipment industry expected to grow in 2021, with momentum growing during the year. The construction industry is in good shape in most markets. However, the growing threat to free trade and the risk of a global trade war pose a severe risk to the world economy. It is not clear yet if this will have an impact on the equipment market, and possibly result in changes in competitiveness between different regions.

Construction equipment production in Europe recorded a CAGR of 0.4% over 2016-20 to 175,600 units. The share of mini excavators in total production is stable across all years at 30-32%. During the same period, the share of backhoe loaders and crawler excavators in total production declined.

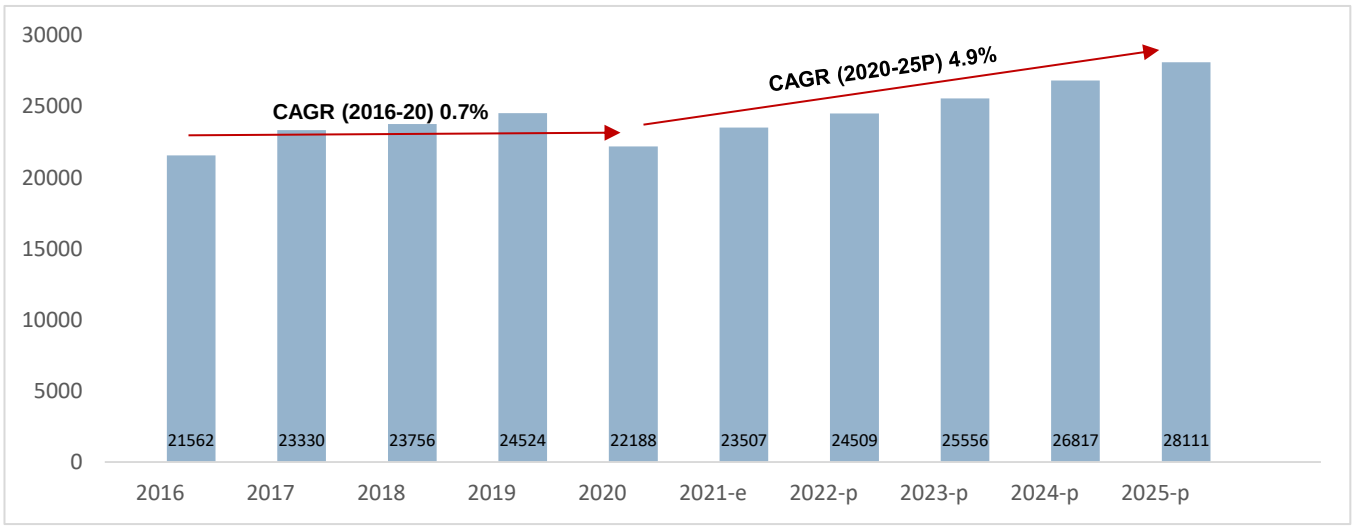
Europe Construction Equipment Production Volume ('000 Units)



Note: CARC: Compound Annual Rate of Change

Source: Markets & Markets, CRISIL Research

Europe Construction Equipment Production Value ($ Million)



Source: Markets & Markets, CRISIL Research

Japan

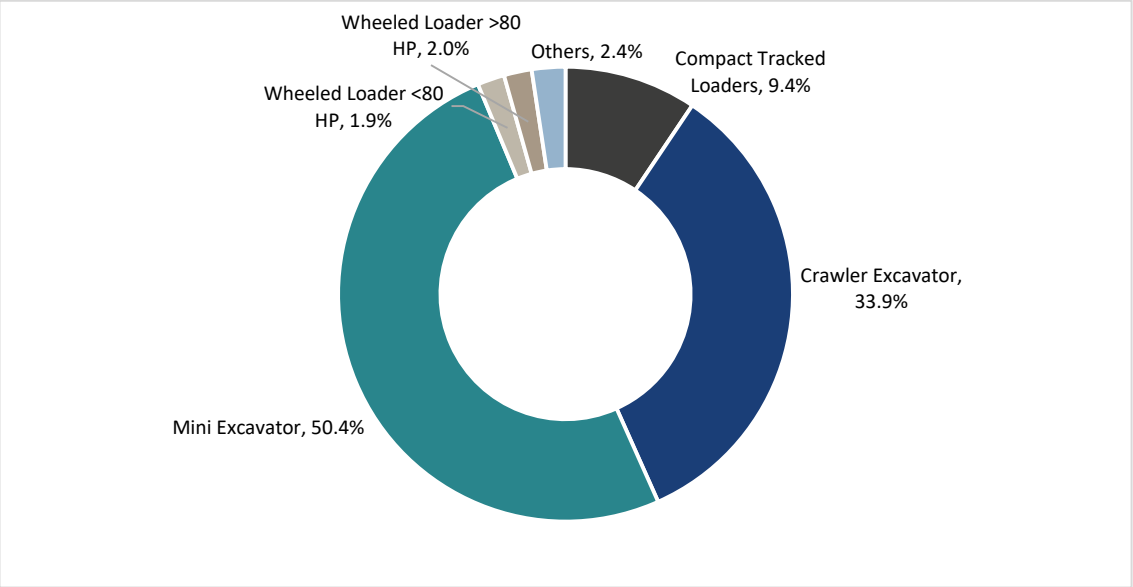
Japan is the second largest construction equipment market after China in 2020 in terms construction equipment production volumes. However, it exports approximately two-thirds of the production volumes mainly to North America and Europe. The growth in Japanese construction equipment industry is driven by increase in government spending on the rapid infrastructural developments in prominent sectors, including telecommunication, transport, and renewable energy, along with advanced technologies in construction equipment. Also, the reconstruction demand is rapidly growing as Japan is the most earthquake prone region in the world.

In addition to the domestic market, the companies operating in Japan target China and India for growth. China's economic slowdown in the beginning of 2016 had a negative impact on Japan's construction machinery industry. Nonetheless, increasing demand of construction machines in China since December 2016 has boosted Japan's construction equipment market.

With globalization, the Japanese construction equipment industry became more vibrant through joint ventures and overseas production in order to coexist and cooperate with the US and European counterparts in the fields of technology, production, and management.

The market is dominated by excavators. Mini excavators accounted for half of the total production of construction equipment in Japan, followed by crawler excavator with 33.9% share. The share of excavators in total production remained above 80% over 2016-2020.

Japan Construction Machinery - Unit Production by Category (%), (212 thousand units in CY 2020)



Note: Others include crawler dozers, rigid dump trucks, motor graders, skid steer loaders, articulated dump trucks, wheeled excavators, asphalt finishers, backhoe loaders, crawler loaders, RTLTs – masted, and RTLTs – telescopic.

Source: Off-highway, CRISIL Research

Key construction equipment manufacturers in Japan include Hitachi Construction Machinery, Komatsu, Kobelco Construction Machinery, Kubota, Sumitomo Heavy Industries, etc. Komatsu and Hitachi Construction Machinery are among the top five biggest seller of construction equipment worldwide.

Japanese construction companies are leveraging acquisitions to expand their presence in international markets. Hitachi Construction Machinery acquired Australian construction1 equipment manufacturer Bradken Limited in March 2017. In December 2016, it acquired H-E Parts International and H-E Parts Australian Holdings, suppliers of mining equipment parts and services, to provide repair, maintenance, and after sales services in the US and Australia. In February 2017, Sumitomo Corporation acquired Sunstate Equipment, an equipment rental company in the US, to gain market share in the rental business.

The construction equipment manufacturers are also entering into partnerships with technology companies to develop new products. In December 2017, Komatsu entered into a partnership with NVIDIA, a technology company, to bring Artificial Intelligence (AI) to jobsites, making them safer and more efficient.

Key Demand Drivers for Construction Equipment

Increase in number of construction projects

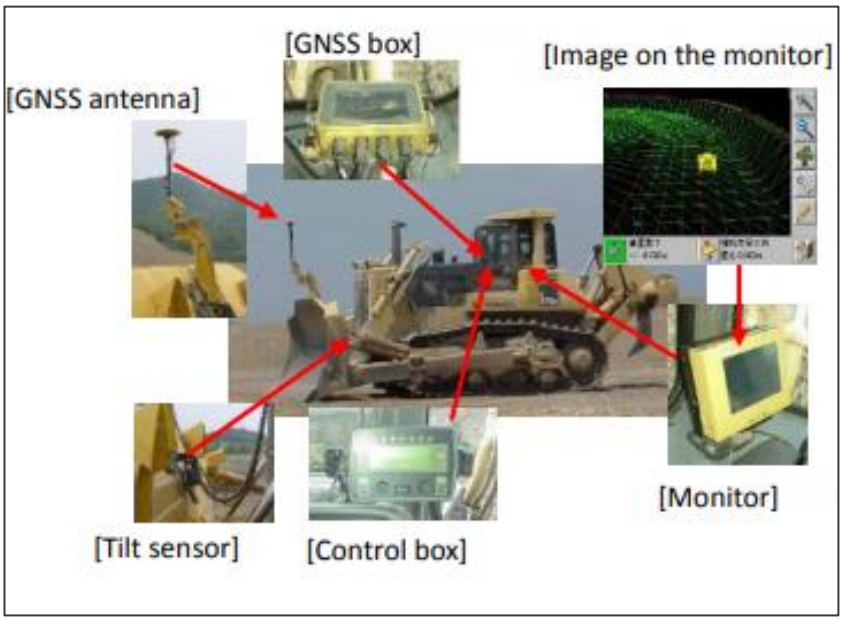
- The number of construction projects in Japan have been increasing in recent years; these are expected to increase over the medium term
- The ongoing urban development activities and the migration of consumers from rural to urban areas are expected to foster the demand for construction equipment throughout the country. High demand for quality healthcare, education, medical and research facilities, and developing shopping and logistics infrastructure is fuelling the growth of the construction industry, which in turn is expected to accelerate the Japan Construction Equipment market.
- Allocation of funds for the restoration activities focusing on damaged infrastructure facilities and efforts to flourish the tourism industry to boost the country’s economy is expected to create enormous growth potential for the Japan Construction Equipment market.
- Expansion of the railway network and the ongoing construction of Chuo Shinkansen Maglev Rail Line, along with the development of Hokuriku Shinkansen from Kanazawa to Tsuruga line and plans to make these railway lines operational as soon as possible is expected to fuel the market demand.
- Attempts to develop the country’s road and airport infrastructure to improve connectivity and domestic and international trade activity are expected to accelerate the growth of the Japan Construction Equipment market in the coming five years.

Government initiatives to improve productivity on construction sites

- The construction industry's growing adoption of advanced technologies, such as artificial intelligence and computer vision, is expected to lower the human resource requirements at construction sites. It contributes to not only cost reduction but also the efficiency of work. An unskilled operator operates construction machines like skilled operator by its automatic controller.
- A typical example of the ICT - introduction to construction is the sophistication of machine control, which can be classified into machine guidance (MG) and machine control (MC)
  - MG technology helps to improve construction accuracy can be improved by supplying the information on the construction to operators
  - MC technology enables automatic controls of machine parts
- Also, using Building Information Modelling, Civil Information Modelling software, and the Internet of Things to get real-time analysis and information helps prevent safety hazards and lower the worker's life at construction sites.

- By combining artificial intelligence technology and cameras, managers at the construction sites can reduce the occurrence of accidents by setting up alarms when the workers enter the danger or the high-risk zones. It helps in identifying whether the workers wear personal protection safety equipment that comprises helmets, gloves, high visibility jackets, and masks.

Example of MC function – Blade automatic control system in bulldozer



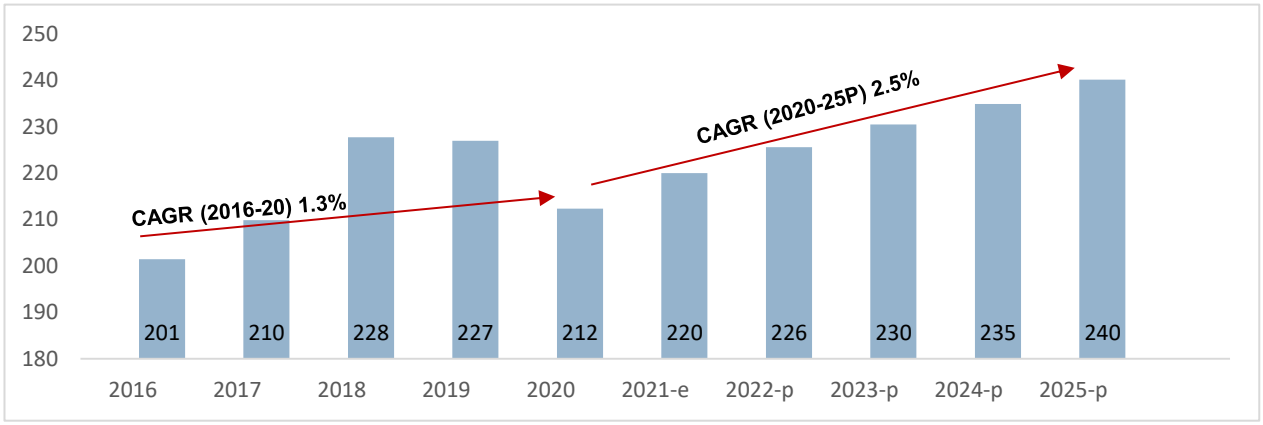
Source: Japan Construction Equipment Manufacturers Association, Industry, CRISIL Research

Demand Review and Outlook

Over 2013-17, the construction equipment production in Japan recorded a CAGR of 1.3% to 212,370 units in 2020. The share of mini excavators in the total production increased from 47% in 2016 to more than 50% in 2020. At the same time, the share of crawler excavator declined from 37% in 2016 to 35% in 2020. Also, the share of crawler dozers, and wheel loaders in the total production declined over 2016-20.

Over 2020-25, construction equipment production is expected to grow at an annual rate of 2.5%, however, the market is expected to touch a level of 240,142 units in 2025. Key factors that will impact the market are infrastructure investments by the government to develop road, rail, and airport.

