

Chapter 2 Industry Machinery Sector

2-1. Machine Tools

2-1-1. Trends in Supply & Demand

(1) Orders

Orders in 2005 rose 10% over the previous year to a total of JPY 1.3632 trillion. This was the second consecutive year that the total monetary amount of orders exceeded JPY 1 trillion, and although the market has yet to reach bubble-era peak levels, it has nevertheless continued to grow for three consecutive years (see Diagram 2-1-1). A breakdown of orders shows that domestic orders increased by 11% over the previous year for a total of JPY 746.7 billion; domestic orders accounted for 54.8% of total orders. The industry continues to experience favorable conditions, and orders continue to rise. This may be attributed to a strong willingness on the part of users in the automobile and general machinery sectors to invest. A mid-to-long-term forecast suggests that orders will remain at high levels in the future.

A breakdown of customers shows that the number of orders from seven out of 11 sectors increased over the previous year, due in part to rising domestic demand (see Diagram 2-1-2). Orders placed by companies in the automobile sector – the largest machine tool user – rose by 15% over the previous year to a total of JPY 259 billion, the sec-

ond highest level after the peak reached in 1990. Furthermore, the number of orders placed by companies in the general machinery sector rose by 14% over the previous year to a total of JPY 302.3 billion; this is the first time since 1991 that orders from this sector have exceeded JPY 300 billion. On the other hand, orders placed by companies in the electrical machinery sector dropped 13% from the previous year to a total of JPY 44.3 billion, and orders from companies in the precision instruments sector dropped 0.2% from the previous year to a total of JPY 32.9 billion; this was the first time in three years that orders from both of these sectors decreased.

Foreign orders increased by 9% over the previous year to a total of JPY 616.5 billion; foreign orders accounted for 45.2% of total orders. Specifically, orders from North America increased by 21% over the previous year; orders from the EU increased by 18% over the previous year, orders from Europe increased by 18% over the previous year, and orders from East Asia increased by 13% over the previous year. Demand continues to rise in each major market.

Diagram 2-1-1. Demand Trends

Unit: JPY 100 million; %

	1998	1999	2000	2001	2002	2003	2004	2005
Total Orders	9,892	7,566	9,750	7,889	6,758	8,511	12,362	13,632
	87	76	129	81	86	108	145	110
Domestic Orders	4,572	3,619	5,217	4,111	3,503	4,416	6,728	7,467
	72	79	144	79	85	107	152	111
Domestic Order Ratio	46.2	47.8	53.5	52.1	51.8	51.9	54.4	54.8
Foreign Orders	5,320	3,947	4,534	3,778	3,255	4,095	5,634	6,165
	107	74	115	83	86	108	138	109
Foreign Order Ratio	53.8	52.2	46.5	47.9	48.2	48.1	45.6	45.2

Notes: 1. Domestic order ratio = [amount of domestic orders] / [amount of total orders]

2. Foreign order ratio = [amount of foreign orders] / [amount of total orders]

3. Figures below order amounts in the cells show year-on-year growth (%).

Source: Japan Machine Tool Builders' Association (JMTBA)

Diagram 2-1-2. Industry-specific Machine Tool Orders

Unit: JPY 1 million; %

Sector \ Year	1998	1999	2000	2001	2002	2003	2004	2005	Y/Y 2005/2004
1. Steel & non-ferrous metals	9,374	6,684	7,824	5,189	3,680	5,557	8,613	11,619	135
2. Metal products	15,753	13,000	18,325	13,383	9,732	15,209	22,067	22,641	103
3. General machinery	168,047	132,685	192,850	154,430	120,190	160,512	264,502	302,287	114
4. Electrical machinery	28,073	25,131	45,922	35,131	22,564	30,483	50,902	44,296	87
5. Automobiles	149,808	103,377	129,042	136,541	141,490	158,988	225,632	258,959	115
6. Shipbuilding & other transportation related equipment	14,991	8,642	10,227	15,587	14,287	12,074	17,328	23,942	138
7. Precision instruments	12,560	17,878	38,276	22,082	16,459	24,176	32,990	32,913	99.8
3-7: Machine industry subtotal	373,479	287,713	416,317	363,771	314,990	386,233	591,354	662,397	112
8. Other mfg. industries	19,413	15,667	26,557	17,198	14,197	24,507	37,643	33,333	89
9. Gov't/schools	4,422	3,713	3,085	3,065	2,125	1,873	1,842	1,588	86
10. Other users	2,429	1,983	1,760	853	610	1,644	2,971	6,081	205
11. Trading firms/agencies	32,344	33,162	47,818	7,666	4,988	6,564	8,349	9,050	108
1-11: Total domestic orders	457,214	361,922	521,686	411,125	350,322	441,587	672,839	746,709	111
12. Foreign orders	531,986	394,694	453,360	377,773	325,515	409,514	563,353	616,494	109
1-12: Total orders	989,200	756,616	975,046	788,898	675,837	851,101	1,236,192	1,363,203	110
NC (Numerically Controlled) machine tools only	925,861	711,742	926,477	745,409	638,831	807,208	1,176,257	1,304,058	111

Source: JMTBA

(2) Production

The total monetary value of production in 2005 rose 26% over the previous year to a total of JPY 1.1103 trillion, the second highest level after the peak reached in 1990 (JPY 1.3034 trillion). This was the third consecutive year of year-on-year growth (see Diagram 2-1-3), and the first time in eight years that the total value of production rose above the JPY

1-trillion mark. The total value of NC machine tool production alone increased 27% over the previous year to a total of JPY 979.4 billion; the total value of NC machine tool production accounted for 88.2% of the total value of all machine tool production (a 0.1-point increase over the previous year).

Diagram 2-1-3. Production Trends

Unit: JPY 100 million; %

	1998	1999	2000	2001	2002	2003	2004	2005
Value of Production	10,105	7,395	8,146	7,765	5,851	6,902	8,781	11,103
	99	73	110	95	75	118	127	126
NC Machine Tools	8,768	6,354	7,219	6,802	5,097	5,973	7,735	9,794
	103	72	114	94	75	117	129	127
NC Machine Tool Ratio	86.8	85.9	88.6	87.6	87.1	86.5	88.1	88.2

Note: Figures below production values in the cells show year-on-year growth (%).

Source: JMTBA

(3) Imports & Exports

Diagram 2-1-4 shows trends related to imports and exports of machine tools. As indicated, the total monetary value of exports in 2005 rose 19% over the previous year to a total of JPY 815.1 billion; this was also the third consecutive year of export value growth, and the second consecutive year in which the record has been broken. The export ratio (exports / production) to production was 73.4% (a 4.4-point decrease from the previous year). Exports to East Asia, which showed favorable results the previous year, increased only slightly (3.2%). However, exports to Southeast Asia (including Indonesia, India, and Thailand) rose significantly. Exports to the U.S. - the largest importer of Japanese machine tools - increased 36.6% over the previous year, indicating a recovery trend. In recent years, the U.S. share of Japanese machine tool exports has dropped, partly because of an increase in imports to Asian nations; this year, however, exports to the U.S. exceeded those to both Asia and Europe.

The total value of machine tool imports also

increased for the third consecutive year (up 22%) for a total of JPY 107.5 billion. This was the first year in which the value of imports rose above the JPY 100-billion level, and the second consecutive year in which the record has been broken.

The degree of dependence on imports (imports / [production - exports + imports]) was 26.7%, down 4.5 points from the previous year. Imports from the U.S. - Japan's largest supplier, rose 9.4% to a total of JPY 53.1 billion and accounted for 49.5% of total imports. The next largest suppliers after the U.S. were Switzerland followed by Germany. Together, machine tool imports from these three nations account for more than 70% of the total monetary value of machine tool imports. Of particular interest are imports of "other special processing machines" (semiconductor manufacturing machine category) from the U.S.; these imports doubled in the previous year and continued to experience double-digit growth in 2005 as well.

Diagram 2-1-4. Import & Export Trends

Unit: JPY 100 million; %

	1998	1999	2000	2001	2002	2003	2004	2005
Value of Exports	6,571	5,292	6,201	5,584	4,848	5,641	6,831	8,151
	101	81	117	90	87	116	121	119
Export Ratio	65.0	71.6	76.1	71.9	82.8	81.7	77.8	73.4
Value of Imports	658	637	856	696	509	532	882	1,075
	92	97	134	81	73	105	166	122
Degree of Dependence on Imports	15.7	23.3	34.9	24.2	33.6	29.7	31.2	26.7

Notes:

1. Export ratio (exports / production)

2. Degree of dependence on imports (imports / [production - exports + imports])

Source: JMTBA

2-1-2. Business Operation Trends & Challenges

(1) Cost & Profit Status

The "Machine Tool Builders' Business Conditions Survey 2004" (JMTBA), which solicited responses from 31 companies, indicates that - based on all indicators - profits in 2004 rose considerably over

the previous year, reflecting a favorable level of domestic and foreign orders (see Diagram 2-1-5). While sales soared, sales costs were kept at a low level (up 18.1% from the previous year); as a result,

operating profits increased by 170% over the previous year to a total of JPY 80.4 billion. Furthermore, pre-tax profits increased by nearly 200% over the

previous year; they were affected by exchange rate losses, dividend income that exceeded interest paid, and other developments.

Diagram 2-1-5. Annual Profit Status

Unit: JPY 1 million; points

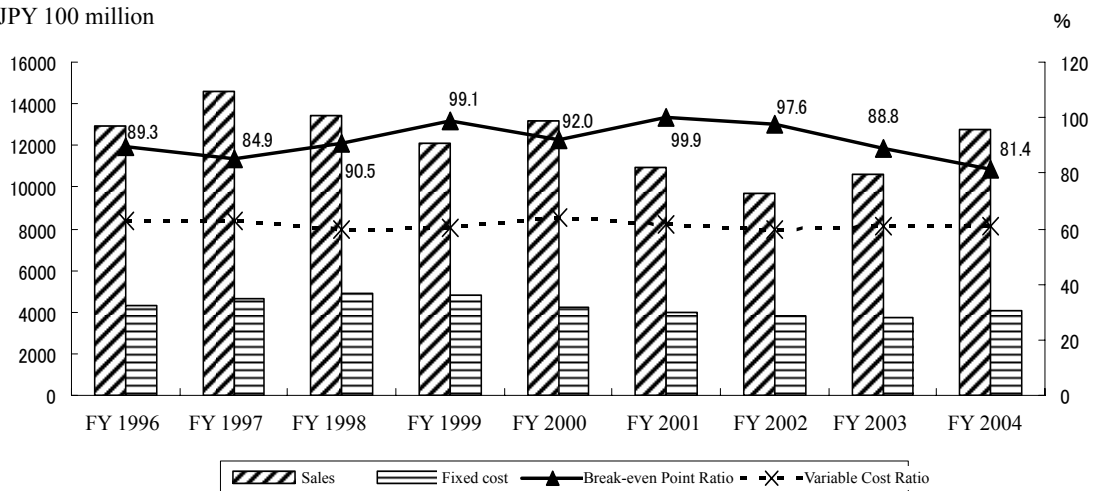
	FY 2001	FY 2002	FY 2003	FY 2004	Y/Y
Sales	1,092,025	969,294	1,058,918	1,274,713	120.4
Operating profit	988	9,733	45,983	80,360	174.8
Operating profit ratio	0.1	1.0	4.3	6.3	+2.0
Pre-tax profit	1,194	3,539	40,362	82,540	204.5
Pre-tax profit ratio	0.1	0.4	3.8	6.5	+2.7
Current-term profit (after taxes)	△32,730	△18,546	16,297	54,517	334.5
Current-term profit ratio (after taxes)	△3.0	△1.9	1.5	4.3	+2.8

Source: “Machine Tool Builders’ Business Conditions Survey 2004” (JMTBA)

Diagram 2-1-6 shows shifts in sales, fixed costs, variable cost ratios, and break-even point ratios from 1996 to 2004. As the graph indicates, the break-even point ratio in 2004 was 81.4% (a 7.4-point improvement over the previous year). Industry companies have in recent years made efforts to reduce labor and other fixed costs (e.g. overhead). As a result, the fixed cost increase over the last year stayed at 10.5%, which was almost half the increase rate of sales. The 2004 variable cost ratio, on the other hand, remained almost unchanged at 60.8%. This indicates favorable economic conditions, and

could be attributed in part to increased outsourcing and material costs due to increased production to accommodate soaring sales. As in past years, machine tool manufacturers continue to face the challenge of finding ways to reduce not only fixed costs but variable costs as well. In particular, the cost of steel materials rose dramatically in 2005, indicating that more material cost hikes may be in store for the future. Consequently, manufacturers may be forced to raise product prices and implement drastic cost reduction measures in order to reduce variable cost ratios.

