A Special Management Report From

Ag Equipment Intelligence

The Agricultural Equipment Industry in China

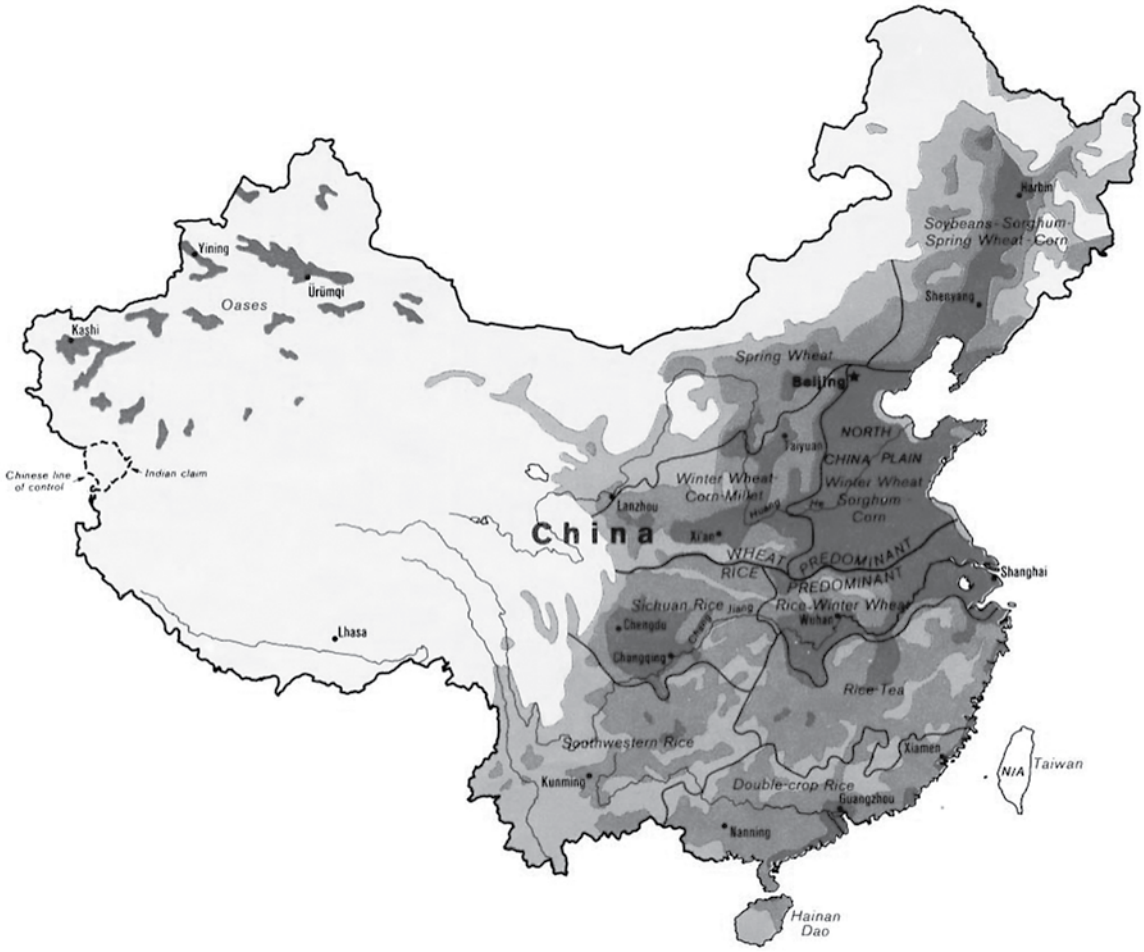

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TABLE OF CONTENTS

TABLES & CHARTS

Explanatory Notes

In most cases, the historical currency values shown in this report are reported as they were given in the original sources. Where the values are given in USD, the following currency conversion was used: 1 RMB Yuan = 0.1255 USD.

References to hectares were not changed, but for reference 1 hectare = 2.4771 acres.