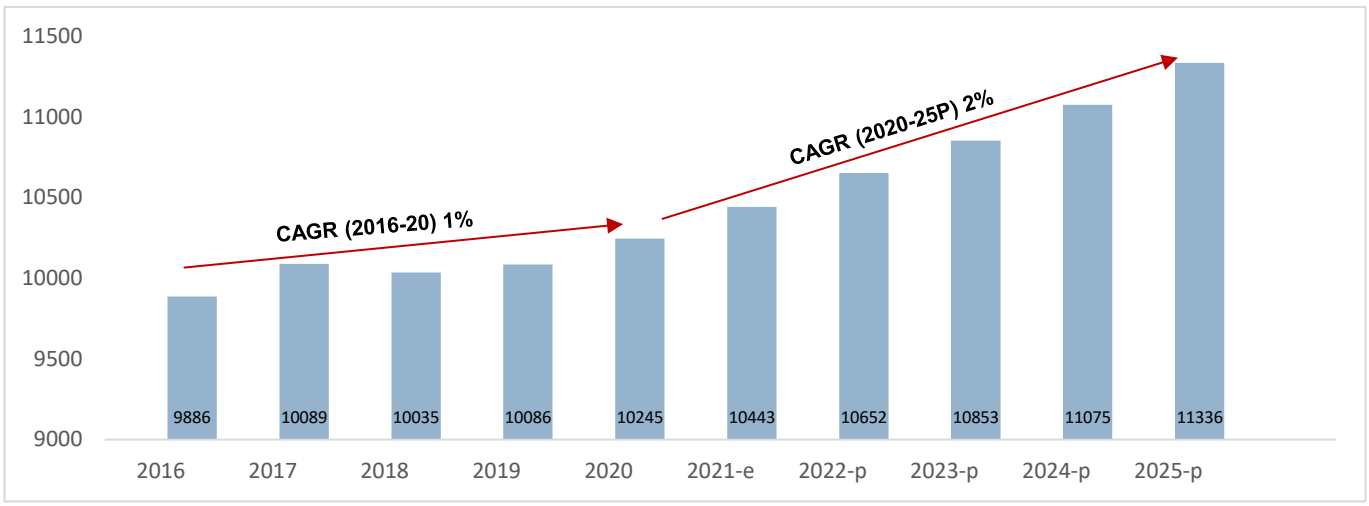
Japan Construction Equipment Production Volume ('000 Units)



Note: CARC: Compound Annual Rate of Change

Source: Off-highway, CRISIL Research

Japan Construction Equipment Production Value ($ Millions)



Source: Industry, CRISIL Research

China

China is the largest market for construction equipment worldwide in terms of sales as well as production volumes in 2020. China exports construction equipment products mainly to Russia as well as other countries in Asia and Africa. Over the years, China has built a complete construction equipment production chain as all parts of the construction equipment production chain can be produced in the country.

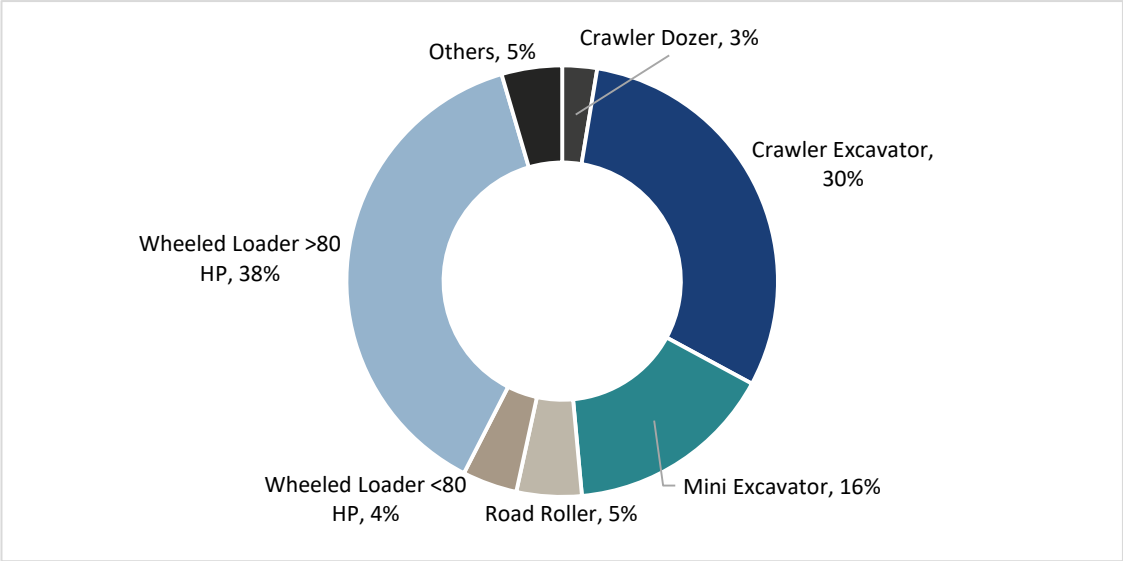
Besides being the largest manufacturer of construction equipment globally, China is the largest market for construction machinery in the world. Rural construction activities, rapid urbanization, and the growth in public-private partnerships drove up demand for construction equipment. China also has one of the world's best construction machinery supply chain, with all parts of the supply chain being in China.

The increasing focus on infrastructure and development of automation in the construction and manufacturing processes had a significant impact on market growth. The road construction machinery market has witnessed a substantial increase in the recent past due to the increased road development programs undertaken, such as the Belt and Road Initiative.

Renting and leasing of construction machinery is on the rise. Buying new equipment involves high cost, maintenance, and storage-related issues. Renting is becoming a viable possibility for newer businesses as well. In fact, for short-term construction applications, renting machinery has been preferable than an original purchase among construction contractors, as renting allows optimum utilization of the machinery.

In 2018, the construction equipment market in China witnessed a strong comeback and sales of crawler excavators more than doubled compared to 2016. The market is dominated by more than 80 HP wheeled loaders with 38% share in the construction equipment production in 2020. This is followed by crawler excavators (30%) and mini excavators (16%). Top three categories accounted for more than 80% of the construction equipment production volumes in 2020.

China Construction Machinery - Unit Production by Category (%), (424 thousand units in CY 2020)



Note: Others include less than 80 HP wheeled loaders, asphalt finishers, skid steer loaders, wheeled excavators, backhoe loaders, rigid dump trucks, and articulated dump trucks.

Source: Markets & Markets, CRISIL Research

Key construction equipment companies operating in China include Zoomlion Heavy Industry Science & Technology Development Co, Sany Heavy Machinery, Xuzhou Construction Machinery Group (XCMG), LiuGong Machinery, Shantui Construction Machinery, Lonking, XGMA, and SDLG (a Volvo joint venture). A number of global companies such as Kobelco, Tadano, Caterpillar, and Liebherr are focusing on expanding their presence in the country.

Key Demand Drivers for Construction Equipment

Growing Investment in The Construction Industry

- The world's major construction machinery makers have been setting up manufacturing bases and joint ventures in China. Also, the restrictions on foreign investment in land development, high-end hotels, office buildings, international exhibition centers, and the construction and operation of large theme parks have been lifted. This

is expected to increase the demand for construction equipment in the country, thus driving the construction equipment market.

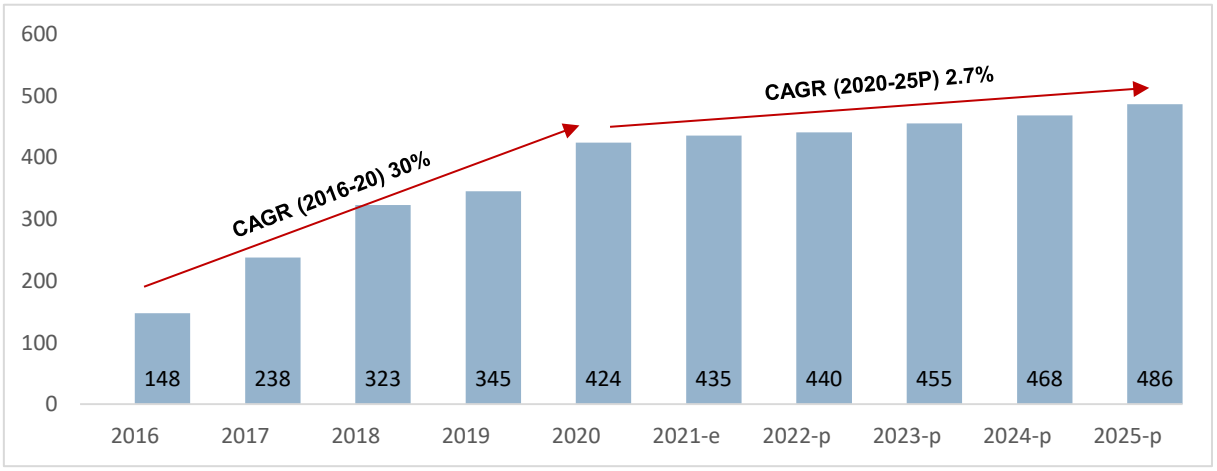
- The Belt and Road Initiative expected to create increased demand for construction equipment. The Belt and Road Initiative, the flagship project of China, has been a significant demand driver for construction equipment in China. Although all the construction projects are executed overseas, the machinery is purchased and shipped from China as the government offers tax rebates to construction companies that buy the equipment for participating in the Belt and Road Initiative. Kobelco, Tadano, Caterpillar, and Liebherr have been working in increasing their presence in the country, as they anticipate massive demand from the country's flagship Belt and Road Initiative.
- The Shanghai Urban Rail transit expansion is valued at the USD 44.23 billion. It includes nine rail projects and six subway lines along with three intercity railways. The project commenced in 2018 and is estimated to be a total of 286km. This network is aimed at creating better connections between Shanghai's two airports and its two major railway stations. In Jiangsu province, eight regional Intercity Railway is being built along the Yangtze River. This is to shorten the commuting time from Nanjing, the capital city of Jiangsu province, to other towns and districts within the area.

Demand Review and Outlook

Over 2016-2020, the construction equipment production in China witnessed robust CAGR of 30% to 423,960 units in 2020. Although, the share of excavators in total production increased from 45% in 2016 to 47% in 2020, the share of more than 80 HP wheeled loaders declined from 41% in 2016 to 38% in 2020.

Construction equipment sales recovered over 2016-20 as new infrastructure projects launched during the period as part of the government's 'One Belt, One Road' initiative positively impacted the market. With infrastructure investment now slowing, the construction equipment market is expected to slow down over 2020-25. Over 2020-25, the construction equipment production is expected to grow marginally at a CAGR of 2.7% to 486,045 units in 2025.

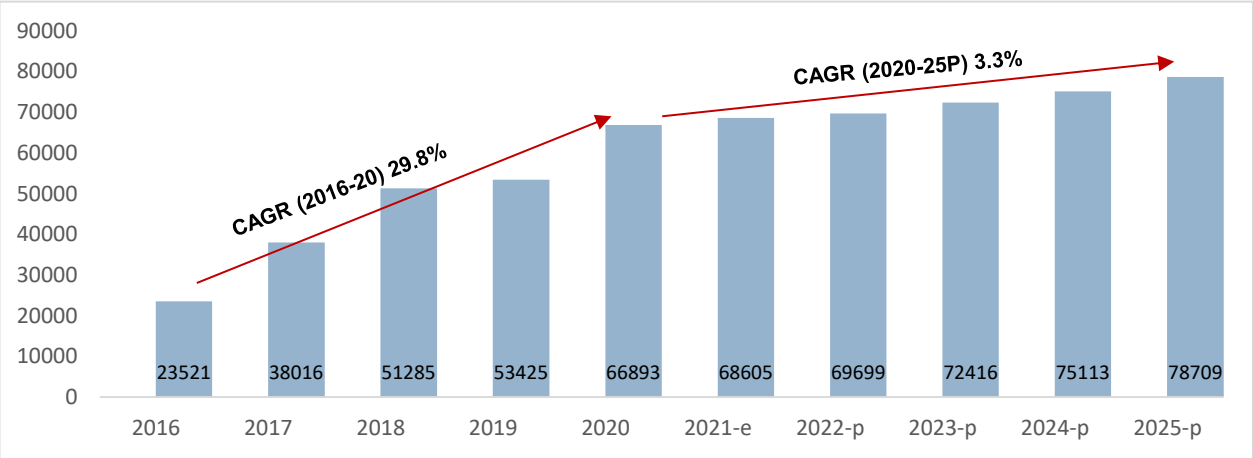
China Construction Equipment Production Volume ('000 Units)



Note: CARC: Compound Annual Rate of Change

Source: Markets & Markets, CRISIL Research

China Construction Equipment Production Value ($ Millions)



Source: Markets & Markets, CRISIL Research

India

Construction equipment can be broadly categorised as earthmoving and mining, material handling, road building, concreting, and material processing equipment. In fiscal 2018, earthmoving and mining equipment (EME) makes up a major share (~70%) of the construction equipment industry.

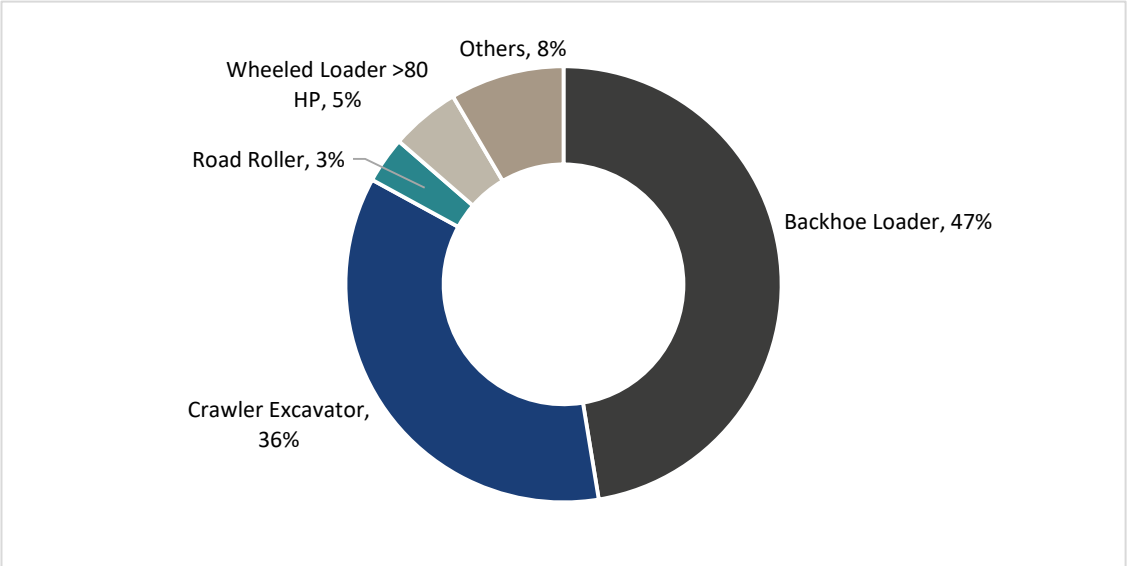
EME, in turn, comprises backhoe loaders, excavators, wheeled loaders, skid steer loaders, and dumpers. Excavators, backhoe loaders, and wheeled loaders account for 85-90% of the EME industry's revenue. In the construction sector, EME is mainly used in infrastructure and industrial construction. These equipment are used in roads, hydropower projects, irrigation, industrial construction, mining, agriculture, waste management, and logging.

Material handling equipment (MHE) are used for storage and movement of bulk or non-bulk goods within a particular premise. It comprises pick and carry cranes, forklifts, etc. Road building equipment are used in various phases of the road construction. Examples are bulldozers, diggers, and scrapers. Concreting equipment are used to mix and transport concrete, and include pumps, transit mixers, etc. Material processing equipment include crushers, compressors, etc.