Unit: JPY 100 million



Source: “Machine Tool Builders’ Business Conditions Survey 2004” (JMTBA)

Diagram 2-1-6. Break-even Point Ratios of Machine Tool Manufacturers

(2) Performance of Six Leading Machine Tool Manufacturers

An observation of the consolidated performance of six major machine tool manufacturers in March 2005 reveals that sales and pre-tax profits among all six companies rose considerably over March 2004 figures (see Diagram 2-1-7). This is thought to be the result of auto industry capital investments, digital home appliance market recovery, increased investments in small and medium size manufacturing businesses, and foreign market recoveries. While industry watchers expect these fa-

vorable conditions will persist in the near future, unpredictable oil and steel costs and other wild cards still exist and, and these industry watchers have continued to point out, machine industry profitability remains unstable. Thus it is important – particularly in times when macroeconomic conditions are favorable and advantageous – for companies to plan ahead for diversity by strengthening their businesses.

Diagram 2-1-7. Performance of Six Leading Machine Tool Manufacturers

Unit: JPY 100 million; %

	March 2002		March 2003		March 2004		March 2005	
	Sales	Ordinary Profit/Loss	Sales	Ordinary Profit/Loss	Sales	Ordinary Profit/Loss	Sales	Ordinary Profit/Loss
Toyoda Machine Works	1,885	30	2,013	56	2,162	69	2,438	125
Okuma Corporation	920	△32	802	△42	868	19	1,152	94
Mori Seiki	697	△30	638	△35	875	19	1,222	105
Makino Milling Machine	757	△5	658	△17	838	30	1,051	67
OKK	214	△5	182	△18	253	4	306	30
Tsugami Corporation	156	△2	163	△0.8	199	13	250	35

Source: Securities reports

(3) Recent Industry Trends: The “Year 2007 Problem” & Transfer of Expertise

Coined in 2003, the Japanese term “2007-nen mondai” (“Year 2007 problem”) refers to the serious predicament in which Japan will find itself once Japanese baby boomers – the core of Japan’s manufacturing industries – begin to retire en masse in 2007. In the machine tool sector, too, more and more companies are taking steps to mitigate the effects of this phenomenon, such as rehiring retirees and recruiting them to serve as skill trainers, providing on-the-job training programs, and hiring more college graduates in order to ensure that skills/expertise are passed on to the next generation.

For example, machine tool manufacturer EN-SHU established in 2004 a career center designed to promote the transfer of expertise. The center is equipped with 20 machines; senior employees (in their 50s) and mid-career employees (in their 30s) work with the machines together in pairs so that the

veterans can pass on their implicit knowledge to their juniors (Business Labor Trend; June 2006; pp. 4-5).

Citizen Machinery Company president Toshio Iwasaki also claims that face-to-face, hands-on training is crucial to the transfer of vital hand-scraping technology from senior to junior employees (Industrial Marketing; March 2006; p. A-73). Iwasaki also states that it is important in on-the-job training to “take junior employees by the hand and teach them step by step,” as opposed to the traditional Japanese-style apprentice system whereby apprentices were expected to learn from craftsmen primarily through observation.

These examples highlight the various efforts being made by manufacturers to transfer skills and technology at an individual level. Nevertheless, in order to improve the skills/expertise of a company’s

organization as a whole so that it can develop revolutionary new products and make other major strides in the future, individual-level training itself is not enough. Skills and knowledge acquired by individuals must be shared on an organization-wide level. If the transfer of expertise stops at the individual level, or the individual who possesses expertise decides to monopolize it, the company risks losing a valuable resource. Consequently, engineer expertise is increasingly being stored in company databases for later incorporation into machine tools.

As the functionality of machine tools becomes more and more advanced, Okuma Corporation is making efforts to incorporate as much engineer expertise as possible into its machines as a means of ensuring that the expertise is retained; it is also working to develop next-generation “intelligent” machine tools with improved uptime ratios. Additionally, it has installed multiple temperature sensors on equipment used in the machining of large press dies; based on its proprietary temperature control theory, the system anticipates thermal displacement and automatically corrects the position of the cutting tool. The new system eliminates the need for adjustments to be made by highly skilled workers, and reduces die production time by 40% (Nikkei Sangyo Shimbun; May 18, 2006).

Makino Milling Machine maintains both precision and productivity by transferring top engineer expertise to its machine tools. Roughly two years ago, the company developed a scraper with sliding surfaces and special purpose tools; the system eliminated the bulk of the manual labor formerly required.

2-1-3. Future Prospects

Domestic demand in the automobile, digital home appliance and semiconductor sectors is expected to continue to grow in the near future. However, undue reliance on demand in the automobile sector could destabilize profitability. Furthermore, unpredictable factors such as oil and steel prices must also be taken into consideration as in the past. One of the primary challenges that machine tool

Even when fitting and adjusting, skilled engineers only need to perform final scraping tasks to achieve the same results as before the new system was developed.

As mentioned above, scraping expertise is essential to machine tool manufacturers, and certainly it is possible in some cases to incorporate this expertise into equipment used to manufacture machine tools; still, it appears that manufacturers will continue to evaluate skilled workers’ finishing touches on their products. Furthermore, manufacturers will likely need to devote more resources to advancing and improving expertise in the future in order to develop more sophisticated scraping technology; consequently, management will need to adopt suitable practices for evaluating expertise. Citizen Machinery Company pays its workers based on their merits and results; they receive no fringe benefits except for a “scraping allowance,” which underscores the fact that the company considers scraping to be a highly specialized skill (Industrial Marketing; March 2006; p. A-73).

In summary of the above, it is a fact that machine tool manufacturers are beginning to replace the manual labor and expertise of skilled workers with machining and control technology. Nevertheless, the implicit knowledge of such skilled workers, their tenacity, their awareness of duty, and their uncompromising self-discipline must also be transferred to the younger generations. A true transfer of expertise is not likely possible if these facets are ignored.

manufacturers will be faced with in the future is bolstering their business structures in order to be able to cope effectively with these various destabilizing factors. They must strive to cut costs significantly by reducing variable costs and, at the same time, work to develop products that offer a much higher degree of value.

2-2. Construction Machinery

2-2-1. Trends in Supply & Demand

(1) Overview

The total monetary value of construction machinery production in 2005 rose 9.5% over the previous year to a total of JPY 1.3929 trillion. The total value of crawler tractor production rose 15.1% over the previous year, the total value of construction crane production rose 28.4%, and the total value of excavation machinery production rose 8.7%.

The total monetary value of crawler tractor sales in 2005 rose 13.8% over the previous year to a total of JPY 1.3897 trillion, and the total value of construction crane sales rose 24.6% over the previ-

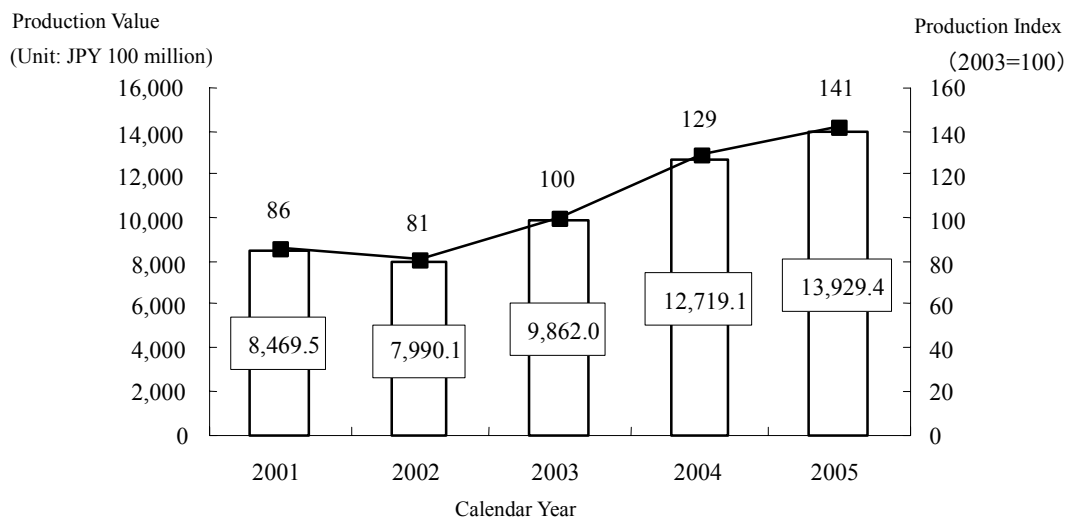
ous year. The total value of excavation machinery sales rose 10.1% over the previous year and exceeded JPY 1 trillion. This upward trend may be attributed primarily to solid demand for construction machinery overseas driven by housing market investments and resource development.

The total monetary value of construction machinery exports in 2005 rose 17.1% over the previous year to a total of JPY 894.4 billion, while the total value of imports rose 25.8% over the previous year to a total of JPY 23.1 billion.

(2) Production

As mentioned above, the total monetary value of construction machinery production in 2005 rose by 9.5% to JPY 1.3929 trillion, surpassing the previous year total by JPY 121 billion. This was the

third consecutive year that the total value of production has increased year-on-year, indicating dramatic growth (see Diagram 2-2-1).



Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-1. Total Value of Construction Machinery Production

Next let us take a look at the values of production in each construction machinery sector. Diagram 2-2-2 shows that, with the exception of asphalt paving machinery and crushing equipment, every sector saw the total value of production increase over the

previous year.

In 2005, the total monetary value of engineering and construction machinery rose 10.5% over the previous year to JPY 1.370 trillion.

Within this category, the total value of crawler tractor¹ production rose 15.1% over the previous year to JPY 120.6 billion, construction crane production rose 28.4% to JPY 147.6 billion, and excavation machinery production rose 8.7% to JPY 988.5 billion. The total value of concrete machinery production rose 0.7% over the previous year to JPY 18.6 billion, foundation machinery production rose 10% to JPY 11.6 billion, elevating work platform production rose 26.5% to JPY 30.1 billion, and crushing/shredding machinery production rose 39.7% to JPY 8.5 billion. Additionally, the total value of mining machinery production rose 2.1% over the previous year to JPY 13.4 billion. However,

the total value of asphalt paving machinery production fell 52.5% from the previous year to JPY 6.4 billion, and crushing equipment production fell 50.5% to JPY 9.5 billion.

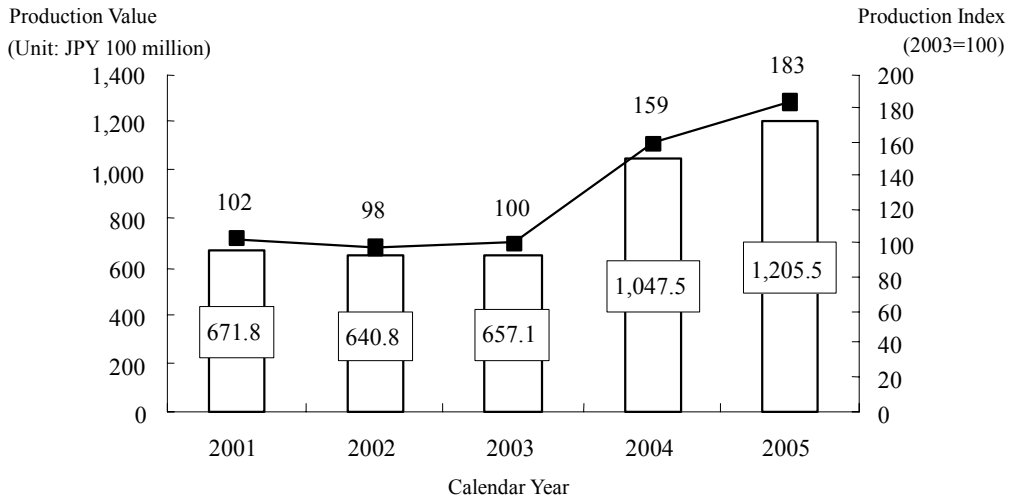
Based on the above figures, it is possible to conclude that the total value of construction machinery production has maintained an upward trend since 2003. Moreover, the consolidated value of crawler tractor, construction crane, and excavation machinery production in 2005 accounted for more than 90% of the total value of all construction machinery production. As such, the following sections will focus primarily on trends in these three sectors.