References to kW can be converted to horsepower using the following conversion rate: 1 kW = 1.3410 hp

Information Sources

Proceedings of the 15th Members Meeting of the Club of Bologna – UNACOMA — National Union of Construction and Agricultural Machinery – Chinese Academy of Agricultural Mechanization Sciences (CAAMS) – Chinese Society for Agricultural Machinery (CSAM) – China General Confederation of Machinery Industry – National Bureau of Statistics of People's Republic of China – U.S. Department of Agriculture - New York Times - Cornell University

PART I
The Agricultural Equipment Industry in China

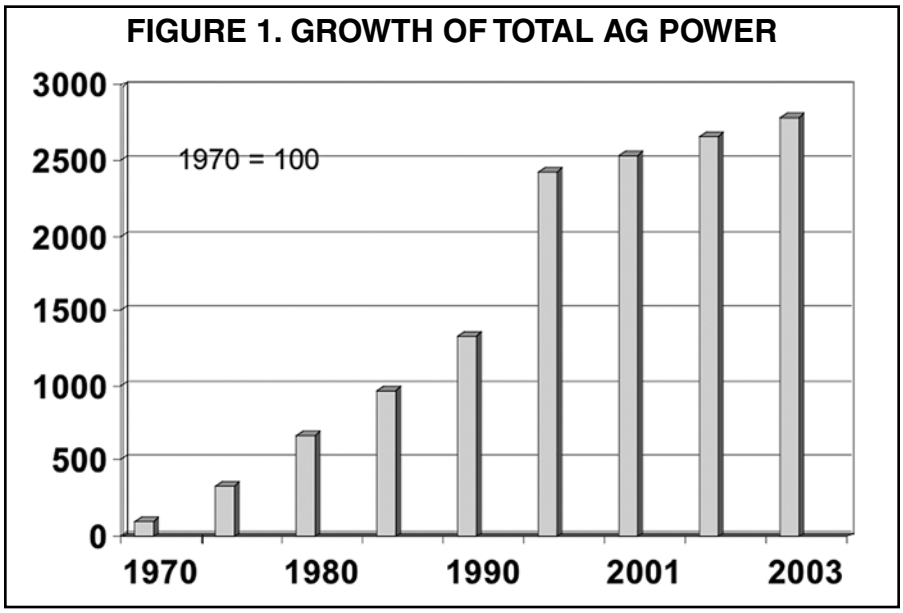
In its June 19, 2006 edition, the *New York Times* reported that China had contracted with Deere & Co., Moline, Ill., for farm equipment that was valued at $25 million. The order included 400 large tractors, 500 grain drills, 60 planters, 200 cultivators, rippers and spare parts, and 100 combines. Financed by the World Bank, most of the equipment is to be delivered before the end of 2006.

The company also reported that it had signed a separate agreement to sell Chinese technology for the manufacture of several models of tractors. A spokesman for Deere would not disclose the financial terms of the deal.

This transaction and many more like it make it increasingly clear that China is embarking on yet another stage in its amazing economic growth path. Summing up the current status of China's farm equipment industry, Professor Jiaping Yuan of the Chinese Academy of Agricultural Mechanization Sciences (CAAMS) says, "A new stage of agricultural mechanization and agricultural machinery is coming."

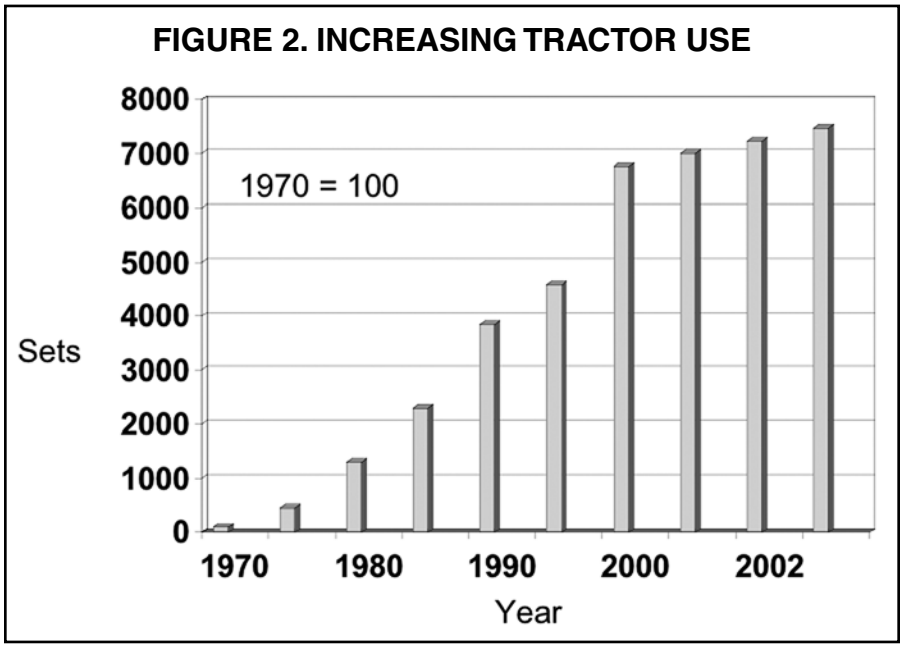
The general manager of Deere Tiangjin Tractor Co. reinforced the notion that China is on the brink of becoming a worldwide power in the production of farm machinery when he added, "The spring for the agricultural machinery industry in China is coming soon."