Major players in the construction equipment space are JCB (highest market share in backhoe loaders) and Tata Hitachi (highest market share in excavators). Other players include Case New Holland, Caterpillar, Terex, Mahindra Construction Equipment, L&T Construction Equipment, Hyundai, Bharat Earth Movers Ltd (BEML), etc.

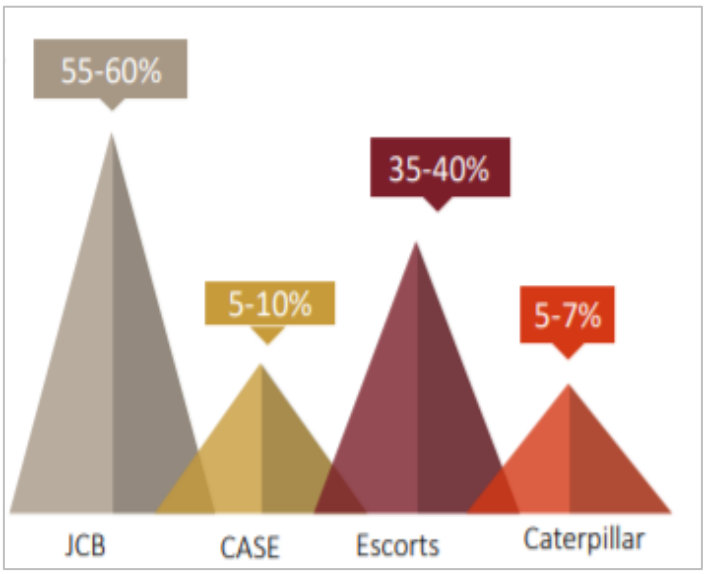
Leading players in the construction equipment industry have been able to maintain market share as new players have not been able to provide discounts, given their fragile financials, caused by a prolonged downturn. Large players in the backhoe loader and excavator segments will continue to dominate, with a widespread after-sales service network, revenue from which makes up for lower equipment sales.

India Construction Machinery – Unit Production by Category (%), (74 thousand units in CY 2020)



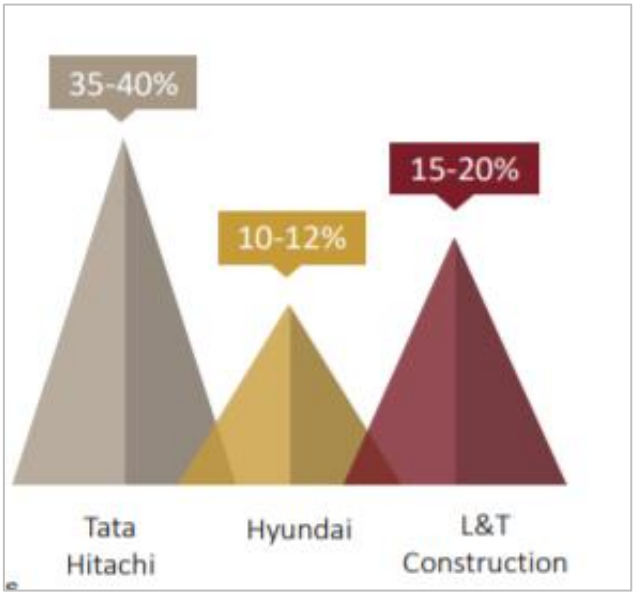
Source: Markets & Markets, CRISIL Research

Backhoe loaders market share (FY20)



Source: Industry, CRISIL Research

Excavator market share (FY20)



Source: Industry, CRISIL Research

JCB India is the leader in the backhoe loader segment, commanding ~60% market share. It introduced the backhoe loader in 1979 and currently has the widest dealer network of ~500 outlets, a diversified product range, and strong brand recall even in Tier 2 and 3 cities. These key strengths have helped the company maintain its position. Other players include Case New Holland, Caterpillar, Tata Hitachi, Escorts, etc.

Tata Hitachi and L&T Construction Equipment are major players in excavator space having technology collaborations with Japanese companies Hitachi and Komatsu. Moreover, these companies stand to gain from their partner companies' experiences in other Asian markets, where they have a strong foothold. Tata Hitachi leads the segment with its wide dealership network of over 300 outlets and popular models. L&T Construction Equipment has recovered its lost share from competitors by focusing on high quality models. Hyundai, Volvo, Caterpillar, JCB India, and BEML are the other major players.

Other earth moving equipment includes wheeled loaders, crawler dozers (bulldozers), compaction equipment, skid-steer loaders, and motor graders, used in mining, road construction and soil levelling. These comprised ~16% in volume and value terms of the EME market in 2020. BEML, Caterpillar, and Tata Hitachi are major players, while Liugong and Kobelco are new entrants. We do not expect any major change in the top three players' market share over the next 2-3 years, as new ones are still trying to establish a stable dealership and after-sales service network.

Key Demand Drivers for Construction Equipment

Construction investments expected to grow at a good pace

The outbreak of Covid-19 and the subsequent lockdown impacted construction spending across infrastructure sub sectors in fiscal 2021. CRISIL Research estimates a 12-14% drop in construction investments for fiscal 2021 with a smart 26-30% recovery seen in fiscal 2022. The recovery would be led by rising focus on infrastructure investments with increasing budget allocations for infrastructure and deferred investments in Building and construction from fiscal

2021.

The construction sector had been plagued with policy logjams in the infrastructure segment and muted industrial investments over the past few years. Construction spending in the residential segment has been falling owing to tepid demand amid affordability issues and a weak economic scenario. However, construction spending had picked up because of the policy initiatives introduced by the Central and state governments in the infrastructure segment.

Some key initiatives introduced by the Central government are:

- Introduction of schemes, such as Pradhan Mantri Awas Yojana (PMAY), Swacch Bharat Abhiyan and Smart Cities Mission
- Streamlining of existing schemes, e.g., Atal Mission for Rejuvenation and Urban Transformation (AMRUT), clubbing four major irrigation schemes under Pradhan Mantri Krishi Sinchai Yojana (PMKSY)
- Introduction of HAM (hybrid annuity model) in road construction
- Payment of 75% of arbitration claims to private players against a bank guarantee
- Awarding national-highway projects only after 80-90% of the required land is in possession of the government
- Launching of schemes to help developers improve cash flow and repay debt, such as rescheduling premiums in road projects and permitting developers to offload stake in build-operate-transfer projects.

The total budgetary allocation on capital expenditure in infrastructure for FY2021-22 saw a 20% rise over the revised estimates for FY 2020-21 to Rs 5.64 lakh crore with roads and railways being the biggest beneficiaries. Of this, Rs 2.58 lakh crore will be through budgetary support, with the remainder from internal and extra budgetary resources.

Focus on infrastructure development

The share of infrastructure projects is expected to increase to 65-70% in the next five years as against 55-60% in the past five years, as Infrastructure investments are seen growing faster than the other two segements due to the Government's focus on Infrastructure under the NIP, NMP and the Gati Shakti initiative. The Central government's focus on roads, urban infrastructure and railways will boost infrastructure investments.

Demand review and outlook

The momentum seen from 2016 till date is expected to continue until 2025. We expect the Indian construction industry to grow at a compounded annual growth rate (CAGR) of 6.5% (in volume terms) between calendars 2020 and 2025, i.e., almost twice the growth rate between calendars 2016 and 2020.

In value terms, construction equipment market is expected to grow at 7.2% CAGR between 2020 and 2025.

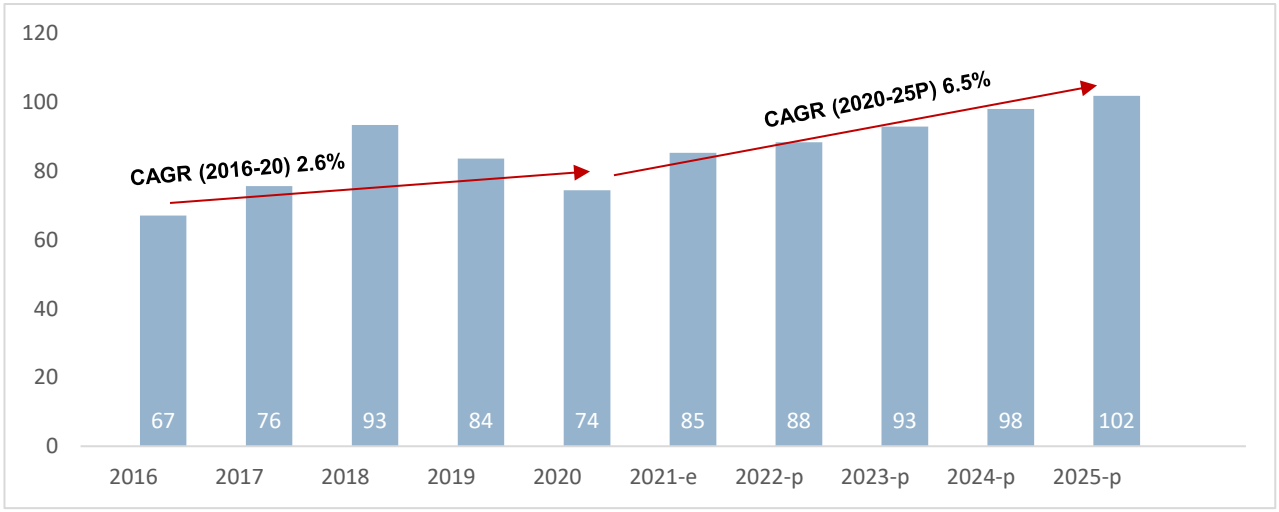
According to the current announcement by the Government of India, Bharat Stage Construction Equipment Vehicles (CEV)-IV norms will be implemented from April 1, 2021. Manufacturing of CEV-III equipment will stop from October 1, 2020 and sale of such equipment will end from April 1, 2021. Post implementation of CEV-IV, price of the equipment is expected to increase marginally, owing to changes required in engine and its parts.

Infrastructure is projected recording a 17-20% on-year rise led by health increases in centre and state budgets with the Mining sector too expected to grow from FY21 lows. The volumes for the sector are seen rising 6-9% on year in FY22 with price hikes accounting for the balance growth. The sharp rise in input prices, appreciating yen coupled with implementation of the new emission norms from 1st April 2021 have necessitated the rise in prices.

Overall, the industry expects growth momentum in construction activity to sustain. In a bid to stay on top, construction equipment firms are building manpower and technical capabilities as they enter newer segments and launch new products.

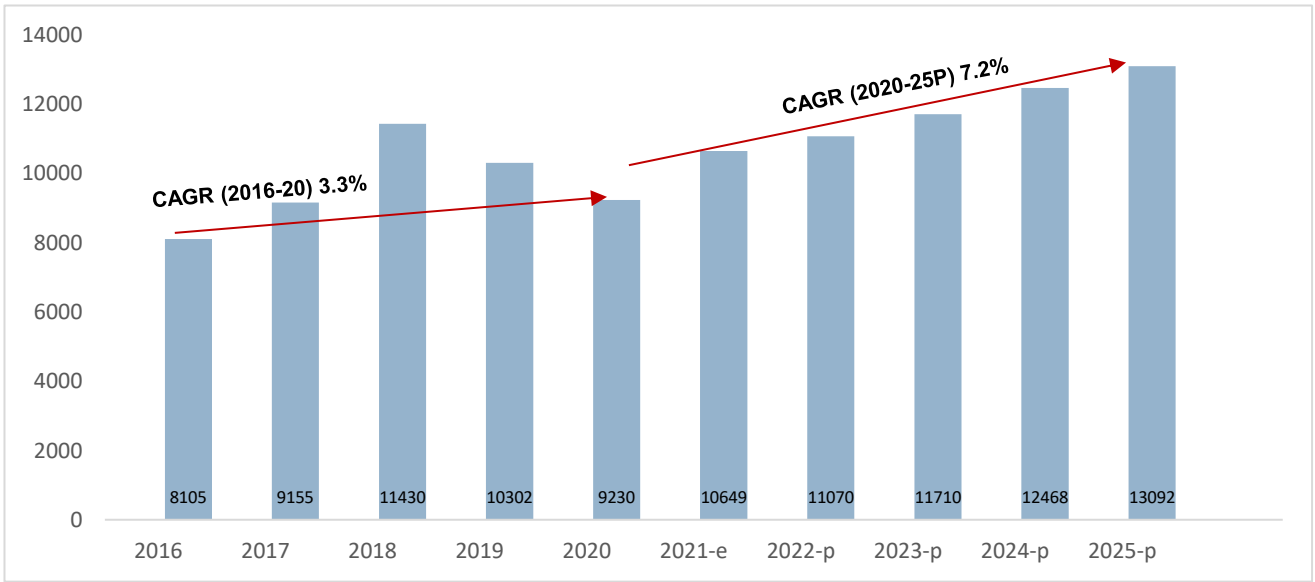
While nearly all type of equipment will witness growth, the market will continue to be dominated by popular products such as backhoe loaders, crawler excavators, mobile cranes, mobile compressors, compaction equipment, and wheeled loaders.

Indian construction equipment market, production volume ('000 units)



Source: Markets & Markets, CRISIL Research

Indian construction equipment production value (US$ million)



Source: Markets & Markets, CRISIL Research

Rest of the World:

Russia

The Russian construction equipment market is recovering from the decline in recent years. In 2017, the construction equipment market recovered with about 50% increase in sales. All types of construction equipment machinery witnessed growth in 2017. Sales of skid steer loaders and motor graders grew at a lower rate than sales of other construction equipment. Further, recovery in construction activities is expected to drive the construction equipment market.

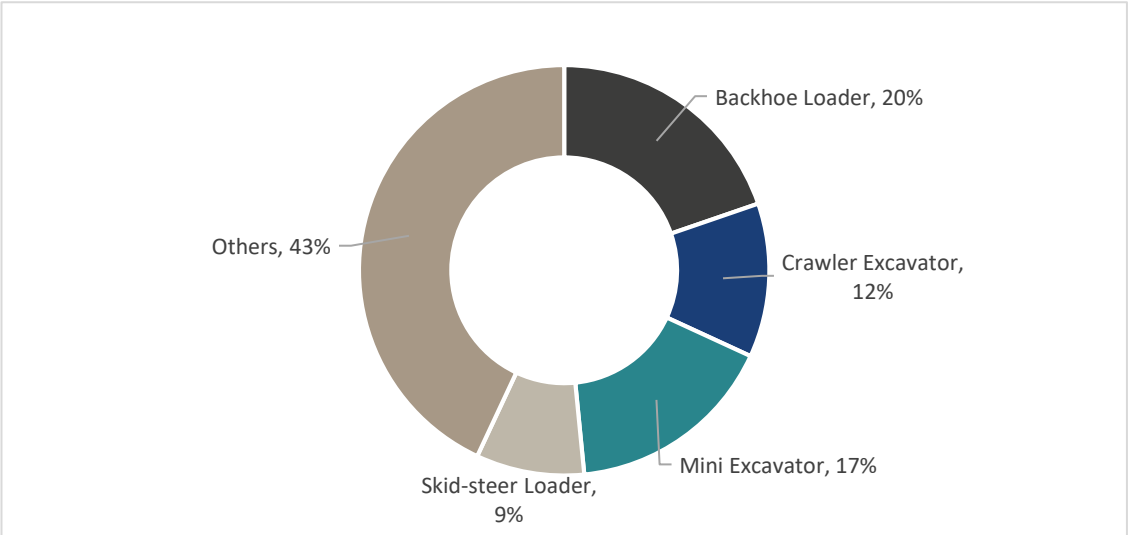
The weak dynamics in construction activity observed in Russia in recent years can also be attributed to:

- Subdued economic growth in recent years. Between 2013 and 2019, Russia's GDP expanded by only 7.5% overall, following a major contribution from the 2.8% increase achieved in 2018. Also, the country's GDP increased by only 2.0% in 2019. However, in 2020, Russia's GDP contracted by 3.0%, overwhelmingly due to the impact of COVID-19 pandemic, which resulted in a cumulative GDP growth of only 4.2% between 2013 and 2020. Furthermore, the country's GDP is not expected to rebound notably in 2021
- A sizeable reduction in the purchasing power of the population, with real disposable income falling every year between 2014 and 2017. The figure decreased by 3.0% in 2020, following 7.1% cumulative reduction between 2014 and 2019, and will rebound by no more than 2.5% in 2021. However, the 3.0% contraction in real disposable income in 2020 indicates an aggregate reduction of 9.9% for the period 2014-2020.