Diagram 2-2-2. Construction Machinery Sector-specific Production Values (Unit: JPY 100 million)

	2001	2002	2003	2004	2005	Y/Y Growth Rate (2005)	% of Total (2005)
Construction machinery	8,469.5	7,990.1	9,862	12,719.1	13,929.4	9.5%	100%
Engineering & construction machinery	8,105.2	7,689.7	9,533.4	12,395.2	13,699.8	10.5%	98.4%
Crawler tractors	671.8	640.8	657.1	1,047.5	1,205.5	15.1%	8.7%
Construction cranes	813.2	820.1	836	1,148.9	1,475.5	28.4%	10.6%
Excavation machinery	5,468.8	5,227.4	6,962.8	9,096.9	9,885	8.7%	71%
Grading machinery	365.1	286.6	318.6	378	381.7	1.0%	2.7%
Asphalt paving machinery	109.1	111.5	108.1	134.8	64.1	▲ 52.5%	0.46%
Concrete machinery	238.1	195.1	228.1	184.6	185.9	0.69%	1.3%
Foundation machinery	99.6	119.6	89.3	105.3	115.8	10%	0.83%
Elevating work platform	154.6	209.2	239.7	238.2	301.2	26.5%	2.2%
Crushing/shredding machinery	134.6	79.4	93.7	61	85.2	39.6%	0.61%
Mining machinery	160.5	145.6	132.3	131.6	134.4	2.1%	0.96%
Crushing machinery	142.5	98.5	130.6	105.8	95.2	▲ 50.5%	0.68%

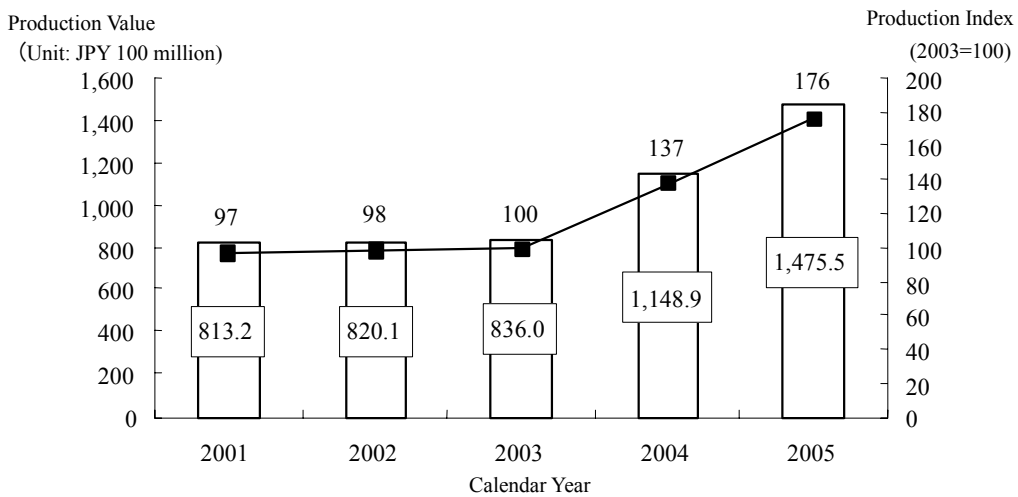
Source: "Annual Report on Machinery Statistics" (METI)

¹ In METI's "Annual Report on Machinery Statistics," crawler tractor and bulldozer totals are equivalent. Consequently, each mention of "crawler tractors" in the following sections may be replaced with "bulldozers."



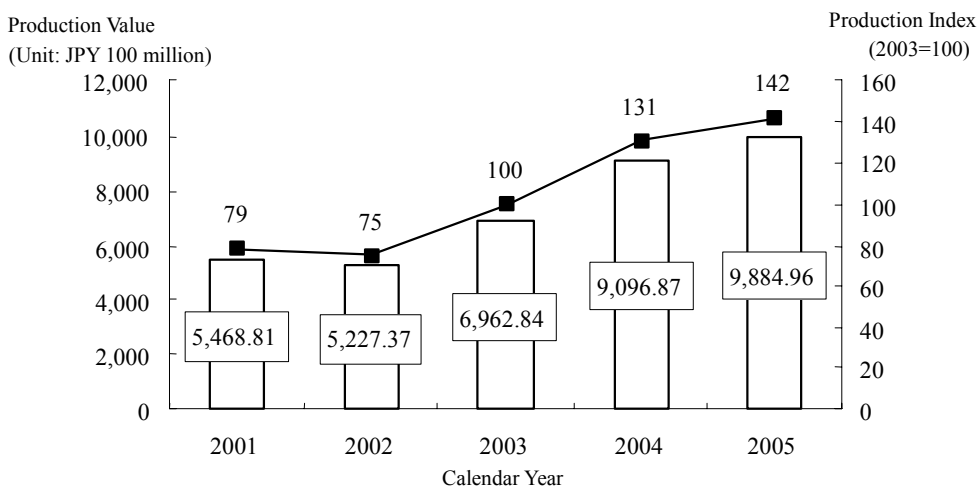
Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-3. Total Value of Crawler Tractor Production



Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-4. Total Value of Construction Crane Production



Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-5. Total Value of Excavation Equipment Production

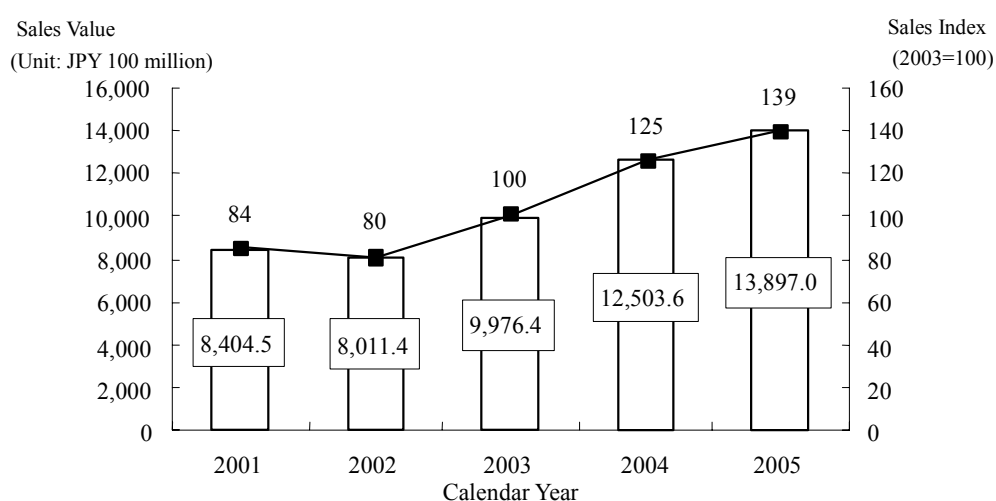
(3) Sales

Next, let us take a look at the total value of construction machinery sales. Data on mining machinery, crushing machinery, and others was not included in METI's "Annual Report on Machinery Statistics;" therefore, it has been omitted here.

Diagram 2-2-6 shows that the total monetary value of engineering and construction machinery in 2005 rose 11.1% over the previous year to JPY 1.3897 trillion. Diagram 2-2-7 shows the value of

sales in each construction machinery sector between 2001 and '05.

The total value of crawler tractor sales in 2005 rose 13.8% over the previous year to JPY 119.4 billion, construction crane sales rose 24.6% to JPY 145.2 billion, and excavation machinery sales rose 10.1% to JPY 1.005 trillion. The 1-trillion yen mark was hit in 2005 for the excavation machinery sales.



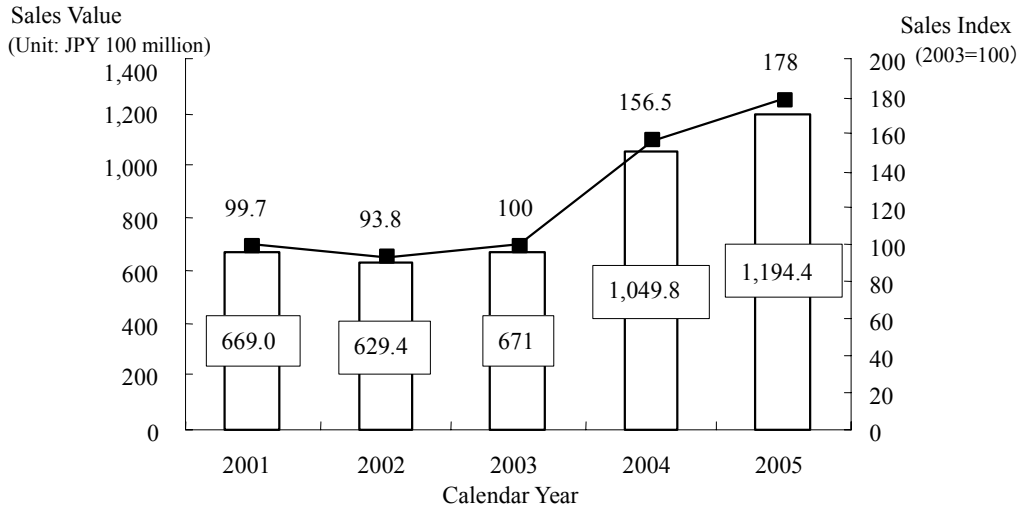
Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-6. Total Value of Engineering & Construction Machinery Sales

Diagram 2-2-7. Construction Machinery Sector-specific Sales Values

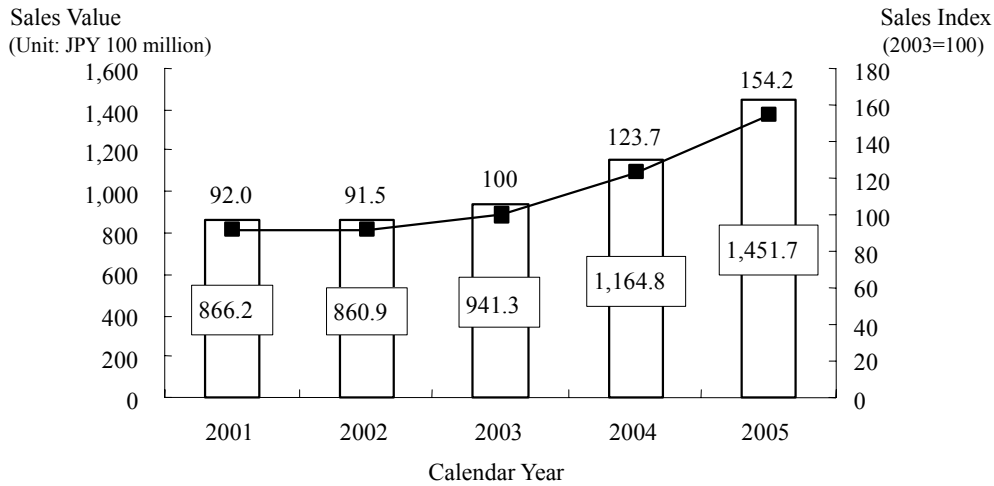
	2001	2002	2003	2004	2005	Y/Y Growth Rate (2005)	% of Total (2005)
Construction machinery	-	-	-	-	-	-	-
Engineering & construction machinery	8,404.5	8,011.4	9,976.4	12,503.6	13,897	11.1%	100%
Crawler tractors	669	629.4	671	1,049.8	1,194.4	13.8%	8.6%
Construction cranes	866.2	860.9	941.3	1,164.8	1,451.7	24.6%	10.4%
Excavation machinery	5,645.9	5,469.8	7,186.5	9,124.8	10,049.6	10.1%	72.3%
Grading machinery	392.5	306.6	345.7	391.4	396.1	1.2%	2.9%
Asphalt paving machinery	109.6	114.2	117.6	149.6	79.1	▲ 47.2%	0.57%
Concrete machinery	247	205.6	243.5	192.9	192.87	▲ 0.03%	1.4%
Foundation machinery	125.4	133.5	120.8	129	142.6	10.5%	1.03%
Elevating work platform	162.1	211.6	255.7	239.2	304.5	27.3%	2.2%
Crushing/shredding machinery	135.6	79.8	94.3	62.2	86.2	38.7%	0.62%
Mining machinery	-	-	-	-	-	-	-
Crushing machinery	-	-	-	-	-	-	-