FIGURE 1. GROWTH OF TOTAL AG POWER



By 2003, the rapidly expanding use of mechanized vehicles used by China's farmers rose exponentially by 27 times from what it was just 33 years earlier.

FIGURE 2. INCREASING TRACTOR USE



Compared with 1970, the numbers of tractors used on Chinese farms were 74 times greater by 2003, reflecting the country's push to mechanize its agricultural productivity.

MECHANIZING CHINA'S FARMS

Even at its current level of agricultural technology — with many Chinese farmers still utilizing animal power — the country is feeding 23% of the world's population from an estimated 8% of the world's farmland. But like so much of what is taking place in the country, its use of ag technology is escalating rapidly. Professor Shujun Li of CAAMS describes China's current status, in terms of technology, as being at its "elementary stage with great market and developing potential."

The early 1970s marked China's first major push toward mechanizing its farming industry. Between 1970 and 2003, the country's use of machinery for agriculture grew at an astounding rate. Using 100 as a baseline representing the level of mechanization in 1970, the total use of powered-machinery by 2003 had grown exponentially by nearly 27 times (Fig. 1).

In that same 33-year period, the number of tractors used to work China's farms increased by nearly 74 times its level in 1970 (Fig. 2). Likewise, the use of combines grew by 45 times (Fig. 3) and farm implements increased by nearly 28 times (Fig. 4).

Even at these growth rates, Shujun Li estimates that the country's mechanization levels in plowing, seeding

and harvesting are today at 47%, 27% and 20% respectively. Compared with industrialized nations, the potential for further mechanizing China's farms remains virtually unlimited.

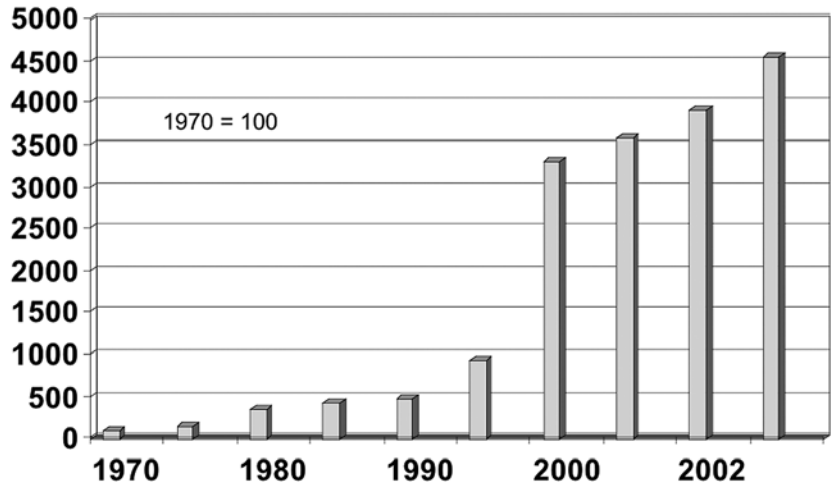
Machinery Use Steadily Increasing. The value of agricultural machinery used throughout China in 2003 was about $43 billion. The total power of agricultural machinery utilized by Chinese farmers reached 0.61 billion kW in '03, which represented an increase of 5% over the previous year alone. During the past decade, according to Shujun Li, the annual increase in horsepower has risen steadily at a rate of 20 million kW. Each 1,000 hectares of cultivated land requires 312 kW of mechanical power, he reports.