Russian construction equipment manufacturers have invested limited resources in the research and development of equipment during the past two decades. As a result, construction equipment manufactured in Russia faces intense competition from construction equipment from other geographies in terms of features and price.

Backhoe loader dominate the market (20% market share in 2020), followed by mini excavator (17%) and crawler excavator (12%).

Russia Construction Machinery Sales – Unit by Category (%), 2020



Source: Markets & Markets, CRISIL Research

Russian construction equipment faces intense competition from less expensive Chinese construction equipment as well as high-quality construction equipment of international manufacturers such as Komatsu, Caterpillar, Volvo, Hyundai and Hitachi. As a result, production of excavators in Russia declined from 15,000 units in early 1990s to less than 3,000 units in 2016.

The key players in the market are Caterpillar, Komatsu, Hitachi, JCB, Volvo, XCMG, Bobcat Company, Shantui, and Liebherr.

Key Demand Drivers for Construction Equipment

Upgrades to the average quality road infrastructure

- Russia is among the top countries across the globe in terms of length of road network. However, the condition of the road network in the country is average compared to many European countries. According to the World Economic Forum,
  - Russia was ranked 114th globally in terms of quality of roads in 2019
  - Road infrastructure in the country scored only 2.9 in the rating, where 1 is extremely poor and among the worst in the world, and 7 extremely good and among the best in the world
  -

  Under the Comprehensive Plan for the Modernization and Updating of the Main Infrastructure 2018-2024, the Russian government allocated a budget of over 1.7 trillion Russian rubles for the connection between centers of economic growth. Under 1.3 trillion Russian rubles were planned to be spent on modernization of railway transport and transit infrastructure. The expenditure on sea ports amounted to 927 million Russian rubles.

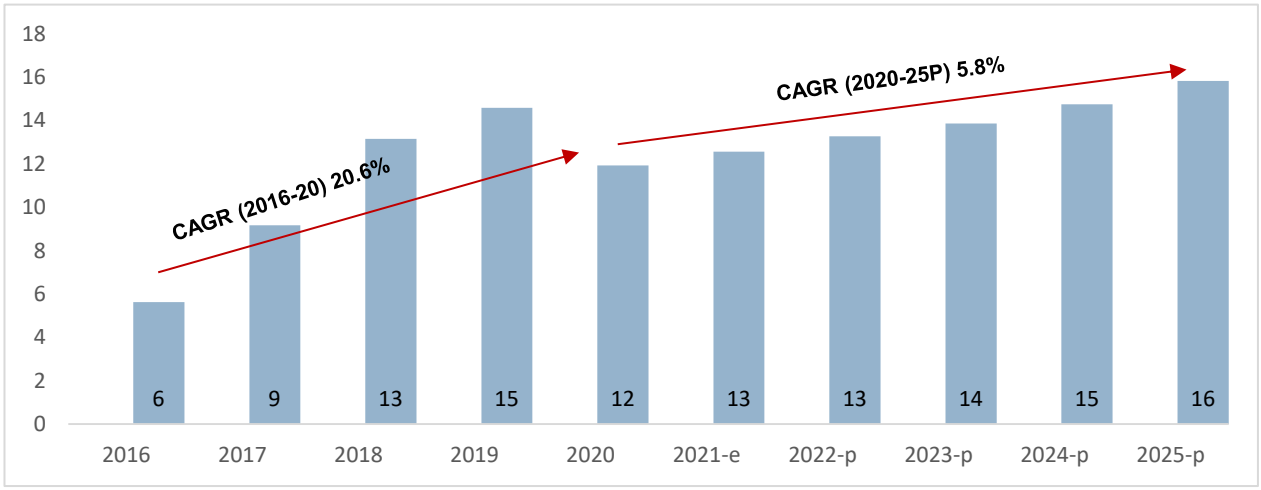
Government focus on infrastructure development over 2018-24

- Russian President Vladimir Putin pledged to oversee a major upgrade of infrastructure in Russia between now and 2024. According to reports by RBC (Russia's leading media company), infrastructure spending in the country will gradually increase in the next six years from 410 billion rubles in 2019 to 650 billion rubles in 2024
  - A $52.3 billion (3.5 trillion rubles) development fund was created to cover infrastructure spending by 2024. According to a 2019-21 draft budget bill, the fund will finance about 170 construction and other projects
  - Russia plans to invest $24.0 billion (1.6 trillion rubles) in infrastructure, including new airports and highways, over 2018-21
  - The government is investing to reconstruct the 1,879 km-long M5 motorway. It also plans to invest in the 1,351 km-long M7 motorway, a new high-speed route between Kazan and Ekaterinburg, the development of the Moscow transport hub, the completion of the Moscow-St. Petersburg motorway, etc.
  - The country is set to develop the Northern Sea Route and increase its cargo traffic to 80 million tons. It will also invest resources to significantly upgrade its railroads
- Investments by the government for improvement in infrastructure are expected to drive the market for construction equipment in Russia

Demand review and outlook

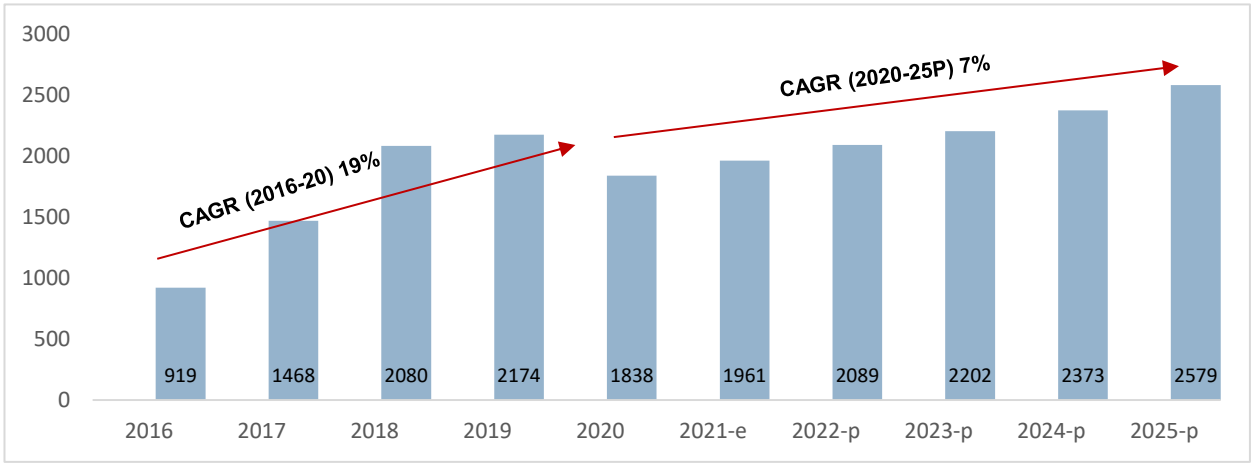
Construction equipment production volume for Russia increased at 20.6% CAGR over 2016-2020 to 11,931 units in 2020. The market was driven by factors such as infrastructure development and upgrading roads. Over 2020-2025, construction equipment production volume is expected to grow at 5.8% CAGR to 15,827 units in 2025.

Construction equipment production volume - ('000 units)



Source: Industry, CRISIL Research

Construction equipment production value - ($ million)



Source: Industry, CRISIL Research

Brazil

Brazil is the 9th largest economy in the world; however, it scores poor in terms of general infrastructure. According to World Economic Forum's general infrastructure ranking, Brazil was ranked 73rd below other emerging countries. The country is also ranked lower with respect to quality of roads (103), port infrastructure (106), and overall infrastructure (108).

The Infrastructure sector in Brazil is estimated to grow at a CAGR of approximately 5% during 2016-2026.

The Government of Brazil plans to auction 44 infrastructure projects in 2020. Out of the 44 projects, 22 are private sector airports. There are also nine ports, seven highways and six railroads. Among the highways to be auctioned, which is approximately 400 km long and links the largest cities in Brazil, Rio, and Sao Paulo. the government aims

to attract 101 billion BRL (24.6 billion USD) in investments in these projects. In 2019, 27 assets, including 12 airports, were auctioned for 5.4 billion BRL (1.3 billion USD).

Initiatives to improve the business environment and restore investor confidence are expected to support recovery in the construction industry. The government launched an infrastructure program - Programa de Parceria de Investimentos (PPI) that aims to promote private investments in the infrastructure sector as well as privatization of state-owned assets.

Key construction equipment companies operating in Brazil are Caterpillar, JCB, Komatsu, and Volvo. Caterpillar, Case, New Holland, and JCB are key producers of backhoe loaders in Brazil. During the past few years, a number of construction equipment companies including JCB, Deere, Hyundai, Doosan Infracore, XCMG, Tadano, Zoomlion, Raimondi, etc. have opened production facilities in Brazil.

Key Demand Drivers for Construction Equipment

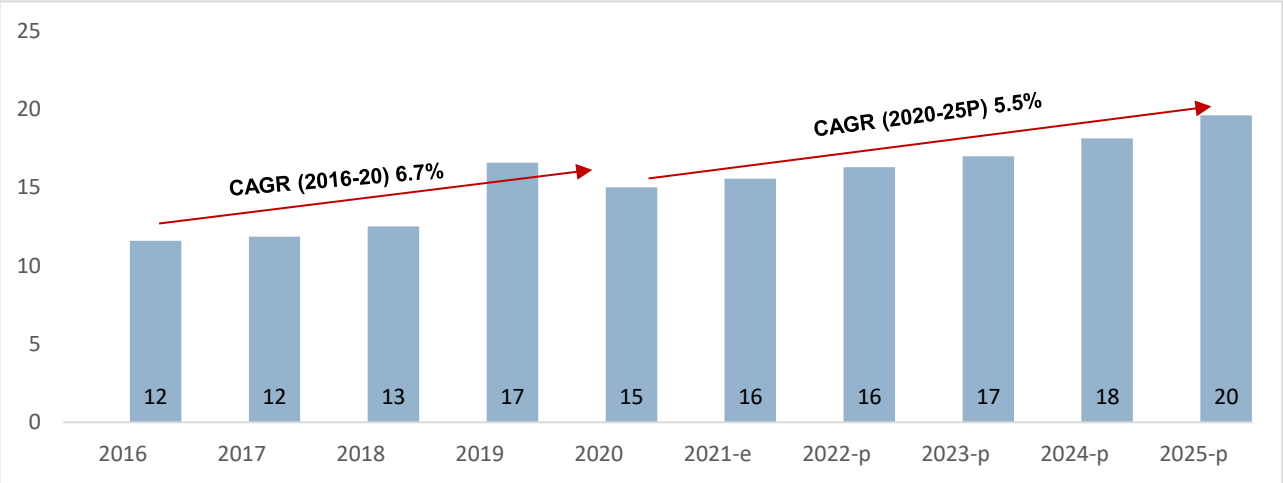
Government focus on public-private partnerships

- Brazil needs an investment of $2.7 trillion (slightly over 4.5% of Brazil's GDP) between 2018 and 2040, with the government investing for about 56% of the infrastructure investment requirements in the country
- To close the funding requirements, the government is promoting infrastructure projects as part of the country's national and sub-national infrastructure plans to facilitate the participation of foreign investors
  - A number of sub-national governments such as São Paulo, Bahia and Piauí states have leveraged public-private partnerships to make progress on infrastructure projects
- Increase in interest by foreign investors will positively impact construction activity in the country, which in turn will improve the construction equipment market

Demand review and outlook

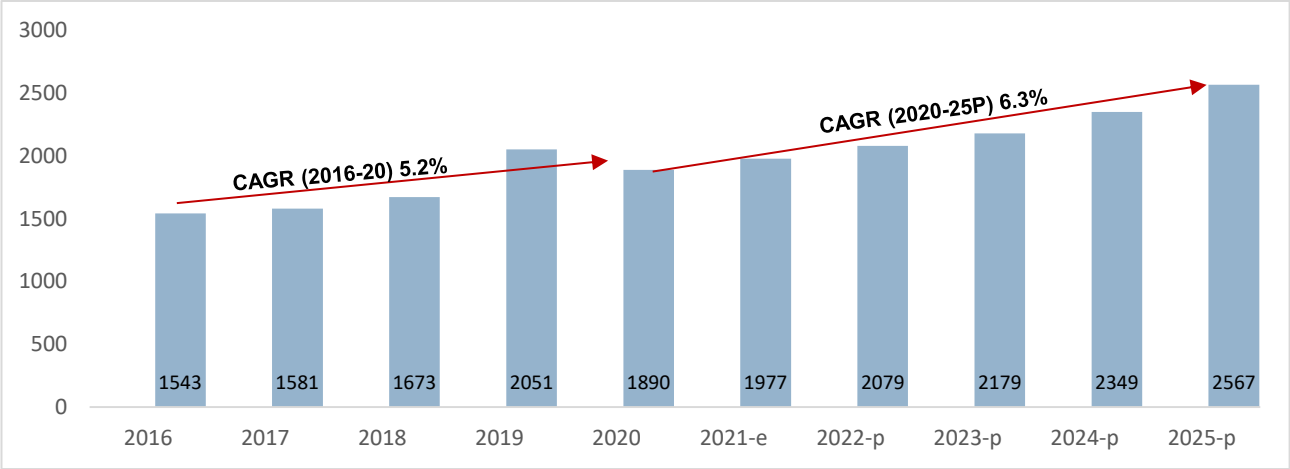
Construction equipment production volume for Brazil increased at 6.7% CAGR over 2016-2020 to 15,000 units in 2020. Over 2020-2025, construction equipment production volume is expected to grow at 5.5% CAGR to 19,595 units in 2025.