Source: "Annual Report on Machinery Statistics" (METI)



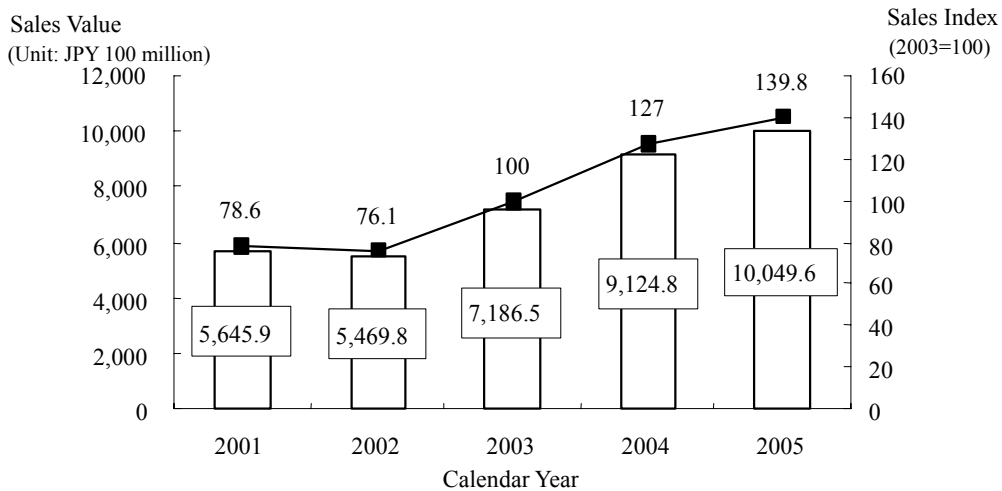
Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-8. Total Value of Crawler Tractor Sales



Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-2-9. Total Value of Construction Crane Sales



Source: "Annual Report on Machinery Statistics" (METI)

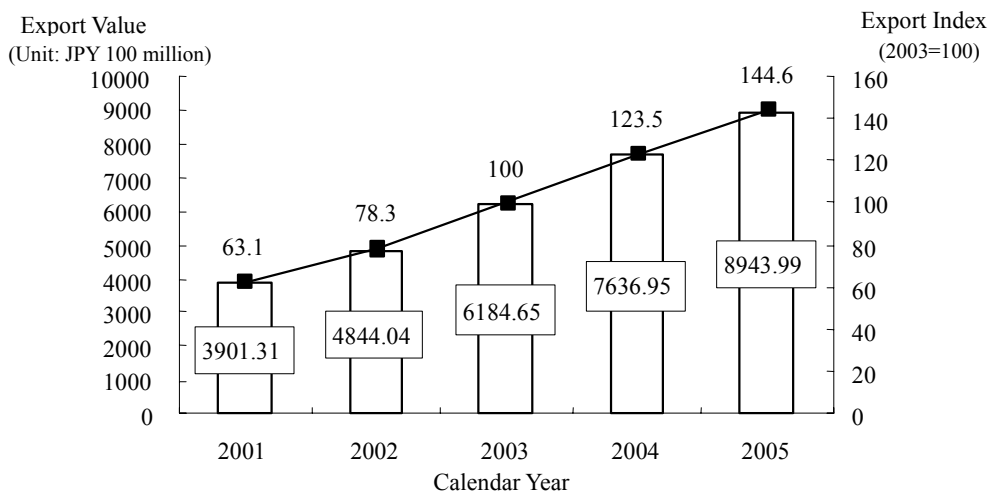
Diagram 2-2-10. Total Value of Excavation Machinery Sales

(4) Imports & Exports²

Diagram 2-2-11 shows that the total monetary value of construction machinery exports rose 17.1% over the previous year to JPY 894.4 billion. Since 2001, the total value of exports has continued to rise each year. As the graph indicates, the total value of exports in 2005 was 230% higher than 2001.

Diagram 2-2-12 shows that the total monetary

value of crawler tractor exports in 2005 rose 13.8% over the previous year to JPY 82.7 billion, and Diagram 2-2-13 shows that construction crane exports rose 27.7% to JPY 67.6 billion. Additionally, the total value of excavation machinery exports rose 18.7% over the previous year to JPY 754.1 billion – 2.4 times greater than 2001 exports.



Source: "Trade Statistics" (METI)

Diagram 2-2-11. Total Value of Construction Machinery Exports

² Product numbers for the products included in export statistics are as follows:

All construction machinery: 8429, 8430, 8431.42, 8431.43, 8474, 8479.10

Crawler tractors: 8429.11-000, 8429.19-000

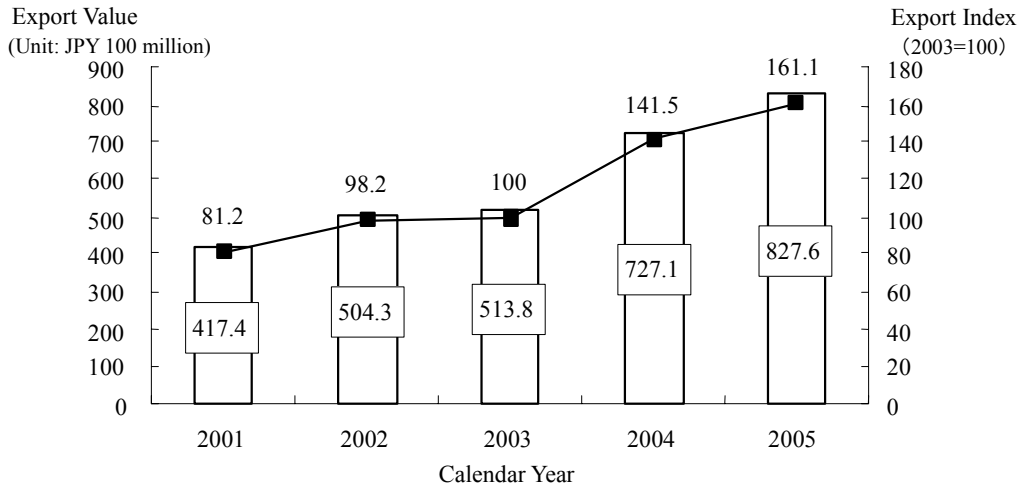
Construction cranes: 8426.41-000, 8426.49-000, 8426.91-000

Excavation machinery: 8429.51-100, 8429.51-900, 8429.52-110, 8429.52-120, 8429.52-900

8429.59-100, 8429.59-900, 8430.31-000

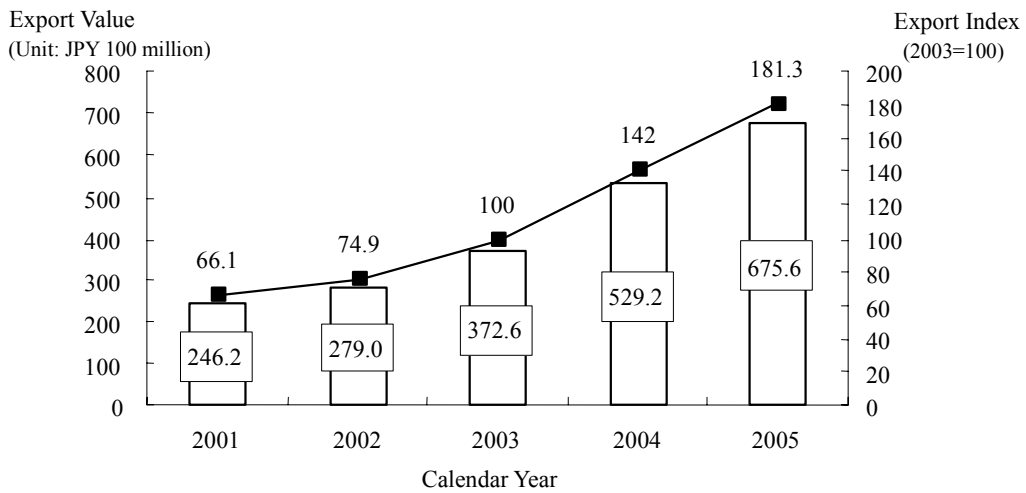
8430.39-000, 8430.41-000, 8430.49-100

8430.49-200, 8430.50-000, 8430.69-000



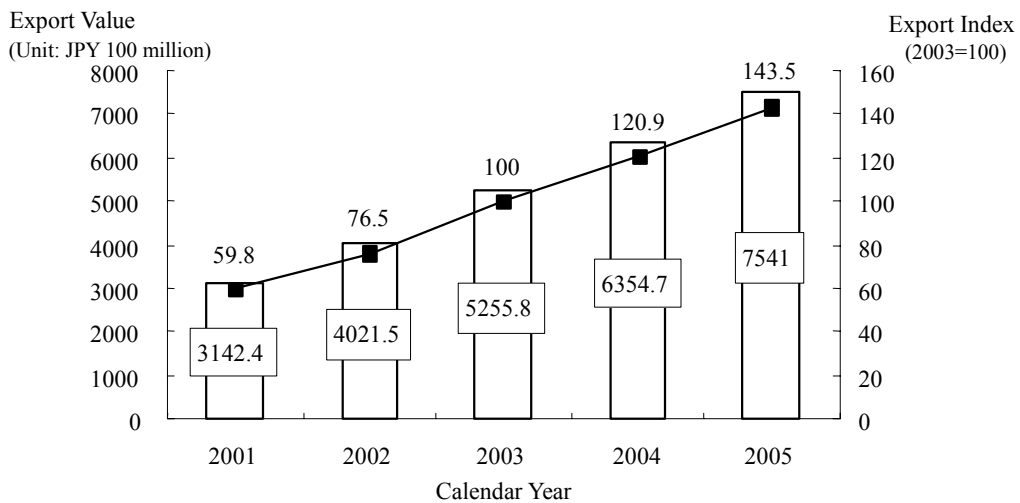
Source: "Trade Statistics" (METI)

Diagram 2-2-12. Total Value of Crawler Tractor Exports



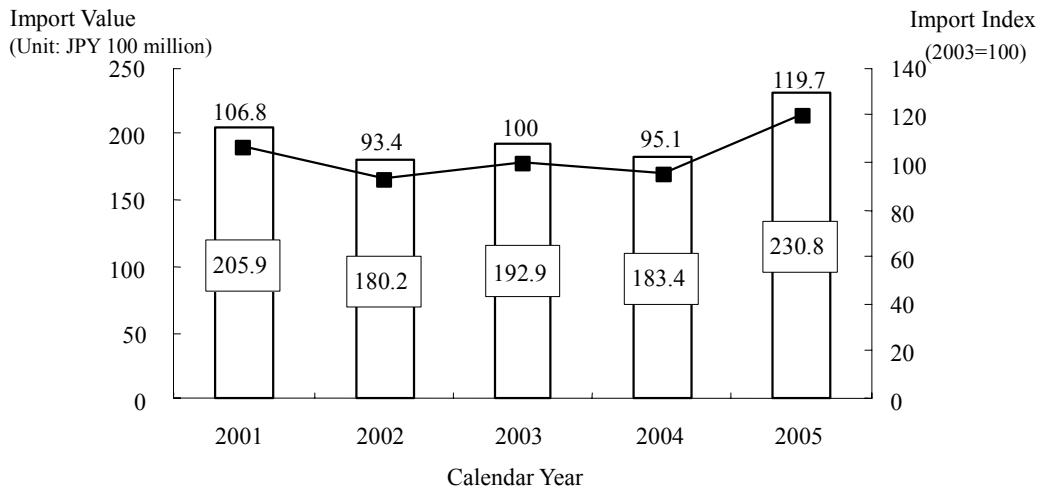
Source: "Trade Statistics" (METI)

Diagram 2-2-13. Total Value of Construction Crane Exports



Source: "Trade Statistics" (METI)

Diagram 2-2-14. Total Value of Excavation Machinery Exports



Source: "Trade Statistics" (METI)

Diagram 2-2-15. Total Value of Construction Machinery Imports

The total monetary value of construction machinery imports in 2005 was JPY 23.1 billion. While the total itself is a relatively low value, it is still the

result of a relatively high 25.8% increase over the previous year.