Mechanizing Seeding and Harvesting. Throughout the country, the field operations of plowing, seeding and harvesting utilizing mechanical devices represent the bulk of the ag machinery use on Chinese farms today. In 2003, 47.2% of Chinese plowing/harrowing operations were accomplished mechanically. Mechanical seeding and harvesting were utilized at levels of 27.2% and 18.5%, respectively.

More specifically, the level of mechanized wheat seeding and harvesting reached 73% and 70% utilization levels respectively. The use of power-driven equipment for planting and harvesting of corn reached 47% and 1.7%. Likewise, the motorized seeding and reaping of rice reached 6% and 20%.

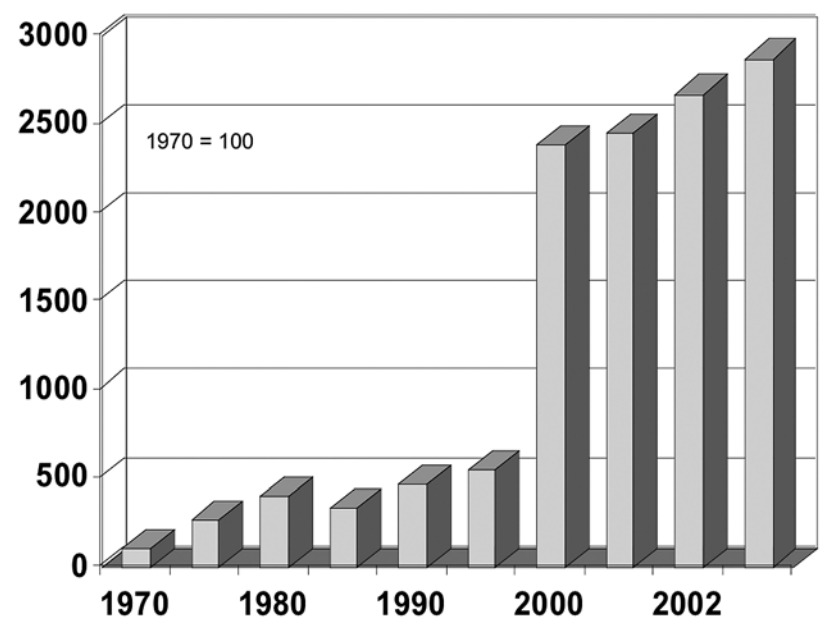
Along with the development of mechanized grain production, the application of newly introduced agricultural mechanization is speeding up in several other areas of crop production. Mechanical irrigation of farmland today accounts for 12.8% of the irrigation-controlled areas. Production of cotton, sugarcane, rapeseed and potatoes are also utilizing some level of automation.

FIGURE 3. INCREASED USE OF COMBINES



On a relative basis, the use of combines for harvesting grains was 45 times greater by 2003 than the number used 33 years earlier.

FIGURE 4. INCREASED USE OF FARM IMPLEMENTS



The use of various farm implements to mechanize Chinese agricultural practices grew by 28 times between 1970 and 2003.

AN EXPANDING AG EQUIPMENT INDUSTRY

It is expected that total worldwide sales of farm equipment will reach $66 billion by the end of this year. The Freedonia Group, a Cleveland-based market research firm, reports that the annual global growth rate for farm machinery between 2001-06 was 4.2%. This compares with a 3.6% global growth rate between 1996-2001. A significant portion of this expansion is credited to China's move toward mechanizing its farms and its purchases of Western-made machinery.

The market for ag equipment worldwide is forecast to continue on a steady, upward trend. Considering the current state of Chinese agriculture and its long-term outlook, it should come as no surprise that Chinese manufacturing is also gearing up to claim its share — or more — of the ag equipment market.