Construction equipment production volume - ('000 units)



Source: Industry, CRISIL Research

Construction equipment production value - ($ million)



Source: Industry, CRISIL Research

3.3 Market size and outlook by region (PMP)

World Market

Precision machined product (PMP) is a group of products that are components requiring stringent material and manufacturing specifications and controls. These include among others, precision machined components e.g. Pins and bushes used in articulated joints (AJ) across the construction, forestry and mining equipment. Our current study focuses on mapping the market for such precision machined components for articulated joints ("PMP for AJ").

The world market for PMP for AJ is estimated to be USD 520 million in 2020. Global production value for PMP for AJ is expected to grow at CAGR of 7-9% per cent during 2020-25, registering a decrease in the growth rate compared to 2016-2020 period which was a CAGR of 12.9%.

This expansion will be fuelled primarily by growth in North America and India, where construction spending, especially on infrastructure projects, continues to increase.

China, being the largest market globally, contributes around 40% to the total market share and is expected to grow at a CAGR of 6-8% from 2020-2025.

India, contributing around 10%, is expected to grow at a CAGR of 9-11% from 2020-2025 due to higher investments towards infrastructure activities and expansion plans by various construction equipment manufacturers.

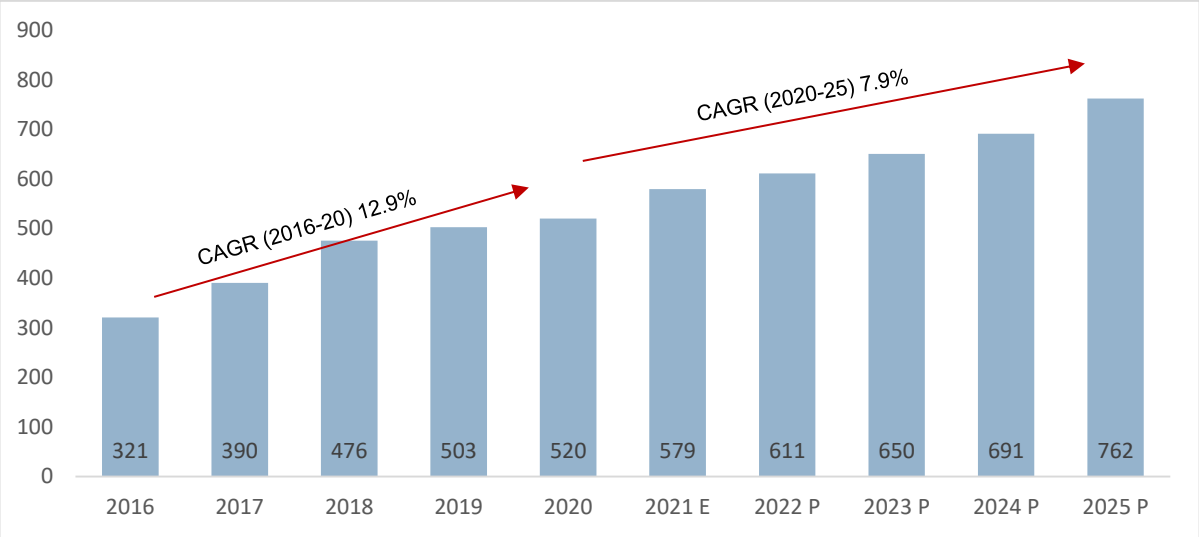
Japan and Europe are the second and third largest consumers of PMP for AJ parts respectively, contributing approximately 36% of the world market.

Demand for construction equipment is expected to be seen from geographies such as Russia due to higher focus of the government to improve the quality of road network.

Construction equipment industry of Brazil has remained sluggish due to weak business confidence and delay in the construction of several infrastructure projects. To improve business environment and restore investor confidence,

the government launched an infrastructure program that aims to promote private investments in the infrastructure sector as well as privatization of state-owned assets.

Precision Machine Parts for AJ - Market Value (USD Million)



NOTE: E-Estimate; P-Projected

SOURCE: CRISIL Research

Note: The above projections does not include any impact of the on-going Russia & Ukraine crisis

North America

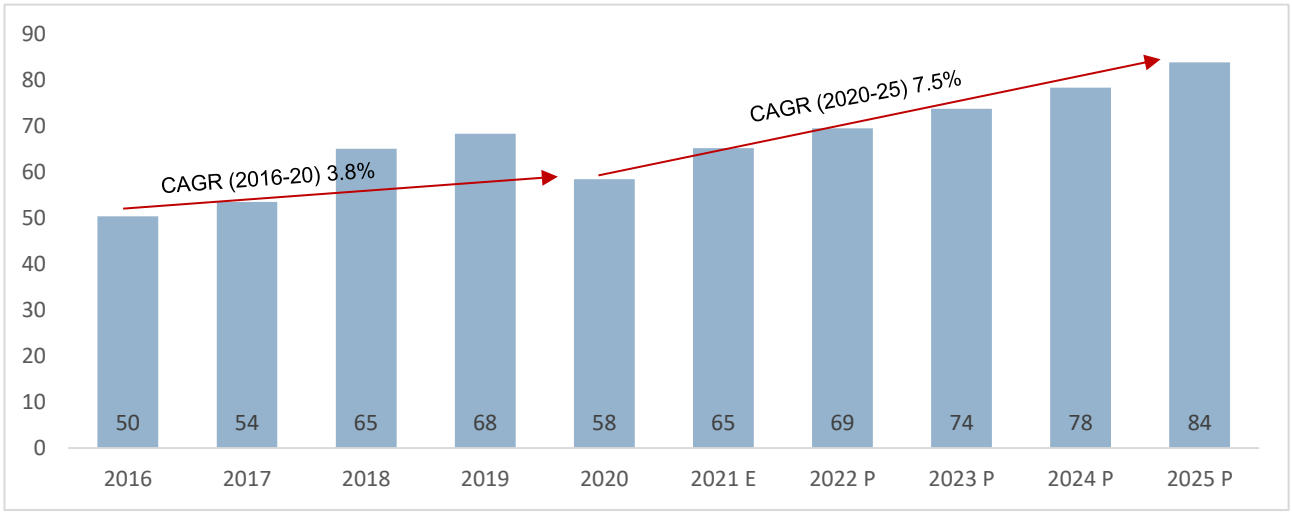
North America PMP for AJ market is approximately $58 million in 2020, with major construction equipment manufactured being skid steer loader, crawler excavator, mini excavators, more than 80 HP wheeled loaders, etc. The market is expected to grow at a CAGR of 7.5% over 2020-25 to $84 million in 2025. Growth will be driven by higher spending in construction activities by USA and Canada,

Structure of Unit Production by Product Category (% of Total)

Year	Skid Steer Loaders	Crawler Excavators	Mini Excavators	Wheeled Loaders > 80 HP	RTLTs - Telescopic	Compact Tracked Loader	Others
2020	8%	26%	11%	14%	5%	20%	17%

Source: Industry, CRISIL Research

North America PMP Market Value ($ Million)



Source: Industry, CRISIL Research

Europe

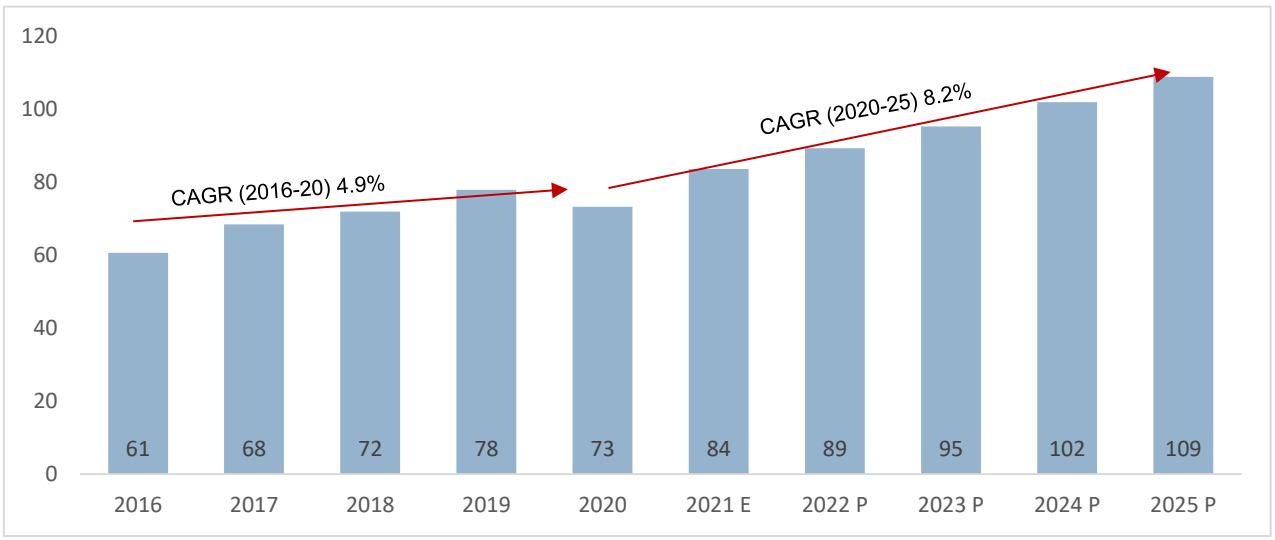
Europe PMP for AJ market is approximately $73 million in 2020, with major construction equipment manufactured being RTLTs - telescopic, mini excavators, wheeled and backhoe loaders, etc. The market is expected to grow at a CAGR of 8.2% over 2020-25 to $109 million in 2025. This strong growth in next five years is backed by government spending on infrastructure.

Structure of Unit Production by Product Category (% of Total)

Year	RTLTs - Telescopic	Mini Excavators	Wheeled Loaders < 80 HP	Wheeled Loaders > 80 HP	Crawler Excavators	Others
2020	11%	20%	4%	8%	40%	17%

Source: Industry, CRISIL Research

Europe PMP Market Value ($ Million)



Source: Industry, CRISIL Research

Japan

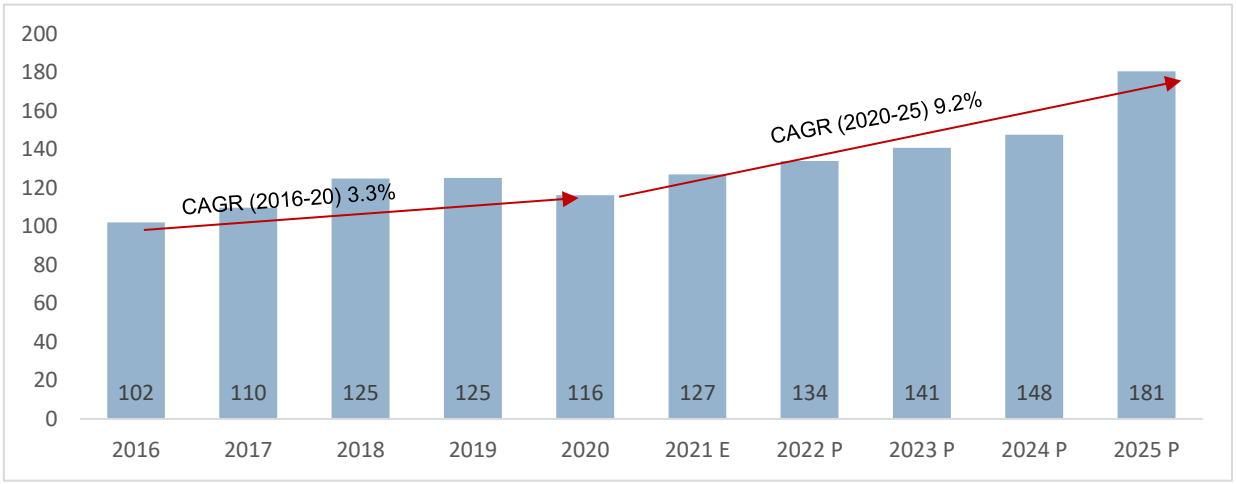
Japan PMP for AJ market is approximately $116 million in 2020, with major construction equipment manufactured being skid steer loaders, excavators (mini and crawler), wheeled loaders, etc. The market is expected to grow at a CAGR of 9.2% over 2020-25 to $181 million in 2025. PMP growth will be impacted by demand for construction equipment due to investments by the government to develop road, rail, and airport.

Structure of Unit Production by Product Category (% of Total)

Year	Crawler Excavators	Mini Excavators	Wheeled Loaders > 80 HP	Others
2020	76%	20%	2%	3%

Source: Industry, CRISIL Research

Japan PMP Market Value ($ Million)



Source: Industry, CRISIL Research

China

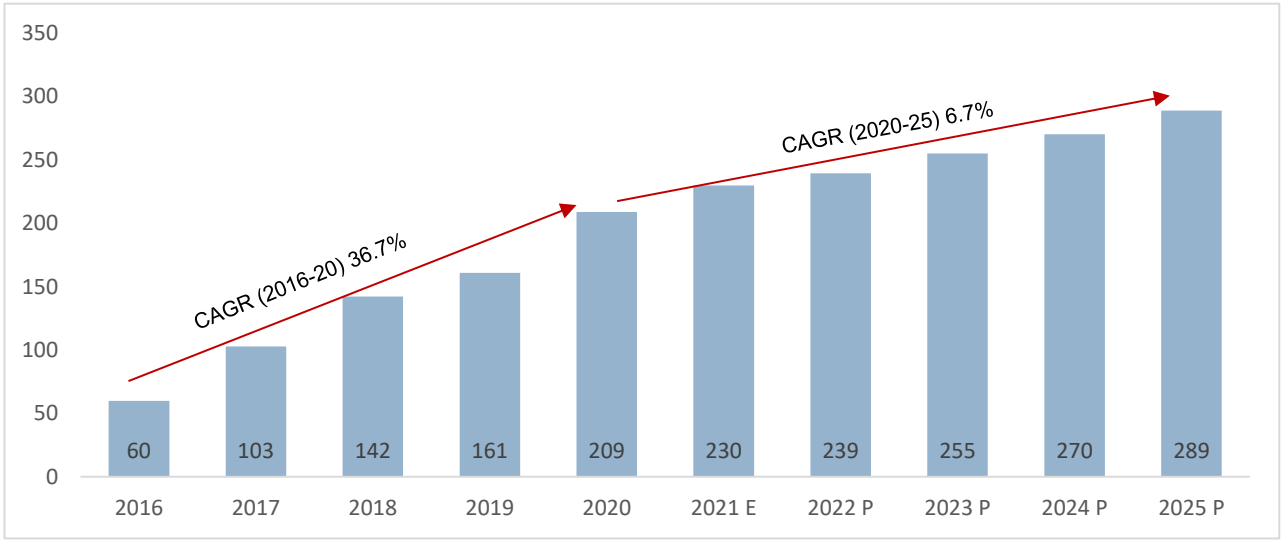
China PMP for AJ market is approximately $209 million in 2020, with major construction equipment manufactured being excavators (mini and crawler), wheeled loaders, crawler dozers, etc. The market is expected to grow at a CAGR of 6.7% over 2020-25 to $289 million in 2025. PMP demand will be driven by increase in investment in infrastructure activities mainly China's Belt and Road Initiative.