2-2-2. Business Conditions & Industry Trends

(1) Business Trends

Diagram 2-2-16 shows financial results for leading companies in the construction machinery industry. Let us first take a look at the performance of general construction machinery and crawler tractor manufacturers.

Komatsu saw sales rise 21.9% and operating profits rise 82.3% over the previous year. This upward trend may be attributed to healthy investment activity in overseas housing markets – particularly in the U.S.

Shin Caterpillar Mitsubishi saw its sales increase 7.5% over the previous year; pre-tax profits, however, fell 3.1%. This is because the company was unable to incorporate the added cost of materials into the pricing of its products.

Furukawa Company's sales rose 13.3% and its operating profits rose 18.6% over the previous year in 2005. This upward trend can be attributed to favorable demand for the company's products in U.S., European, and Asian markets.

**Diagram 2-2-16. Consolidated Financial Results of Construction Machinery Industry Leaders
(Based on the Latest Financial Reports)**

Consolidated performance; Unit: JPY 100 million (rounded up to the nearest 100 million)

	FY 2004		FY 2005		Y/Y Growth Rate	
	Sales	Operating Profit	Sales	Operating Profit	Sales	Operating Profit
Komatsu: Construction/Mining Machinery Division	10,764	784	13,124	1,429	21.9%	82.3%
Shin Caterpillar Mitsubishi (data from the website)	3,592	<u>264</u>	3,861	<u>207</u>	7.5%	▲ 21.6%
Furukawa Company: Machinery Division	627	35	711	42	13.3%	18.6%
Tadano: Construction Machinery Division	978	50	1,166	77	19.3%	54.4%
Kato Works Company: Construction Machinery Division	103	<u>16</u>	129	<u>23</u>	25.6%	43.1%
Hitachi Construction Machinery Co.: Construction Machinery Division	4,457	<u>401</u>	5,739	561	28.8%	39.8%
Kobelco Construction Machinery	<u>1,745</u>	<u>61</u>	<u>1,942</u>	<u>73</u>	11.3%	18.9%

Notes:

1. The names of divisions indicate the relevant section in the company. In-house transactions between sections are included in the sales amount.
2. Komatsu results are based on U.S. accounting standards. Shin Caterpillar Mitsubishi's operating profits are actually pre-tax profits. Kato Works Company's operating profits are based on the operating profits of all the company's divisions. Hitachi Construction Machinery's FY 2004 operating profits are based on the operating profits of all the company's divisions.

Source: Each companies' financial reports.

Next, let us take a look at construction crane manufacturers. Tadano saw sales rise 19.3% and operating profits rise 54.4% over the previous year. This high level of growth may be partly attributed to domestic demand (replacement of old equipment) and an increased level of capital and construction investments in the Middle East where high-price of crude oil spurred the economic boom. Furthermore, Kato Works Company saw sales rise 25.6% and operating profits rise 43.1% over the previous year. The company attributes this to increased imports to China and South Africa.

In the excavation machinery sector, Hitachi

Construction Machinery's sales rose 28.8% and operating profits rose 39.8% over the previous year. This is due to increasing demand in both domestic and overseas markets, and can be attributed specifically to high oil prices, which have driven demand for oil drilling machinery.

Kobelco Construction Machinery saw sales rise 11.3% and operating profits rise 18.9% over the previous year. The company attributes this to an increase in domestic demand (Japanese companies exporting used excavation machinery to China) and increased demand in the U.S. and other overseas markets.

(2) Technological Innovation & Business Environments

Let us take a look at R&D costs for Furukawa Company and Hitachi Construction Machinery in FY 2005.

Diagram 2-2-17. Construction Machinery Manufacturer R&D Costs (Consolidated)

(Unit: JPY 100 million)

	FY 2004	FY 2005	Y/Y Growth Rate
Furukawa Company	17.8	19	4.6%
Hitachi Construction Machinery Co.	112.8	131.3	16.4%

Note:

The above chart shows R&D costs that are included in general administrative costs and manufacturing costs in the term.

Source: Each companies' financial reports.

Furukawa Company's R&D costs in 2005 rose 4.6% over the previous year to JPY 1.9 billion, and Hitachi Construction Machinery's R&D costs rose 16.4% to JPY 13.1 billion. This upward trend may be attributed to the favorable performance of these

two companies, and it indicates that other companies in this sector made active R&D investments in 2005.

Diagram 2-2-18. Construction Machinery Manufacturing R&D

	R&D Results
Komatsu	Development of the construction machinery equipped with "ecot3" engine, which complies with Japanese, U.S., and European emissions regulations
	Reduced fuel consumption, reduced noise, and improved safety for shovel trucks
Shin Caterpillar Mitsubishi	Development of shovel trucks that comply with emission regulations
Hitachi Construction Machinery Co.	Development of new environment-friendly wheel loaders
	Development of minimum swing radius front loaders and mini-shovel trucks
Kobelco Construction Machinery Co.	Development of shovel trucks that comply with emission regulations
	Development of the world's tallest building demolition machine

Source: Each companies' financial reports.

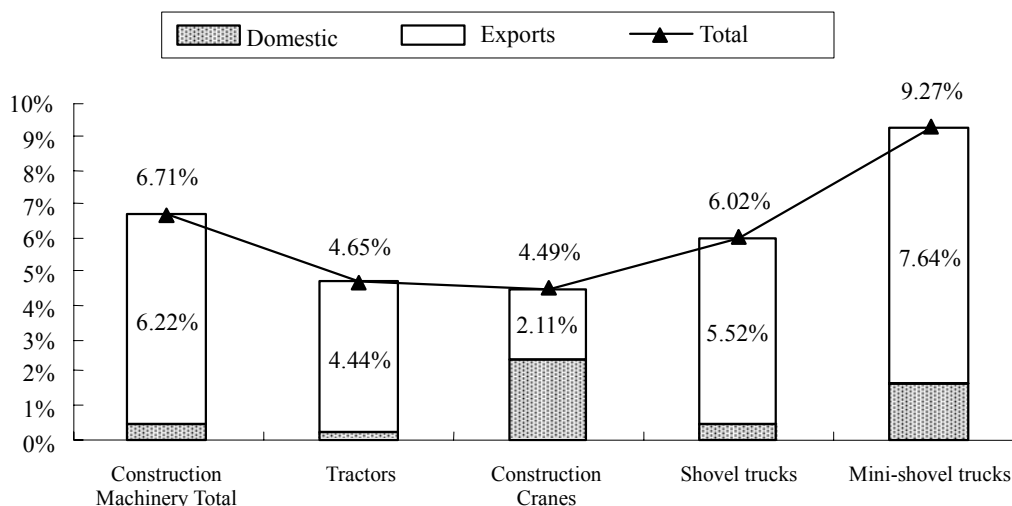
As Diagram 2-2-18 shows, the R&D efforts of each company are focused on environmental compliance. This trend may be attributed to the "Off-road Law" that was enacted in 2006; the new law places the same restrictions applied to on-road vehicles on off-road construction-related vehicles. Moreover, U.S. and European emissions regulations are expected to increase and become stricter in the future. Additionally, starting in 2006, construction machinery in European nations will be subject to stricter noise restrictions. For these reasons, con-

struction machinery manufacturers have invested in R&D efforts designed to develop more environment-friendly products.

In addition to the above R&D projects, Hitachi Construction Machinery has also focused on the development of mini front loaders and mini-shovel trucks, and Kobelco Construction Machinery has developed and starting selling a building demolition machine (SK3500D) that boasts the world's highest working range of 65-plus meters, according to Guinness World Records.

(3) Future Prospects & Challenges

Diagram 2-2-19 shows construction machinery domestic demands and exports in the total volume. demand predictions for FY 2006 and the shares of



Source: Japan Construction Equipment Manufacturers Association

Diagram 2-2-19. Growth Rate and Forecast of Construction Machinery Demands

Construction machinery demand is expected to increase in FY 2006. Additionally, as Diagram 2-2-19 indicates, overseas exports are expected to be a major driving force behind this demand; overseas investment in housing and resource development will likely drive demand for construction machinery

in the future as public investment in Japan decreases. In order to take advantage of this overseas demand, construction machinery companies will need to step up R&D efforts to develop new products that comply with environmental standards.

2-3. Agricultural Machinery

2-3-1. Trends in Supply & Demand

(1) Overview

The total monetary value of agricultural machinery and tool production in 2005 was a relatively favorable JPY 496.1 billion. The value of exports, according to MOF customs clearance statistics, rose roughly 12% over the previous year to JPY 225.1 billion. Although exports to North America continued to increase, the rate of growth in 2005 was lower than in '04. Exports to Asian nations, too, continued to increase; their monetary value reached nearly the same level as exports to Europe.

The value of imports, according to MOF customs clearance statistics, rose approximately 10% over the previous year to roughly JPY 44.7 billion. While the monetary

value of European imports was overwhelmingly high, the rate of growth shown signs of slowing down. The value of Asian imports, however, indicated dramatic growth.

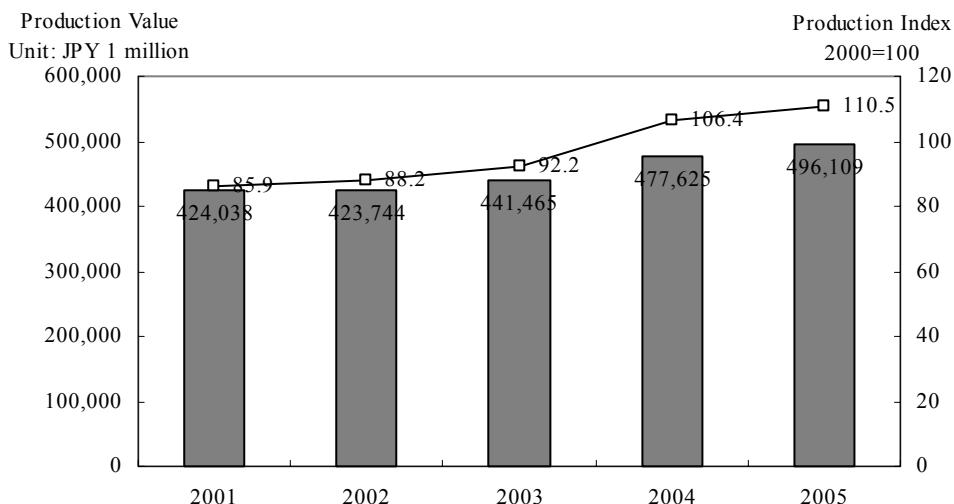
In addition to healthy exports to North America, exports to China and Thailand have also grown – and so have sales in those nations. In the domestic market, manufacturers that have taken measures to accommodate the polarization of farming in Japan have seen their businesses grow. This polarization refers to an increase in large, commercial farms and the “aging” of and diversification of operations at small farms.

(2) Production

The total monetary value of agricultural machinery production in 2005 rose roughly by JPY18.5 billion over the previous year to JPY 496.1 billion – a relatively favorable result. If the production value index in 2000 were set at “100,” then the production value indexes in 2004 and '05 would be 106.4 and 110.5, respectively.