Planned Development. As the Chinese economy has evolved rap-

TABLE 1. PRODUCTION, SALE AND PROFITABILITY OF FARM EQUIPMENT COMPANIES EMPLOYING 100 OR MORE PEOPLE

Year	Total Output Value		Sales Income		Total Profit	
	Output Value (100 million Yuan)	Increase (%) vs. Previous Year	Income Value (100 million Yuan)	Increase (%) vs. Previous Year	Total (100 million Yuan)	Increase (%) vs. Previous Year
2002	634.8	18	551.8	16	9.9	53
2003	753.4	22	695.9	26	16.3	61.7
First half of 2004	437.4	20	400.8	22	11.1	21.4

idly since the onset of market reform, Shujun Li reports that the government is paying "great attention" to the mechanization of the ag equipment industry. Since 2003, the rate of total production output of Chinese ag equipment makers has risen by 20% or more annually. Likewise, the value of the equipment has also grown dramatically as shown in Table 1, where profits grew by nearly 62% between 2002-03 alone, and production increased by an average of 20%. The latest figures available include all farm machinery, with the exception of diesel engines and irrigation and drainage equipment, for 2002, 2003 and through the first half of '04.

TABLE 2. PRODUCTION OF FARM EQUIPMENT IN CHINA

Product	2003	2004*
Row-Crop & Utility Tractors	48,544	48,822
Compact Tractors	1,864,540	867,878
Engines	33,010.50	21,695.70
Harvest Machinery	193,265	119,091
Field Operating Machinery	137,955	63,162
Transportation Machinery	2,581,952	1,117,246
Grain Processing Machinery	664,645	378,184
Feed Processing Machinery	130,873	60,736
Tobacco Processing Machinery	4,534	3,291
Cotton Processing Machinery	12,746	10,231
Pumps	22,638,779	12,681,069

**Through first 6 months of 2004*

Source: National Bureau of Statistics of P.R. China

A Fragmented Industry. Like its farms, the Chinese ag equipment industry is large but highly fragmented, mostly comprised of very small enterprises producing a wide range of machinery. Shujun of CSAM reports that there are nearly 8,000 enterprises currently manufacturing equipment for China's farms. Of these, nearly 1,500 produced annual sales of about $600,000 (5 million RMB). Only 4 of

TABLE 3. VALUE AND SALES OF THE CHINESE AG EQUIPMENT INDUSTRY

Enterprise Type	Number	Total Assets		Sales Income	
		Assets Value (100 million Yuan)	Ratio (%)	Income Value (100 million Yuan)	Ratio (%)
Co's w/ +100 Emp	1,469	659.0	100.0	695.9	100.0
State-Owned or State-Owned Holding Enterprises	481	328.3	49.8	218.6	31.4
Private Enterprises	918	287.4	43.6	438.6	63.0
Joint Venture, Cooperative Business and Exclusively Foreign-Owned Enterprises	70	43.3	6.6	38.7	5.6

TABLE 4. IMPORTS OF LARGE-SIZED TRACTORS AND FARM IMPLEMENTS FOR STATE FARMS (MAINLY IN HEILONGJIANG PROVINCE)

No.	Items	1950-1957	1978	1980	1983	1985	1996	1997	1999
1	Name of projects	For State Farms, Tractor Stations	Friendship State Farm	Honghe Joint Farm	State Farms	Sanjiang Plain Agri Development	Honhhe Joint Farm	State Farms	Sanjiang Plain Agri. Development
2	**Import Units	16,750		700	450	2,800	32	1,000	2,713
	Tractors		7 (110-130)		60	55 (4,450)	25	1,000	363 (NH)
3	Volume (million USD)		1.00	13.50	60.00	76.00	20.00	24.00	200.00
4	Foreign Partner			Nichimen Co. (Japan)			Nichimen Co. (Japan)		
5	Resource of Funds			Japanese Loan		World Bank Loan	Japanese Loan		Japanese Loan
6	Form of Trade	Direct Trade	Direct Trade	Compensation Trade	Direct trade	Direct trade	Compensation Trade	Direct Trade	Invitation for Bids
7	Importer	Ministry of Agriculture	Ministry of Agriculture	GBSF* of Heilong	GBSF* of Heilong	GBSF* of Heilong	GBSF* of Heilong	Ministry of Agriculture	GBSF* of Heilong
8	Supplier	USSR, UK	John Deere	USA, Japan	John Deere, Hitachi	John Deere	Yugoslavia Belgrade Co.	New Holland, John Deere	