Structure of Unit Production by Product Category (% of Total)

Year	Crawler Excavators	Wheeled Loaders > 80 HP	Mini Excavators	Others
2017	58%	31%	6%	4%

Source: Industry, CRISIL Research

China PMP Market Value ($ Million)



Source: Industry, CRISIL Research

India

India's PMP market for pins and bushes used in articulated joint was ~US$ 50 million in 2020, with major construction equipment manufactured being backhoe loader and crawler excavator. From 2016 to 2020, PMP market has grown by 5.4% CAGR on account of push by the Government towards infrastructure and other construction related activities.

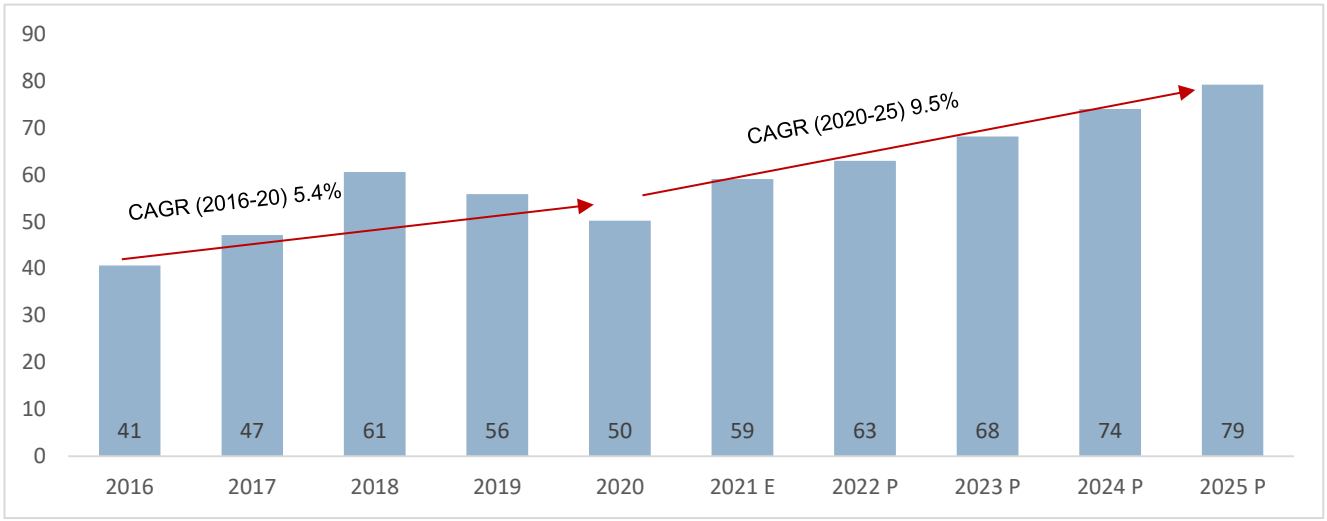
We expect PMP market in India to grow by 9.5% CAGR between fiscals 2020 and 2025 to ~US$ 79 million, surpassing growth in the previous 4 years, owing to higher expected growth in the construction equipment market.

Structure of unit production by product category (% of total)

Year	Backhoe loader	Excavator	Wheeled loader	Rigid dump trucks	Others
2017	41%	52%	3%	2%	2%

Source: Industry, CRISIL Research

India PMP market value in (US$ million)



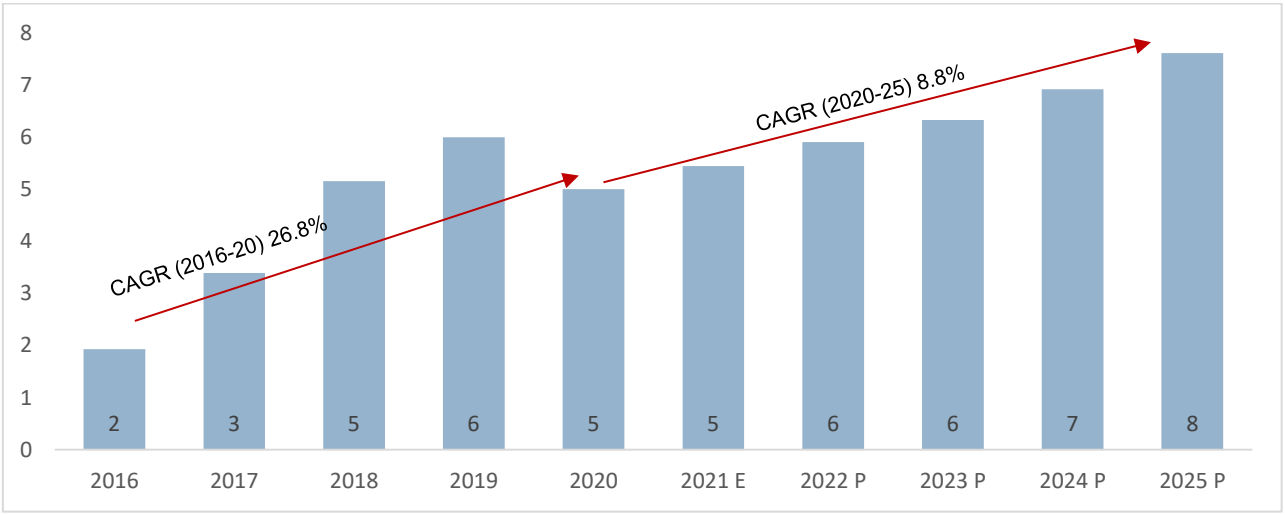
NOTE: For calculating market size of PMP, construction equipment such as backhoe loader, excavator, wheeled loader, skid steer loader, and rigid dump trucks have been considered.

Source: Industry, CRISIL Research

Russia

The PMP for AJ market in Russia stood at about $5 million in 2020. Major construction equipment includes crawler excavators, mini excavators, backhoe loaders, telescopic RTLTs, etc. The market is expected to grow at 8.8% CAGR over 2020-2025 to $8 million in 2025.

Russia PMP market value ($ million)

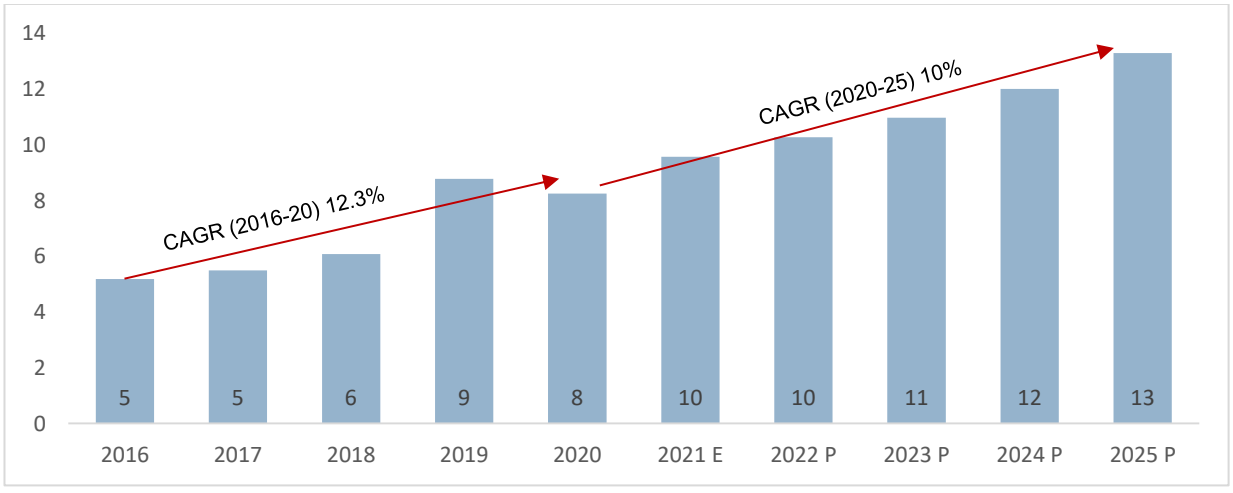


Source: Industry, CRISIL Research

Brazil

The PMP for AJ market in Brazil stood at about $8 million in 2020. Major construction equipment includes crawler excavators, mini excavators, backhoe loaders, telescopic RTLTs, etc. The market is expected to grow at 10% CAGR over 2020-2025 to $13 million in 2025.

Brazil PMP market value ($ million)



Source: Industry, CRISIL Research

4. Annexure

4.1 Annexure 1: OEM Profile

Revenue-

Company	Currency	2016	2017	2018	2019	2020	4-year CAGR (2016-20)
AGCO Corp.	USD billion	7.4	8.3	9.3	9.0	9.15	5%
Caterpillar Inc.	USD billion	38.5	45.5	54.7	53.8	41.7	2%
CNH Industrial NV	USD billion	25.3	27.9	29.7	28.0	26.0	1%
Deere & Co.	USD billion	26.6	29.7	37.3	39.2	35.5	7%
Kubota Corp	Yen billion	1596.1	1751.5	1850.3	1920.0	1853.2	4%

NOTE:

Financial year ending of AGCO, Caterpillar, CNH Industrial, Kubota is in December

Financial year ending of Deere & Co. is in October

SOURCE: Company Reports, CRISIL Research

AGCO Corp.

AGCO, a key player in farm equipment segment, started manufacturing and distributing farm equipment in 1990. The Company sells agricultural equipment and related replacement parts, including tractors, combines, etc. Tractor accounts to more than 50% of its total revenue. During 2016-2020, company revenue grew from 7.4 USD billion in 20116 to 9.15 USD billion in 2020, resulting in a 5% CAGR growth.

Caterpillar Inc.

Caterpillar Inc. is one of the world's leading construction equipment manufacturers. In 1925, the Holt Manufacturing Company and C. L. Best Tractor Co. were merged to form the Caterpillar Tractor Co.

Caterpillar designs, manufactures, and markets construction, mining, and forestry machinery. The Company also manufactures engines and other related parts for its equipment and offers financing and insurance. Caterpillar has three main operating segments – Construction Industries, Energy and Transportation and Resource Industries. It even provides financing and related services through its Financial Product segment. Construction Industries contributes approx. 40% to the revenue. During 2016-2020, company revenue grew from 38.5 USD billion in 2016 to 41.7 USD billion in 201, resulting in a 2% CAGR growth.

CNH Industrial NV

CNH Industrial, a key player in agriculture and construction equipment industry is based in the Netherlands. The company is in the business of agriculture equipment, construction equipment, commercial vehicles, powertrain, and financial services. Agriculture and construction equipment almost account for 50% of the revenue. During 2016-2020, company revenue grew from 25.3 USD billion in 2016 to 26.0 USD billion in 2020, resulting in a 1% CAGR growth.

Deere & Co.

The company was originally founded in 1837. John Deere is the brand name of Deere & Co. The company is one of the leading manufacturers of agricultural and farm equipment.

The company manufactures and distributes agricultural, construction, forestry, and commercial and consumer equipment. Its three main business segment includes – agriculture and turf, construction and forestry, financial services segment. Almost 90% of the revenue is from agriculture and turf, construction and forestry segment. During 2016-2020, company revenue grew from 26.6 USD billion in 2016 to 35.5 USD billion in 2020, resulting in a 7% CAGR growth.

Kubota Corp.

Kubota, one of the leading players in tractor and heavy equipment manufacturer is based in Japan. The company was established in 1890.

Kubota manufactures industrial machinery, farm machinery, and fluid piping systems. Farm and industrial machinery accounts more than 75% share in the revenue. The company major markets include Japan and North America. During 2016-2020, company revenue increased from 1596.1 Yen billion in 2016 to 1853.2 Yen billion in 2020, resulting in a 4% CAGR growth.

Uniparts Revenue-

Company	Currency	2017	2018	2019	2020	2021	4-year CAGR (2016-20)
Uniparts India Limited	INR billion	6.94	8.43	10.62	9.39	9.48	8%

NOTE:

Financial year ending of Uniparts is in March

SOURCE: Company Reports, CRISIL Research

Uniparts is an Indian based global manufacturer of engineered systems and solutions. The Group is one of the leading supplier of systems and components for the off-highway market on account of its presence across 25 countries. It operates out of six manufacturing facilities and four warehousing locations across US, Europe and India. Uniparts large India manufacturing footprint and economies of scale helps provide cost competitiveness in an otherwise discreet manufacturing set up involving a large range of SKUs. The company's major business areas are agriculture, construction and forestry, and after-market. They have a leading presence in the manufacturing of 3PL and PMP products globally as they have been serving some of the largest global companies, including John Deere, Bobcat, TAFE, Yanmar and many others.

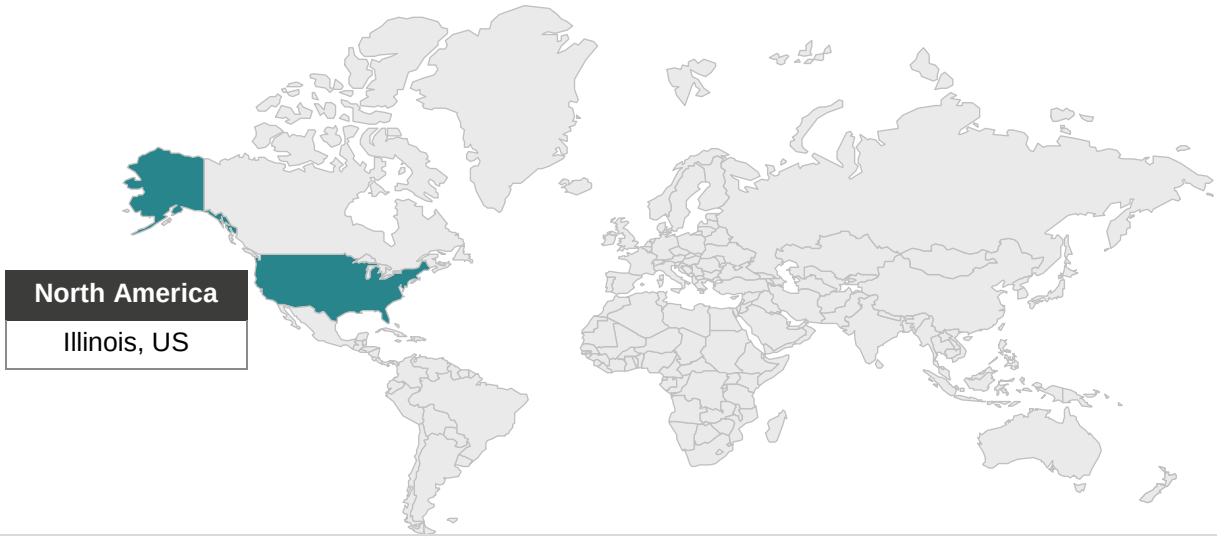
4.2 Annexure 2: Player Profile – Precision Machine Parts (PMP)

General Grind & Machine (www.generalgrind.com)

Key Facts	Brief Profile
HQ: **Aledo, Illinois, US** No. of Employees: **NA** Key Executives: **Mark Bieri, President/ CEO** **Michael Vipond, CFO** **Blake Bieri, COO** Financials ($ million): **NA** Key Customers: **Deere & Co., Caterpillar Inc., CNH, Komatsu, Siemens Wind Power, Spyder** ***Source: Company website***	**Company Background** Established in 1976, General Grind & Machine (GCM) is a privately owned company that specializes in the manufacturing of machined parts. It offers over 150 CNC (computer numerically controlled) machines, including lathes, mills, saws, modern cutoffs, robotic welders, vertical and horizontal induction heat treat, O.D. cylindrical grinders, O.D. centerless grinders and onsite zinc and nickel plating. General Grind & Machine focuses on production of bar machining. GGM currently processes three to four million pounds of bar stock each month. The company utilizes a completely integrated MRP (Material Requirements Planning) based computer application to ensure timely delivery to its customers. Along with MRP, it also incorporates a fully integrated EDI (Electronic Data Interchange) application to decrease processing time and reduce errors.