The total monetary value of agricultural machinery and tool production has experienced an upward trend for

three consecutive years, beginning in 2003. As growth in the value of domestic agricultural machinery production begins to level off, Japanese manufacturers have tried to compensate with exports to North America, Europe, and Asia, including exports of parts to their overseas manufacturing bases in order to galvanize their operations globally with the purpose of maintaining this upward trend and continue recovery (see Diagram 2-3-1).



Source: “Annual Report on Machinery Statistics” (METI)

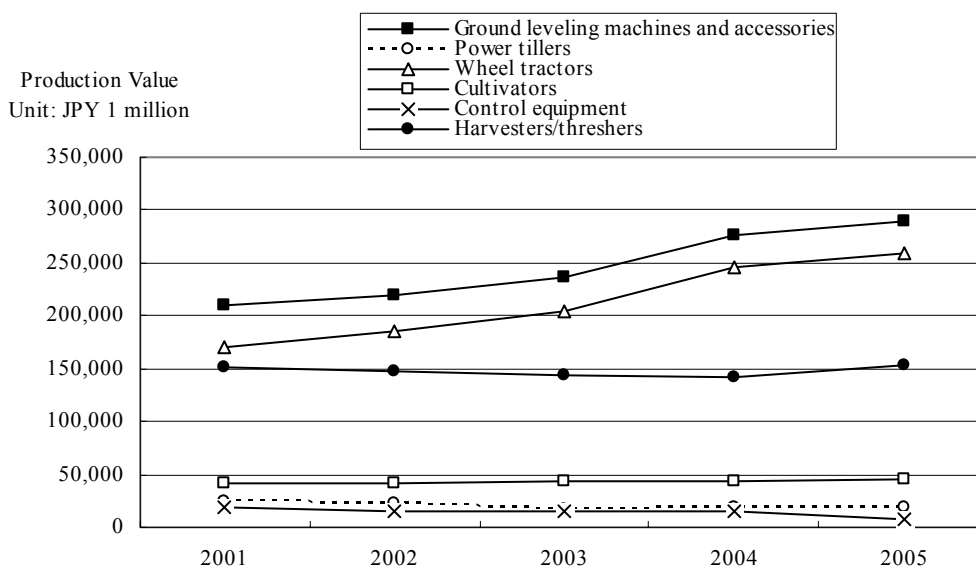
Diagram 2-3-1. Total Value of Agricultural Machinery & Tool Production

A breakdown of the total monetary value of agricultural machinery production in 2005 looks like this:

- Ground leveling machines and accessories: approx. JPY 289.8 billion (up 4.6%)
- Power tillers (including walking tractors): approx. JPY 19.1+ billion (up 2.9%)
- Wheel tractors: JPY 258.4 billion (up 5.4%)
- Cultivators: nearly JPY 45.7 billion (up 5.5%)
- Control equipment: JPY 7.5+ billion (down 51.1%)
- Harvesters/threshers (combines, agricultural dryers, etc.): JPY 152.9 billion (up 7.8%)

Only the value of combine (harvesters/threshers) production saw remarkable growth (JPY 99.1+ billion; Y/Y 114.9%).

As you can see from the figures above, total values of production in almost all main categories of agricultural machinery exceeded previous year figures, indicating favorable conditions. Still, none of the categories experienced dramatic year-on-year growth rates of around 20% like the wheel tractor and ground leveling machines and accessory categories did in 2004. The highest rate of growth was observed in the harvesters/threshers (combines, agricultural dryers, etc.) category (only 7.8% over the previous year). The total value of production in the control equipment category (e.g. power sprayers, mist machines, etc.), on the other hand, dropped significantly (51.1% decrease) from the previous year (see Diagram 2-3-2)



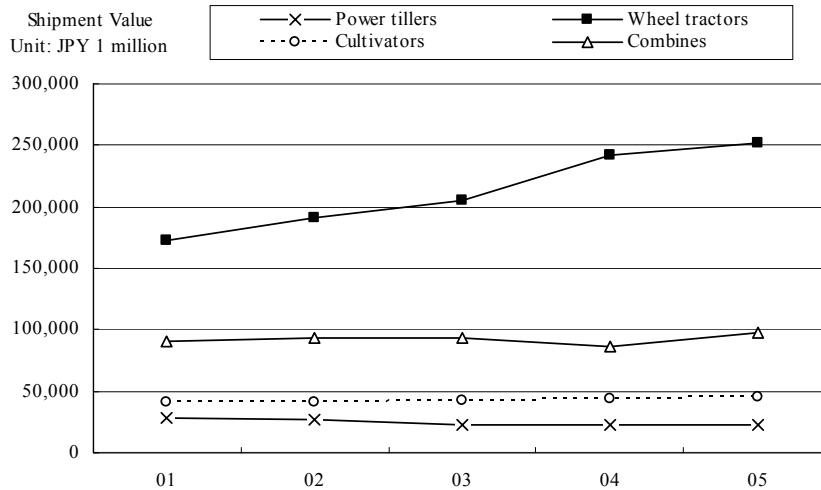
Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-3-2. Category-specific Production Values in Main Agricultural Machinery Categories

(3) Total Value of Shipments

The total monetary value of power tiller shipments (including walking tractors) rose 3.5% over the previous year to JPY 23.2 billion, wheel tractor shipments rose 4.3% to JPY 251.5 billion, cultivator shipments rose 4.3% to JPY 45.2 billion, and combine shipments rose 13.6% to JPY 98 billion.

Like production, the total value of shipments experienced an upward trend in general as well. Growth in the value of combine (harvester/threshing machine) shipments, which fell the previous year, was particularly high this year (see Diagram 2-3-3).



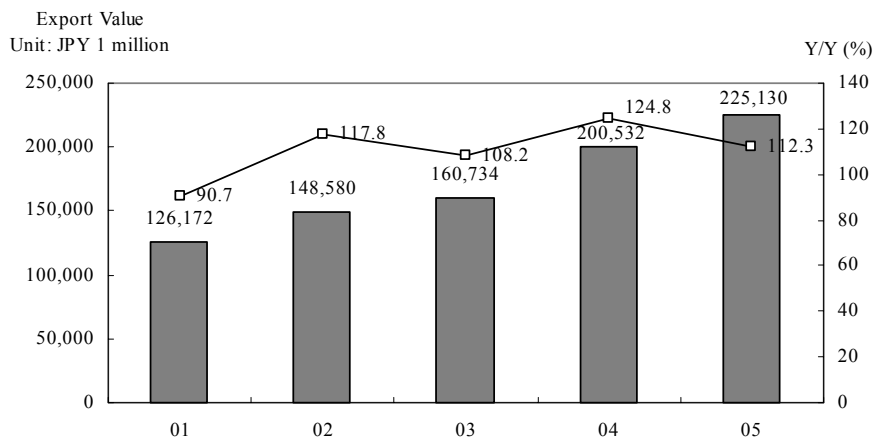
Source: "Annual Report on Machinery Statistics" (METI)

Diagram 2-3-3. Total Value of Agricultural Machinery Shipments in Main Categories

(4) Imports & Exports

The total monetary value of exports, according to MOF customs clearance statistics, rose 12.3% over the previous year to JPY 225.1 billion, indicating highly favorable conditions. This upward trend has persisted over

the past five years, and indicates that the industry's dependence on exports is growing each year (see Diagram 2-3-4).



Source: MOF customs clearance statistics

Diagram 2-3-4. Agricultural Machinery Exports

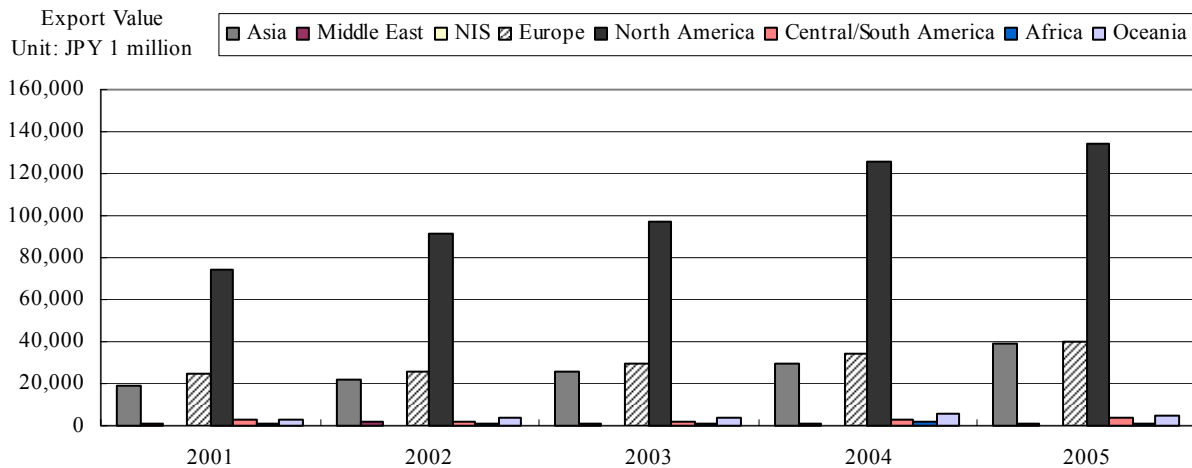
Exports of agricultural machinery to North America accounted for the vast majority of all exports in 2005, rising 6.6% above the previous year to JPY 134 billion. The second largest importer of Japanese agricultural machinery is Europe; exports to this region rose 16.9% over the previous year to JPY 40.4 billion. Asian exports are

catching up to European exports, however; this is one of the trends most evident in 2005. Although exports to Asian have grown steadily over the past five years, 2005 saw significant results; the value of exports to this region increased by a considerable 30.6% over the previous year to JPY 38.9+ billion. This dramatic growth may be attrib-

uted to increased exports to Japanese manufacturing bases in China and to growing demand for agricultural machinery in Thailand and other ASEAN nations. Moreover, demand in India and other nations in Central Asia is expected to rise in the future, which may also drive export

growth.

Diagram 2-3-5 indicates that Asia may surpass Europe as the second largest importer of Japanese agricultural after North America.



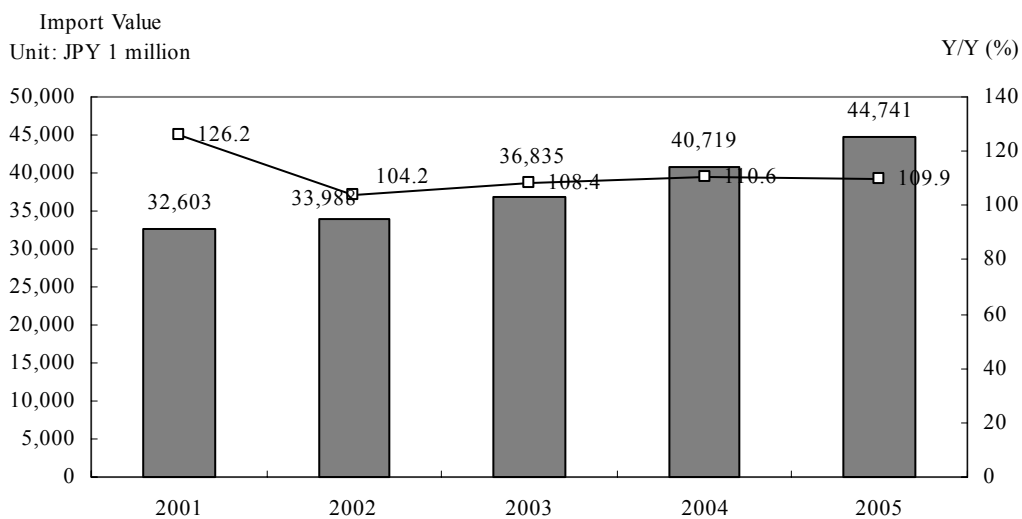
Note: NIS = Newly Independent States (12 former Soviet republics, excluding Estonia, Latvia, and Lithuania)

Source: MOF customs clearance statistics

Diagram 2-3-5. Agricultural Machinery Exports by Region

According to MOF customs clearance statistics, the total monetary value of agricultural machinery imports in 2005 rose 9.9% over the previous year to JPY 44.7 billion, indicating considerably favorable conditions. This upward

trend has continued for the past five years, and indicates that global development in the agricultural machinery industry has driven import growth as well (see Diagram 2-3-6).