Geographic Presence (Locations)

General Grind & Machine is headquartered in Aledo, Illinois, US. It occupies eleven buildings with a total of 230,000 square feet of floor space, 180,000 square feet of which is dedicated to manufacturing



Product Portfolio

General Grind & Machine is focused on bar machining and currently processes three to four million pounds of bar stock each month. Its top products include machined and induction hardened pins and shafts.

S.I.BO. srl Societa' Italiana Boccole (www.sibo.eu)

Key Facts	Brief Profile
HQ: Bologna, Italy **No. of Employees:** 30+ **Key Executives:** Emilio Calabrese, President Alessandra Calabrese, Managing Director **Financials ($ million):**	**Company Background** Società Italiana Boccole Srl (SIBO) manufactures and sells steel bushes for construction and drilling machines, agricultural machinery, and oil hydraulic cylinders and equipment. The steel bushes may be standard or customised as per customer needs. SIBO bushes are manufactured in compliance with environmental standards and production cycle, as well as in accordance with the European Union's new regulations on chemical products, REACH (Registration, Evaluation, Authorisation and restriction of Chemicals). SIBO cooperates with the University of Bologna in the field of technological innovation in order to extend the life of its bushes and identify those which offer the best performance in order to improve its production processes.

Metrics	2018	2019	2020
Total revenue	NA	NA	7.6

Source: Capital IQ; Company website

Geographic Presence (Locations)

SIBO's production facility covers a surface of over 6,000 sq. m. out of a total of 23,000 sq. m. of industrial area. It has a production capacity of over 2 million bushes/year, owing to its modern and regularly renewed range of machinery

Europe
Bologna, Italy

Product Portfolio

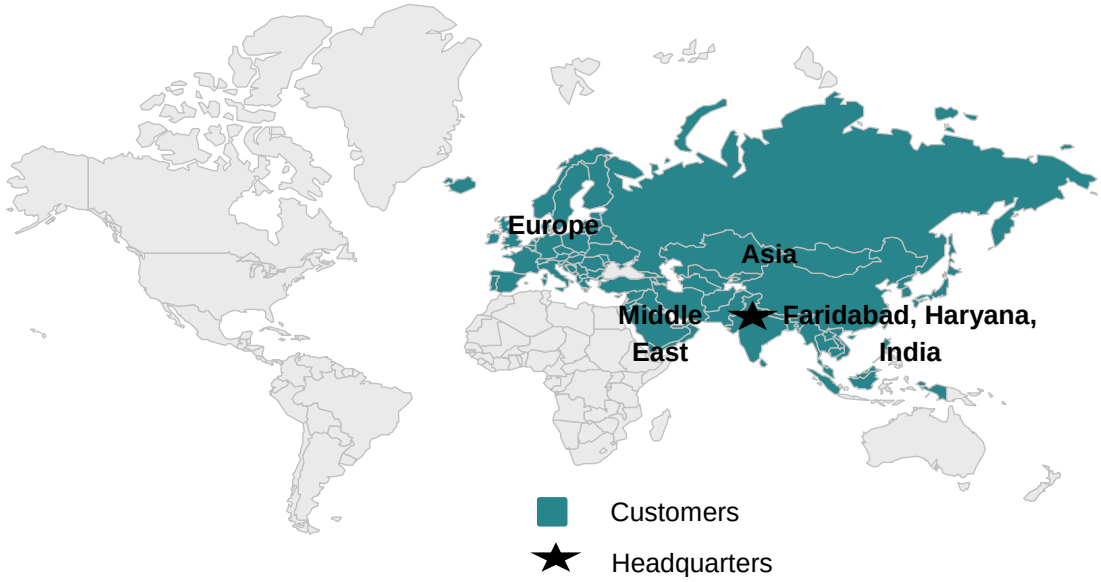
SIBO products are employed as a protection against wear on all coupling systems having a low rotation speed combined with a high specific pressure, where bearings, shafts, pins and coupling bolts can be easily replaced.

Products	
Standard Bushings	Sibo's STD Line is a line of standard bushings with SIBO tolerances (Ø Outside u6 – Ø Inside C8) that undergo casehardening and tempering treatment with casehardening depth of 0.8-1 mm and Hardness HRC 58-62 It is suitable for use in workplaces requiring high resistance to wear and tear and seizing
Flanged Bushings	These are special bushes with a flange (or collar) that are mainly used in the jointed parts of rear excavators
Cushion Bushings	The cushion or shock-absorbing bushings are fitted inside hydraulic cylinders and "brake" the actual cylinder, avoiding sudden stopping and jerking movements of the machine
Special Bushings	These are produced on demand according to customer specifications. SIBO is able to create various types of bushings with particular grooves and of different depths

Vishal Engineers (www.vishalengineers.com)

Key Facts	Brief Profile
HQ: Faridabad, Haryana, India **No. of Employees:** NA **Key Executives:** S.R. Ahuja, Director **Financials ($ million):** NA *Source: Company website*	**Company Background** Vishal Engineers, established in 1972, is engaged in the manufacture and export of precision bushes, precision metal bushes, industrial metal bushes, precision machined components, precision pivot pins and steel bushes as well as providing hardening services. The company manufactures more than 900 types of pins and bushings. Its products are used in equipment serving the earth-moving, agriculture, construction, mining, textile, crane/lifting and other industries. It serves customers in Asia, Europe and the Middle East. Vishal Engineers is an ISO 9001:2000 certified company. The company processes pins, bushes and other machined components in-house. It has a variety of equipment such as CNC cutting, CNC turning, horizontal machining, CNC drilling, tapping, hobbing, milling, grinding and an automatic welding centre. It also provides surface treatments in-house. The company has partnered with a reputed specialist for specialized surface treatments. It has an integrated ERP system which ensures a smooth design to delivery cycle for every part. The company has a 12,000 sq. feet fully dedicated facility that provides induction hardening services. Leveraging on its equipment and other allied tools, the company is capable of processing diameters from 8 mm (5/16 inches) to 200 mm (8 inches) and lengths of up to 2 meters (80 inches). It has a wide frequency range to achieve any depth of hardness.

Geographic Presence (Locations)
Vishal Engineers is based in Faridabad, Haryana, India, where it also has a dedicated facility that provides induction hardening services. It serves customers across Asia, Europe and the Middle East



Product Portfolio

Vishal Engineers primarily offers three products:

Products	
Pins	Offers pivot pins that are qualitatively machined and offer durability as per client specifications. Pin sizes range from ¼ inch diameter to as large as 6 inches and lengths from 2 inches to 60 inches. Typically, pins are offered in SAE 4140, SAE 1045 and SAE 1020. Pins are made from quench and tempered steel and then induction hardened to provide wear resistance and a long life
Bushes	Bushes are manufactured with a diameter of 1-8 inches. Standard bushes are offered in SAE 1040, SAE 1045 and SAE 52100. These are induction hardened in the bore or all over and can also be provided in low carbon case carburizing steel
Machined Components	Offers a wide range of machined components that fit clients' requirements. Machined components are offered in soft or heat treated condition and can be surface treated as per customer specifications. Its range of precision machined components is qualitatively forged and surface hardened to ensure quality and durability

The company also provides induction hardening services to the construction equipment industry.

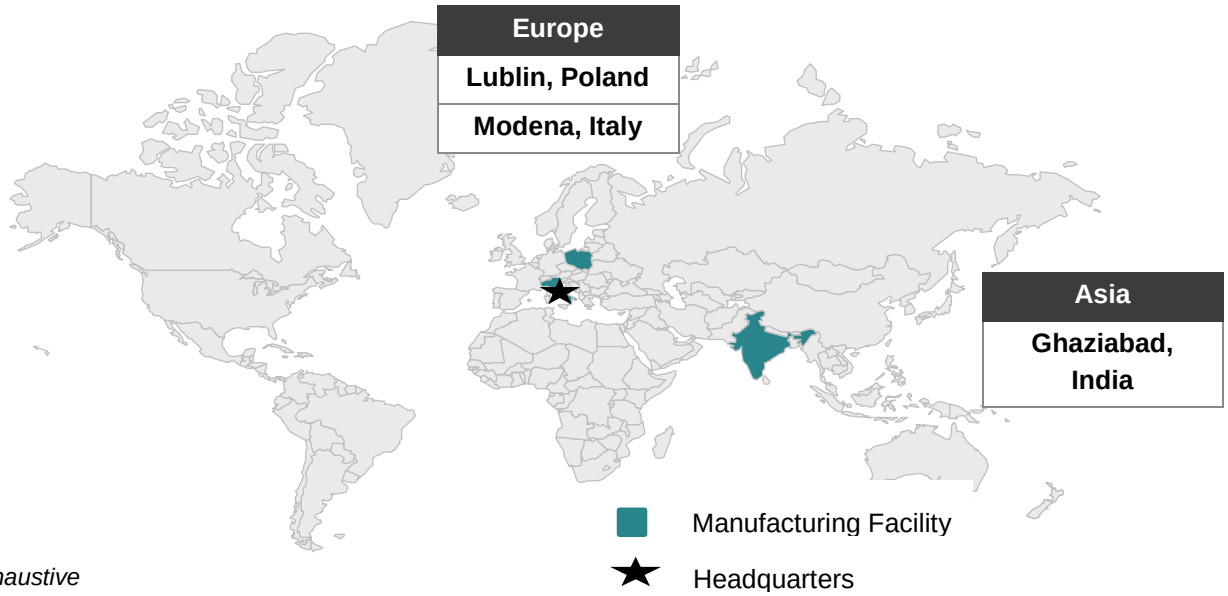
4.3 Annexure 3: Player Profile – 3-Point Linkage

CBM Group (www.cbmgroup.it)

Key Facts	Brief Profile
HQ: Modena, Italy **No. of Employees: ~1,300** **Key Executives:** **Enrico Cornia, Managing Director** **Financials ($ million):** **Revenue: 225.6 (€197.4 million)** **Key Customers:** **CNH, Claas, John Deere, Carraro, Ferrari, Escorts Agri Machinery Group, New Holland Agriculture, Steyr, Lindner, Mahindra, Farmtrac Tractors Electric, Fendt, AEBI** ***Source: Company websites***	**Company Background** CBM Group engages in the design, production and supply of original equipment for lifting, handling and towing systems for work equipment carried or semi-driven by agricultural tractors The group comprises the following companies: • **CBM S.p.A:** Specialises in developing systems for coupling, towing and lifting implements for agricultural tractors. Its product portfolio includes three-point linkages, trailer hitches, and pick-up hitches • **Mita Oleadinamica S.p.A:** Involved in the manufacture and design of lifting and control systems for implements used on agricultural tractors • **CBM Polska:** Manufactures hydraulic jacks, pick up hitches, trailer hitches, automatic lateral stabilisers, metal sheets, tractor body work and tractor cabins and transmissions • **Mita India Pvt. Ltd.:** Was established in 1999 as a joint venture and manufactures hydraulic rockshafts and three point linkages • **Te-tra Acciai S.r.l:** Specialises in reclamation, standardisation, ferritisation or workability annealing, high and medium frequency induction hardening, tempering, and stabilisation

Geographic Presence (Manufacturing Locations and Offices*)

CBM Group operates through the following manufacturing locations across the globe:



**Not exhaustive*

Product Portfolio

The company offers a range of products including:

Company	Products/Services
CBM S.p.A	• Attacks at three front and rear points • Towing groups - Ball towing • Tow hooks • Drawbars • Automatic hooks inf. and for the 3rd point • Automatic side stabilizers • 3 ° points and vertical tie rods with hydraulic adjustment • Hitches pick-up • Spare parts line
Mita Oleadinamica	• Hydraulic and electronic lifts • Command distributors • Hydraulic distributors • Auxiliary hydraulic valves • Command groups CR90 - CR100 • 3° points and vertical tie rods with hydraulic adjustment • Hydraulic cylinders
CBM Polska	• Three-point attacks • Lifters • Transmissions for tractors • Axles for tractors • Stabilizer attachment brackets • Towing groups - ball towing • Hitches pick-up • Medium and large-scale carpentry for agricultural tractors and industrial machines • Tractor’s platforms and cabins
Mita India	• Attacks at three front and rear points • Hydraulic and electronic lifts • Automatic hooks
Te-tra Acciai	• Thermal treatments • Normalization • Annealing

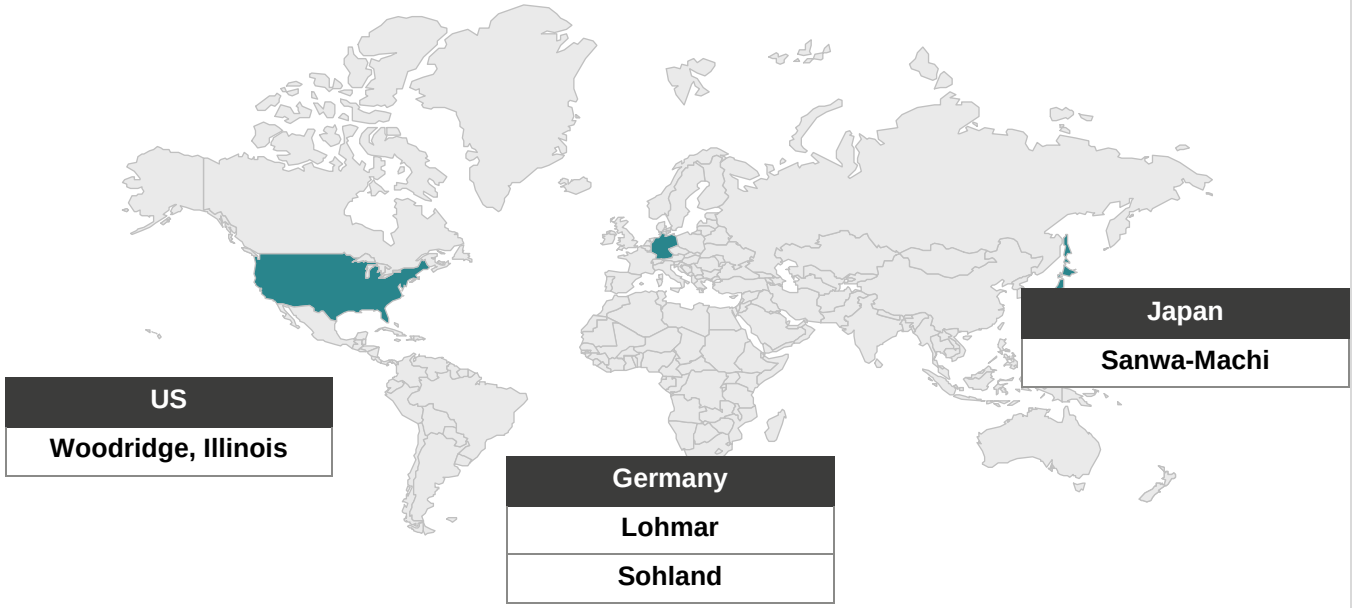
Walterscheid Gmbh (www.walterscheid.com)

Key Facts	Brief Profile
HQ: Lohmar, Germany **No. of Employees: 643** **Key Executives:** **Wolfgang Lemser, Managing Director** **Michael Harant** **Manager** **Dieter Thiede** **Chairman of the Board** **Financials (£ million): NA** ***Source: Company website; Capital IQ***	**Company Background** Walterscheid GmbH operates as a provider of connected and smart powertrain solutions. The Company offers driveshafts, gear boxes, clutches, tractor attachment and hitch systems, spare parts, and other related accessories, as well as provides off highway powertrain, aftermarket distribution, asset management, and other related services. Walterscheid serves customers worldwide. Walterscheid GmbH is located in Lohmar, Nordrhein-Westfalen, Germany and is part of the Engine, Turbine, and Power Transmission Equipment Manufacturing Industry. Walterscheid GmbH has 643 employees at this location and generates $161.18 million in sales (USD). There are 45 companies in the Walterscheid GmbH corporate family. **Segments Overview** • **Agriculture:** Deeply rooted in agriculture and food production, the name Walterscheid is a synonym for high quality driveshafts that offer maximum reliability, performance and service life. Predominantly for mobile secondary drives, our product portfolio includes: Driveshafts, Clutches, Gears, Tractor-Attachment-Systems, Hitch-Systems • **Construction:** Ever since first cardan and driveshafts became available, manufacturers of construction machinery quickly discovered Walterscheid components for various applications including heavy duty wheel loaders and large dump trucks as used in mining operations. • **Mining:** Open cast and underground mining each have their challenges. Moving of material by these huge machines require precision and flexibility. Reliability, machine uptime and low maintenance is imperative in conjunction with driver safety and comfort. At WPG, our experienced engineers have worked with mine operators to understand and see first-hand the challenges to enable expertly engineered solutions to meet the environmental, load and torque requirements. • **Commercial Vehicles:** Increased population growth and urbanisation means the development of infrastructure and new mass transit transportation is increasingly important. Opportunities are emerging to utilise Shafts and Service' expertise in providing powertrain solutions and further develop and build on our existing relationships with major automotive and light commercial OEM's. • **Material Handling:** Material handling applications require flexibility and reliability as well as the reassuring stability to handle high payloads accurately. At WPG we engineer and design customised solutions for shafts, clutches and wheels, to meet your individual needs ensuring safety and a smooth

	flow of materials and logistics for standard and specialised application vehicles**.**

Geographic Presence - GKN Walterscheid

Walterscheid operates through the following locations:



Product Portfolio – GKN Walterscheid

Products			
PTO Drive shafts	PTO Drive shafts - spare parts	PTO Drive shaft clutches	PTO Drive shaft guard
Stabilisation systems	Top links	Lift rods	Hitch systems
Mechanics drive shafts	Double joint shafts DUJ	Lower links	ICVD

Recent Developments

In November 2021, The Walterscheid Powertrain Group takes over IFA Kardan based in Irxleben, Germany. IFA Kardan is a company with a long track record, having been developing a wide range of cardan shafts and various types of joints for the agricultural, construction and specialty vehicle markets since 1959. By offering flexible solutions for small and large series for demanding applications, the company is one of the top 10 suppliers for off-road applications in Europe.

In July 2021, One Equity Partners (“OEP”), a middle market private equity firm, announced that it has entered into a definitive agreement to merge its investment in Walterscheid Powertrain Group (“Walterscheid”), a leading provider of highly-engineered, mission critical powertrain systems and services for off-highway and industrial applications, into Comer Industries S.p.A. (“Comer”) (Borsa Italiana S.p.A.: BIT:COM), a designer and manufacturer of advanced engineering systems and solutions for power transmissions. Under terms of the transaction, OEP will continue to own a significant minority stake in the combined company.

Maxiforja Componentes Automotivos LTDA (www.maxiforja.com.br)

Key Facts	Brief Profile
HQ: Canoas, Brazil **No. of Employees: 624** **Key Executives:** **Émerson Lazuta is the Chief Financial Officer** **Financials ($ million): NA** **Key Customers:** ***Automotive:*** **Daimler, Volvo, Detroit Diesel Corporation, Meritor, MAN, Scania, Master, Iveco** ***Agricultural:*** **Agco, Agrale, Case New Holland, Caterpillar, John Deere, Valtra** ***Source: Company website; Capital IQ***	**Company Background** Maxiforja Componenetes Automotivos is a Brazil-based privately held company mainly engaged in the development and manufacture of components and forged systems used for the agricultural, automotive, industrial and yellow line markets The company was founded in 1963 with a 450 sq. m. factory and a staff of three. Since then, it has established itself in the space of forgings, heat treatment and machining. In 1992, it invested in precision machining and induction hardening, and in 2002 it installed a three point linkage assembly plant. In 2011, with the construction of a new machining plant, it expanded its production facilities to 25,000 sq. m. The company is one of Brazil’s largest foundries and covers a constructed area of approximately 30,500 sq. m. It has the capacity to produce up to 30,000 tons of steel annually **Segments Overview** **Forging:** This sector is one of Maxiforja’s main competitive strengths. It has mechanical presses ranging from 1,000 to 4,000 tonnes, and a fully automated hydraulic hot extrusion line **Heat Treatment:** The company uses gas furnace generators, heating furnaces, electric furnaces, induction tempering machines, and continuous normalisation and tempering furnace for its heat treatment processes. It has the capacity to produce 15,000 tonnes of forged equipment annually **Machining:** Maxiforja currently produces machined products ranging from 200g to 65 kg, in varied shapes. It uses CNC grinders, high speed hobbing machines, machining centres, manipulation systems, robotised welding units, and Magnaflux and Magnatest for manufacturing machining products. This division has the capabilities for three point and automotive assemblies

Geographic Presence

Product Portfolio

Maxiforja designs and manufactures components for the agricultural and automotive markets and is involved in forging, heat treatment and machining

Products	
Automotive	**Agricultural**
• **Yokes** • **Axle brackets** • **Spring-energised seals** • **Axle ends** • **Transmission flanges** • **Drive through shafts** • **S camshafts** • **Pitman rods** • **Tie rod arms** • **Steering arms** • **Thrust rings**	• Three point hitches • Lift rods • Stabilisers • Long axes • Lower links

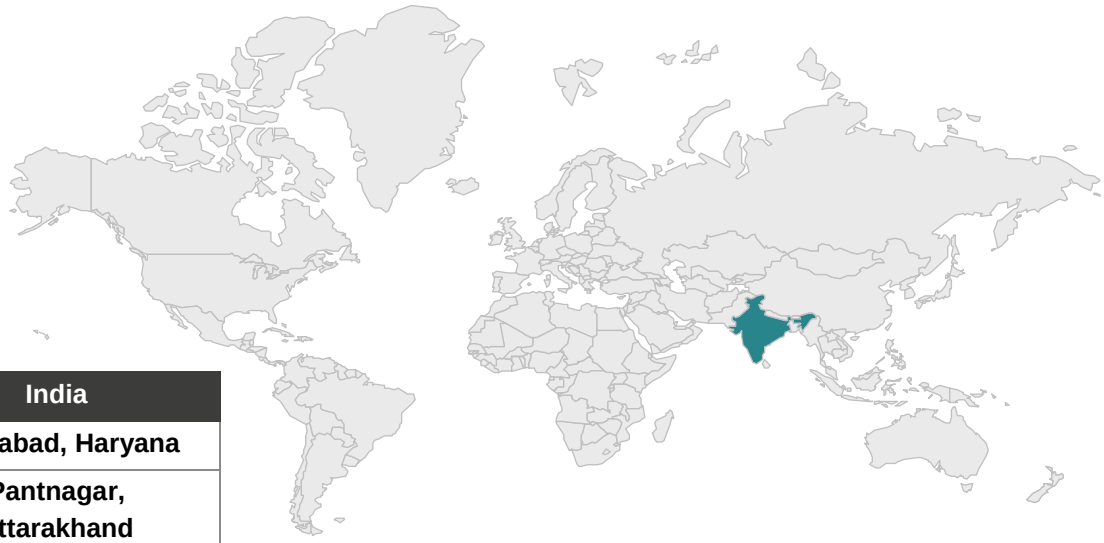
Sudtrac Linkages Private Limited (www.sudtrac.in)

Key Facts	Brief Profile
HQ: Faridabad, Haryana, India **No. of Employees: 150** **Key Executives:** **Dipak Raj Sood, Chairman** **Samir Sood, Director** **Satya Prakash, Chief Operating Officer** **Financials ($ million): NA** **Key Customers: Escorts, Mahindra, Same Deutz-Fahr, Sonalika International, John Deere, Tafe** ***Source: Company website; Capital IQ***	**Company Background** Sudtrac Linkages was founded in 1975 as a Tier-I manufacturer of sub-assemblies to serve the farm equipment industry. Its products encompass fully machined components, sub-assemblies such as the front axle, and three point linkages. Its key production capabilities include CNC & VMC machining, electro plating, heat treatment, induction hardening, gas carburizing, sheet metal pressing & fabrication, welding, robotic welding, wet and dry painting, tool designing and development. All the divisions of Sudtrac are ISO 9001:2008 certified, and the company is in the process of obtaining the ISO 14001certification.

Geographic Presence

Sudtrac's facilities are located in Faridabad (Haryana), Pantnagar (Uttrakhand), and Chennai (Tamil Nadu), which are key tractor and vehicle manufacturing centres. It mostly caters to domestic clients, but also produces lower links, chain assemblies, disc brakes, draft links, pins, front plates, and support draft links for John Deere's international markets.

Its sheet metal pressing facilities operate mechanical and hydraulic presses of 25-500 tons capacity, and the company has an annual capacity of 12,000 tons.



India
Faridabad, Haryana
Pantnagar, Uttarakhand
Chennai, Tamil Nadu

Product Portfolio

Sudtrac's capabilities encompass fully machined components, sub-assemblies such as the front axle, and three-point linkages.

Products				
Three-point linkages	Arm steering gear	Front axle assembly	Lower link	Lift rod assembly
Radius rod	Top link	Check chain assembly	Fix lift rod	Gear shifter lever
Turn buckle	Chain assembly	Disk brake	Draft link	Front plate
Support draft link	Levelling rod	Stabiliser	Pin	Spring seat
Trailing arm	Lower arm assembly	Upper arm assembly	Front axle adjustable type	Front axle fixed type

Delicia Co., Ltd. (www.delica-kk.co.jp)

Key Facts	Brief Profile
HQ: Matsumoto, Japan **No. of Employees: 129** **Key Executives:** **Takehiro Toda, Chairman** **Takahiro Kaneko, CEO** **Revenue ($ million): NA** **Key Customers: IHI Agri-Tech Corporation, Iseki & Co., MSK Farm Machinery Corporation, MK Seiko Co., Kubota Corporation, New Holland HFT Japan Inc., Mitsubishi Mahindra Agricultural Machinery Co., Yanmar Co., Yanmar Agricultural Machinery Manufacturing Co.** ***Source: Company website; Capital IQ***	**Company Background** Delica Co., Ltd. is a manufacturer of agricultural machinery. It manufactures agricultural machinery such as manure spreaders and feed crushers, as well as 3-point linkages. Key customer segments for Delica include companies engaged in agricultural and farm-related activities. The company was established in 1953 as Delica Machinery Manufacturing Co. Ltd. in Matsumoto Saiwaicho and engaged in manufacturing agricultural machines and internal combustion engines for ships. It started manufacturing operating machines for tractors in 1962-, and 3-point linkages for tractors in 1968. In 1972, it started the production of special vehicles for export as construction machinery. It was reconstituted as Delica Co., Ltd. in 1988. Delica received the ISO 9001:2015 certification in October 2017.

Geographic Presence

Delica's head office and flagship manufacturing facility is located in Matsumoto City, Japan.

Product Portfolio

Delica’s capabilities encompass fully machined components.

Products	
Agricultural Machinery	Manure spreaders, manure loaders, manure carriers, manure loader/spreaders, compost stirrers, compost spreaders, compost carriers, excreta spreaders, chaff crushers, mulch-film removers, feed crushers
3 Point Linkages	Top links, lift rods (L & R), lower links, check chain stabilisers, threading balls, pins/eyebolts/shackles, hot forgings. The company currently provides small (CAT I type) to large (CAT III type) 3 Point Linkages
Large Frames	Frames for car washing and LED information signs

4.4 Annexure 4: Key terminology

- **Precision machined parts (PMP):** is a group of products that are components requiring stringent material and manufacturing specifications and controls. These include among others, precision machined components e.g. pins, bushes and bosses used in articulated joints (AJ) across the construction, forestry and mining equipment. Our current study focuses on mapping the market for such precision machined components for articulated joints ("PMP for AJ"). This study excludes the precision machined parts as used in other significant places such as engine, transmission and hydraulic components

- **3-Point linkage (3PL):** The three-point linkage systems consist of different assemblies that are attached to an agricultural tractor. It forms a group of assemblies allowing attaching an implement like a plough to the tractor at 3 coupling points forming a triangle. Three-point linkages are composed of three movable arms. The two lower arms—lower links or draft links—are controlled by the hydraulic system, and provide lifting, lowering, and even tilting to the implement. The upper centre arm—called the top link—is movable, but is not powered by the tractor's hydraulic system and acts like a connecting rod. Each arm has an attachment device to connect implements to the hitch.

- **Construction Equipment:** is mechanized equipment designed to perform operations like excavating, roading, drilling, pile-driving, reinforcement, machinery for carrying out preparatory work etc. It includes equipment like telescopic handler, wheel loader, crawler excavator, backhoe loader, asphalt finisher, articulated dump trucks, crawler dozer, mini excavator, motor grader, rigid mast handlers, rigid dump trucks, skid steer, wheel excavator etc.

- **Production of equipment/tractor volume:** refers to the total production of that equipment/tractor in units in that economy. The production volume is being used interchangeably with shipments volume information, wherever data was limited.

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