Source: MOF customs clearance statistics

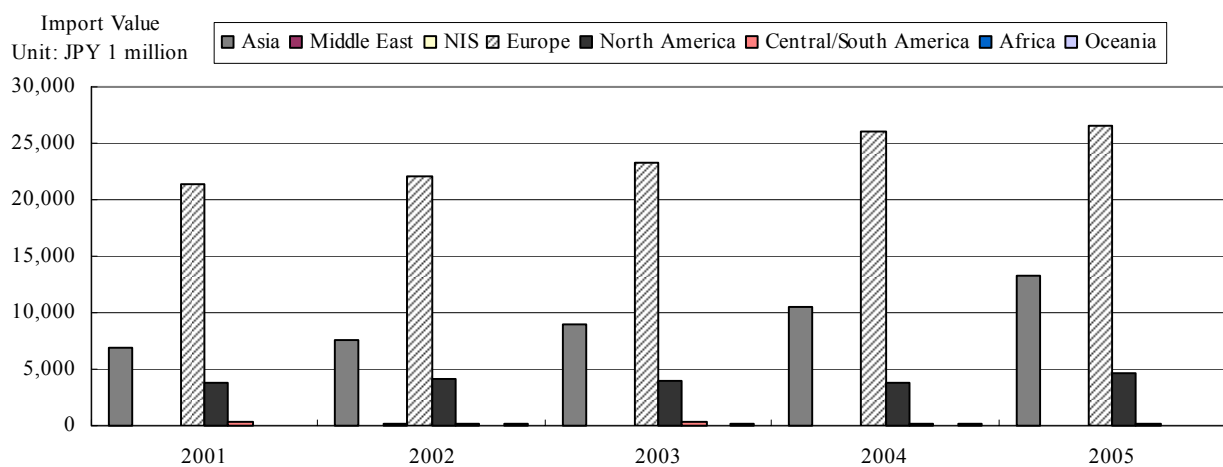
Diagram 2-3-6. Total Value of Agricultural Machinery Imports

An observation of the total value of agricultural machinery imports over the past five years shows that imports from Europe account for the vast majority (approx. 60% of the total value of all imports), rising 1.5% over the previous year in 2005 to JPY 26.5 billion. Although the growth rate is dropping, Japan's dependence on imports of agricultural machinery from Europe continues to be strong.

The total value of agricultural machinery imports from Asia has risen dramatically over the past five years, rising 26.4% over the previous year in 2005 to JPY 13.3

billion. This trend highlights Japan's increasing independence on both imports and exports of agricultural machinery to and from Asia.

The total value of agricultural machinery imports from North America has both risen and dropped over the past five years. In 2005, however, the total value of imports rose 24.5% over the previous year to JPY 4.7 billion. This considerable growth may be attributed to the aforementioned farm polarization that has led to an increase in the number of large commercial farms.



Note: NIS = Newly Independent States (12 former Soviet republics, excluding Estonia, Latvia, and Lithuania)

Source: MOF customs clearance statistics

Diagram 2-3-7. Total Value of Agricultural Machinery Imports by Region

2-3-2. Business Conditions & Industry Trends

(1) Business Trends

Next, let us look at business trends among leading agricultural machinery manufacturers as of March 2006.

- Kubota

Kubota's sales (consolidated) rose JPY 67.8 billion (6.9%) over the previous year to JPY 1.51 trillion. The company's internal combustion engine and machinery division (agricultural machinery, engines, construction machinery, etc.) has maintained a high level of growth – particularly overseas – together with increased sales in its industrial infrastructure division that benefited from integrating its composite piping businesses and boosting sales

of industrial castings/materials.

Sales in Kubota's internal combustion engine and machinery division rose 13.0% over the previous year to JPY 658.8 billion; these sales accounted for 62.7% of the company's total sales, indicating that favorable conditions in the agricultural machinery market helped to boost the company's consolidated sales. Domestic agricultural machinery sales increased conspicuously. This may be attributed to 1) the company's efforts to revitalize the market by implementing various detailed measures aimed at accommodating farm polarization and the fact that the overall number of farms is decreasing, and 2) its aggressive

efforts to develop and offer solutions that meet the needs of changing farming operations.

Currently, Kubota boasts a 42+% share of the domestic market in the three leading categories: tractors, combines, and rice planters; in the past several years, its share has risen one point year-on-year, indicating that its business strategies are achieving a certain degree of success. It has developed large combines for use by farms that have 50 + hectares of land, take in annual revenues of around JPY 10 million, and want to streamline operations. Its smaller combines are tailored to part-time farms, farms operated by the elderly, and other small to medium size farms whose workers are not used to regular farming operations; these smaller farms have five to ten hectares of land.

In addition to offering these types of products that address the needs of domestic farm polarization, Kubota has also taken measures to boost productivity and reduce overall manufacturing costs by streamlining operations at its domestic plants and reducing procurement costs; these measures have enabled it to offer its products at reasonable prices.

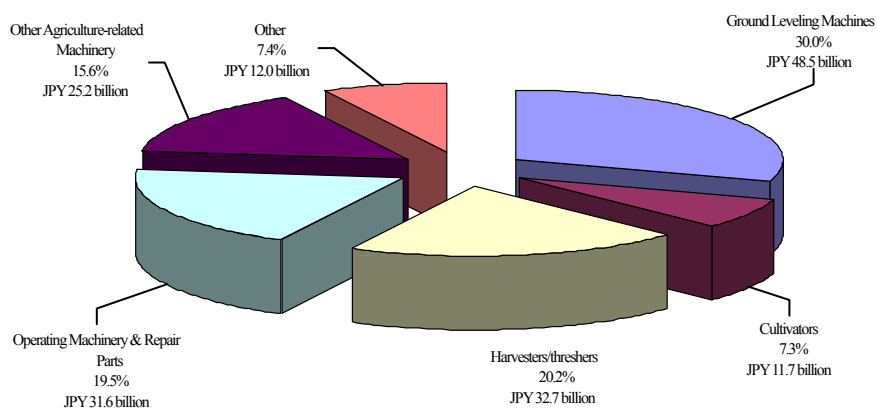
Kubota began selling the nation's first domestically manufactured tractor – the T15 – in 1960. By the end of

December 2005, it had sold three million tractors around the world; the company now sells a limited-edition tractor designed to commemorate this achievement.

- Iseki & Co.

Iseki & Co.'s consolidated sales rose 2.7% over the previous year to JPY 161.7 billion, and pre-tax profits rose 29.8% to JPY 6.86 billion. However, domestic sales of Iseki fell JPY 300 million (0.2%) to JPY 141.2 billion as a result of fewer farms, in spite of growth achieved by the agriculture-related machinery sector. Overseas sales in Europe, North America, and Asia and other markets increased JPY 4.6 billion (29.2%) over the previous year to JPY 20.5 billion.

As Diagram 2-3-8 shows, sales of the company's ground leveling machines totaled JPY 48.5 billion (30.0% of total consolidated sales), cultivator machinery sales totaled JPY 11.7 billion (7.3%), harvesters/threshers sales totaled JPY 32.7 billion (20.2%), operating machinery and repair parts sales totaled JPY 31.6 billion (19.5%), sales of other agriculture-related machinery totaled JPY 25.2 billion (15.6%), and other machinery sales totaled JPY 12 billion (7.4%).



Source: Iseki & Co.'s "82nd Annual Report"

Diagram 2-3-8. Iseki & Co. Sales by Category (Consolidated)

The primary focal points of the Iseki & Co.'s "New Three-year Plan," which was enacted in 2006, are 1) expanding sales and capturing a larger market share, 2) strengthening product competitiveness, 3) improving consolidated financial performance (profitability, cash

flow), and 4) establishing group-wide control.

- Yanmar Group

The Yanmar Group's consolidated sales rose 5.4% over the previous year to JPY 529.5 billion. Although

domestic sales of dedicated generators decreased due to rising heavy oil prices, total consolidated domestic sales still rose 2.1% over the previous year to JPY 359.9 billion due to increased sales of industrial engines and construction machinery.

The company's consolidated overseas sales of industrial engines and construction machinery in North America and Europe rose solidly, and favorable conditions in South Korean and Chinese shipbuilding markets helped to boost sales of large ship engine sales considerably. As a result consolidated sales rose 13.0% over the previous year to JPY 169.5 billion, with overseas dependence in-

creasing over the previous year by 2.1% to 32.0%.

The company's consolidated operating profits rose 20.7% over the previous year to JPY 19.2 billion. Although the cost of materials increased, the company was able to boost operating capacity and reduce cost effectively; as a result, gross sales profits rose significantly together with operating profits. Consolidated pre-tax profits, affected by increased operating profits, rose 16.9% over the previous year to JPY 19.3 billion. As of March 2006, Yanmar Agricultural Equipment Co.'s FY 2005 sales totaled JPY 167.4 billion.

(2) Technological Innovation, Business Environments & Overseas Expansion

Let us take a look at new trends associated with each of these leading agricultural machinery manufacturers.

- Kubota

For the first time in 20 years, Kubota is building a new manufacturing plant in Sakai (Osaka Prefecture) that will be operational as early as 2008. The plant will primarily produce diesel engines for use in construction and agricultural machinery as there is significant demand for them in the North American market. It is the first plant to be constructed after the company's vending machine plant in Ryugasaki (Ibaraki Prefecture), which started operating in 1989. The land on which the new plant is being built was provided for under the Osaka prefectural government's "High-tech Bay Plan" and Sakai City's "Business Location Promotion Ordinance."

Additionally, the company has plans to expand its plant in Tsukuba (Ibaraki Prefecture), increase tractor production capacity by 30%, and increase production capacity of industrial engines used in agricultural and construction machinery by 40%. This move is designed to accommodate growing exports to North America and rapidly increasing tractor sales in the Thai market.

By FY 2008, Kubota plans to boost its North American tractor production capacity 20% over current levels. Furthermore, it plans to transfer tractor equipment manufacturing operations from its existing plant in Georgia (U.S.) to a new plant to be built in the same state – the company's second North American plant. The company

plans to utilize newly available space at the existing plant to boost production of small tractors and light engineering utility vehicles. The new plant will manufacture 70,000 loader, backhoe, and tractor implements annually in order to aggressively meet the needs of the North American market.

- Iseki & Co.

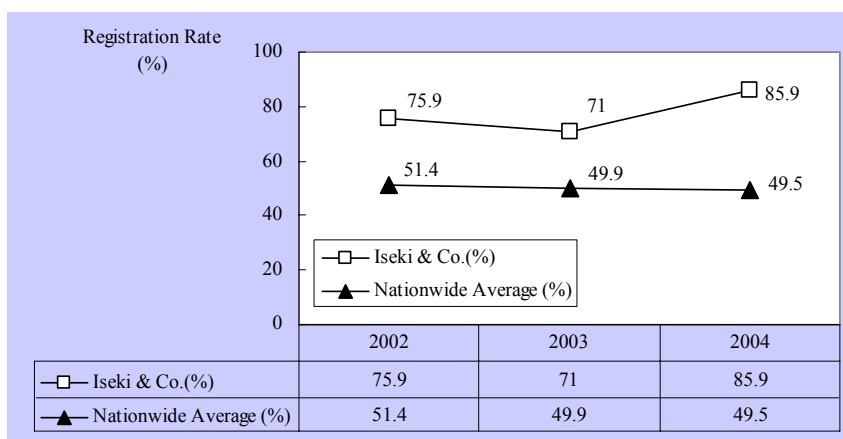
Iseki & Co. has four manufacturing plants in Japan. Its plant in Niigata Prefecture (Sanjo City), which is operated by a subsidiary, produces rice hullers and rice planters, which account for 80% of total production. Currently, the Niigata plant is radically reexamining its rice planter production line in order to better accommodate rising demand in China and Southeast Asia, and has already integrated separate parts processing, welding, assembly, and inspection processes into a single line. As a result, it has been able to reduce goods-in-process inventory; it was also able to shorten the production line by 50%.

The company also made improvements in detailed processes. For example, changes were made so that the wheel/shaft welding process and burr removal process could be performed by the same machine. The employee in charge of this improvement won the 2006 Inventor's Award, which is presented by the Minister of Education, Culture, Sports, Science and Technology.

On a company-wide level, Iseki & Co. is focusing on patent registration. According to 2005 statistics featured on the Japan Patent Office (JPO) web site that are related

to patent registration rates among Japanese companies, number of patent registrations, and other intellectual property-related matters, Iseki & Co. had the highest patent registration rate of any company in Japan (see Diagram 2-3-9). This patent registration rate is based on the ratio of patent applications to the actual number of patents granted by the JPO. As such, the company's leading patent registration rate reflects the high level of quality of its inventions. Iseki & Co. is one of fewer than 200 leading patent

applicants that has had more than 100 patent applications reviewed, and has remained in the top ten for the past three years; only one other company – an automobile company – has been able to achieve the same results. It is evident that the Iseki & Co. is highly devoted to its patent registration activities. In the agricultural and marine products industry, the company ranked number one among 300 companies that submitted patent applications.



Note: Iseki & Company's rankings in 2002, 2003, and 2004: No. 5, No. 8, and No. 1, respectively.

Source: Iseki & Co.'s "82nd Annual Report"

Diagram 2-3-9. Patent Registration Rates

Iseki & Co.'s strategies to accommodate trends in the domestic market by stepping up production of tractors and rice planters for use on large, commercial farms may be attributed to national government policies designed to promote the development of large, competitive farming operations. The Law Concerning Agricultural Policy Revisions, slated for enactment in April 2007, narrows the focus of existing policies, which provided for uniform support for rice and wheat farms, to farming operations that are four hectares or larger in scope. Iseki & Co.'s strategies are seen as measures designed to accommodate the rapid development of large farming operations that the government supports.

Overseas, Iseki & Co. is making efforts to bolster its combine service business in China, where laws are being enacted to promote the normalization of agricultural machinery use; this has lead industry watchers to predict that China's agricultural machinery market will expand in the future. Consequently, the company has dispatched engi-

neers to work with dealers in Jiangsu, Anhui Sheng, and other Chinese provinces in order to provide maintenance services to combine users. It is also studying ways in which Chinese people use combines in an effort to develop new products that meet the peculiar needs of Chinese combine users.

- Yanmar Group

In October 2005, Yanmar Group purchased a stake in IITL, the fifth-ranking tractor manufacturer in India (Hoshiarpur City). The company has announced plans to jointly develop tractors with IITL for the Indian market by 2008. As India is seen as becoming the next largest agricultural machinery market after China and Thailand, industry watchers see this development as a typical strategic move.

IITL, which is located in northern New Delhi, manufactures and sells tractors and parts. Under their partnership, Yanmar will provide technological assistance to IITL

in order to develop tractors suitable to the cultivation of rice paddies in India. Yanmar (specifically, Yanmar Agricultural Equipment Co.) already enjoys highly favorable sales of agricultural machinery in both the Chinese and Thai markets; this may be attributed in part to attractive sales programs in China that feature loan packages, and to an increase in the number of farmers in Thailand who have switched from cultivators to tractors.

One development at Yanmar Agricultural Equipment Co. that deserves mention is the company's implementation of UD (Universal Design) guidelines for user-friendly agricultural machinery development. One trend behind the growing demand for user-friendly machinery in Japan is the aging of the nation's farmers. In order to respond to this trend, Yanmar adopted the "Seven Principles of Universal Design" proposed by North Carolina State University's Center for Universal Design, modified them for its own needs, developed guidelines, and created specific checklists for its tractor, rice planter, combine, and other machinery production lines. It formed a UD promotion team in 2005 to implement the new guidelines; in the future, it plans to modify manufacturing operations to conform to these guidelines in an effort to ensure that its products offer a high level of usability.

- Star Farm Machinery Manufacturing Co.

Hokkaido-based Star Farm Machinery Manufacturing Co., a major dairy machinery maker, plans in 2008 to set up shop in Hohhot (the capital city of the Inner Mongolian Autonomous Region in the People's Republic of China) so that it can manage existing dealerships in Inner Mongolia, partner with new ones, and manage inventory. In 2002, the Star established a company in China through a joint partnership with a local company; in 2003, it started manufacturing grass harvesters and balers in Shanghai. By February 2006, Star had boosted production capacity by 30% and was producing balers that are specialized for the Chinese market. By the end of 2006, the company plans to start manufacturing fertilizer spreaders and crop dusters. These moves are designed to develop the market in Inner Mongolia – one of China's foremost dairy producing regions – in consideration of the Chinese government's ef-

forts to encourage investment in agricultural machinery.

- Toyo Noki Co.

Hokkaido-based Toyo Noki Co., a leading manufacturer of potato harvesters and other heavy farm machinery, produces large-scale agricultural machinery that work efficiently in Hokkaido's natural environment. For example, farm ground in Hokkaido freezes due to its colder climate; as a result, rocks are commonly pushed up through the soil to the surface, creating the need for machinery that harvest plants while sorting out these obstacles. Star has developed harvesters that can do just that. Moreover, the company has integrated its design, processing, and assembly processes, enabling it to manufacture 30 different types (200 models) of machinery.

- Taiyo Corporation

Kochi Prefecture-based Taiyo Corporation is a manufacturer of roughly 2,000 different types of tiller tines. The company claims a 40% share of the domestic market, and its primary customers are Iseki & Co., Yanmar Diesel, and other leading agricultural machinery makers and agricultural cooperatives. In recent years, however, the company has found itself coping with increased procurement costs, and is now devoting resources to developing businesses in other fields. Since 2003, prices for steel that the company uses to manufacture its tines have risen more than 50%.

Currently, major agricultural machinery manufacturers are relying more on their tractor businesses, and less on their cultivator businesses, for growth. Consequently, Taiyo Corporation's tiller tine market has since 2000 shrunk by about 10%. In response to this downward trend, the company has stepped up labor-saving measures in its tine production processes by fully automating a portion of its metal rolling process. It has also begun to focus strengthening its businesses in other fields: brush scrubbers, vegetable bagging machines, citrus fruit bagging machines, and other agricultural machinery in addition to cycle filtration systems and environment-friendly machinery, such as aquafuel systems.

(3) Future Prospects & Challenges

Companies in Japan's agricultural machinery industry will likely step up efforts to expand their business globally by establishing manufacturing and sales bases in advantageous locations in North America, Europe, and Asia – primarily China and Thailand. Developing the domestic market by meeting new needs created by farm polarization will also become a major priority, particularly because revised national agricultural policies will now focus on the promotion of large-scale farming operations; this is expected to drive demand for commercial-use farm equipment.

Manufacturers will also need to implement measures to minimize the adverse effects of the "Year 2007 Problem" on their operations. They hold high expectations, as well, for the baby boomer market where retired workers start small private farming, and industry watchers believe that developing reasonably priced, easy-to-use machinery for this market will enable manufacturers to compete with their rivals.

It is also important to mention the trend of increasing agriculture-industry partnerships that are being forged primarily in the Kyushu region of Japan. A report issued by the Kyushu Bureau of Economy, Trade, and Industry in May 2004 encourages the creation of new industries through the establishment of new manufacturing partnerships and calls for the promotion of agriculture-industry partnerships that make use of the region's resources. In an effort to realize these goals, the bureau sponsored two annual agriculture-industry networking conferences in 2004 and '05 in cooperation with the Kyushu Regional Agricultural Administration Office; the two conferences were held in Miyazaki and Kumamoto Prefectures, respectively.

Next, in March 2006, the Kyushu branch of the Organization for Small & Medium Enterprises and Regional Innovation (SMRJ), which operates in compliance with Kyushu Bureau of Economy, Trade, and Industry policies, held its first "Southern Kyushu Agriculture-Industry Partnership Symposium" in Kagoshima City. A survey was conducted, and 122 out of 249 symposium participants responded. Roughly 80% of the participants answered, "I would like to work on establishing an agriculture-industry

partnership in the future;" this seems to clearly indicate that partnership efforts in the Kyushu region may increase in the future.

In response to these conditions, SMRJ established an agriculture-industry partnership association to study the potential of these types of ventures in Southern Kyushu. By fall 2006, SMRJ plans to start offering programs at the Hitoyoshi campus of its Institute for Small Business Management and Technology that are designed to promote and support joint agriculture-industry businesses; these are the first programs of their kind to be offered in Japan. Furthermore, the Kyushu Bureau of Economy, Trade, and Industry plans to hold additional agriculture-industry networking conferences in October 2006 and March 2007 in Miyagi and Kagoshima Prefectures, respectively.

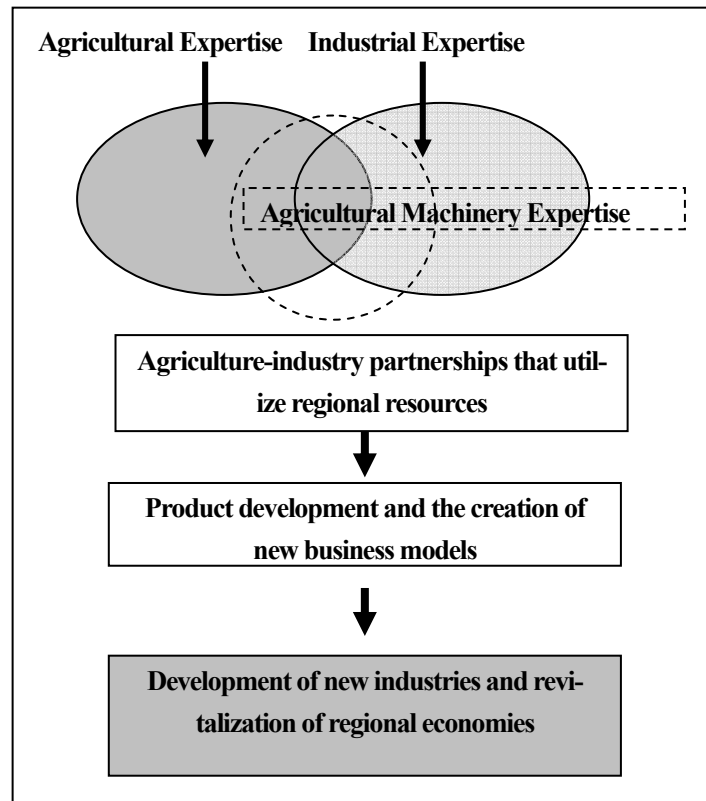
This trend toward agriculture-industry partnerships is starting to gain steam in regions beyond Kyushu as well. For example, the Toyohashi University of Technology has established an advanced agricultural/bioresearch center with the goal of developing next-generation agricultural technology systems. The university hopes that integration of agricultural businesses with information technology and biotechnology will lead to the establishment of agriculture-industry partnerships, the creation of new agricultural systems, and the development of a "food and agriculture industry" cluster.

Chiba Prefecture has adopted guidelines for the reinvigoration of small and medium sized enterprises that call for the creation of regional-brand products through agriculture-industry partnerships.

Aomori Prefecture, too, has made efforts to promote the development of agriculture-industry businesses in Hirosaki City and other locations in the Tsugaru region. It has developed a plan for promoting such businesses, and is already holding conferences in cooperation with Hirosaki University and area manufacturers to consider ways in which to establish them. These conferences have discussed agricultural production management, growing vegetables with the use of biomass-generated power, and the development of organic foods with locally-grown apples.

In summary, Japan’s agricultural machinery industry is faced with a variety of challenges, such as 1) farm polarization, 2) the “Year 2007 Problem,” and 3) and how to secure future growth. However, new agriculture-industry partnerships that take advantage of regional resources may enable the development of new industries and the revitalization of regional economies; such partnerships are

being touted as holding the key to the survival of Japan’s domestic agriculture industry. Consequently, industry watchers have expectations for new business models that are based on partnerships involving agricultural machinery, food processing machinery, environmental machinery, and IT industry businesses (see Diagram 2-3-10).



Source: Author

Diagram 2-3-10. Agriculture-industry Partnerships & the Agricultural Machinery Industry