**GBSF, General Bureau of State farms in Heilongjiang province.*

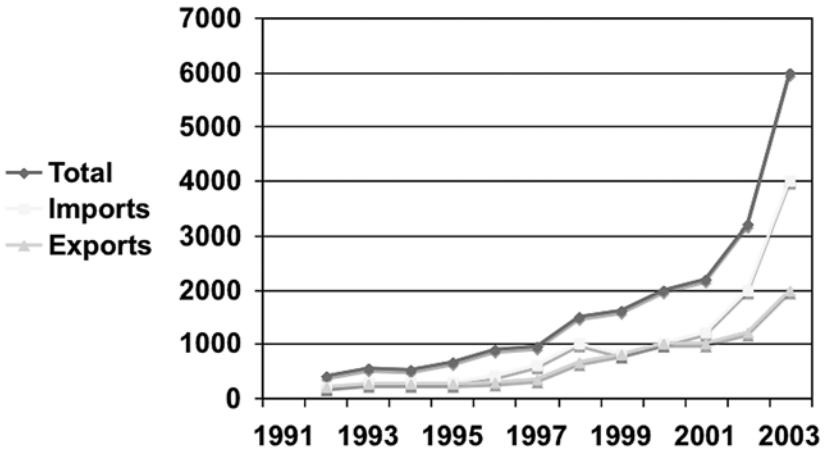
***From 1978 to 1996, only state farms in Heilongjiang imported about 4,000 units of large and medium-sized tractors, implements and combine harvesters, among them 1,000 units of large-sized tractors with 160 hp, in which 600 units of 4WD and 50% from John Deere; 2,800 units of combine harvesters, 198 units of tractor-drawn implements and other farm machines from John Deere, Case, JCB, New Holland, F.M. Kubota.*

these firms produced sales of over $250 million (2 billion RMB).

Of these enterprises, 181 are tractor manufacturers with annual sales of more than 5 million yuan. Total sales of tractors in 2003 reached 16.4 billion yuan, with the average tractor sale price at 90 million yuan each. The output of agricultural machinery for 2003 and through the first half of 2004 is shown in Table 2.

In 2003, there were 918 private enterprises among the 1,469 enterprises with over 100 employees and the annual sale income of over 5 million yuan, covering 62.6% of the total, assets of 44% and sales income of 63%. A breakdown of the ownership, assets and sales of China's farm equipment makers is given in Table 3. These figures clearly indicate the move toward farmer ownership of Chinese farms as two-thirds of all agricultural operations were held privately as of '03.

FIGURE 5. CHINA'S EXPORTS/ IMPORTS 1991-03



By 2003, China's import/export volume of ag equipment surpassed $6 billion, an increase of 43.7% between 2000-03. During this period, imported farm machinery rose 44.8% and exports increased by 41.2%.

OPENING THE DOOR TO WORLD TRADE

China took its first baby steps toward mechanizing its farming industry in the early 1950s. Trade at that time was highly concentrated with other Communist countries, though Great Britain was an early recipient

as China began to open its doors to the world. From 1949-1957, China imported 16,750 large- and medium-sized tractors and implements, which came mainly from the Soviet Union, Eastern Europe and Britain.

The "Beijing 12 Foreign Agricultural Machinery Exhibition," held in Beijing in 1978, "was a historical turning point for foreign cooperation and trade in China," says Yuan. After the exhibition, foreign farm machinery makers began entering the Chinese market and imports and exports of agricultural machinery increased rapidly. State-owned farms were the major importers of farm machines at the time.

From 1978 to 1996, state-owned farms in the Heilongjiang province imported a total 4,000 large-sized tractors and implements from various countries and firms as illustrated in Table 4.

Due in large part to the simplicity and lower prices of Chinese-manufactured farm machinery, exports of this equipment have risen rapidly, particularly in the past 3 years. According to the Chinese customs agency, the country's main exports included diesel engines and irrigation and drainage machinery, but extensive export activity was also seen in mid- and small-sized engines as well as small tractors and spare parts.

At the same time, with the government's focus on efforts to improve the productivity of farming, the rate of growth of imported agricultural equipment has outstripped the country's exports. Chief among the imported machinery are diesel engines, high-horsepower tractors, cotton pickers, grass machinery and other processing machinery. A summary of China's imports and exports are shown in Table 5.

By 2003, China's import/export volume of ag equipment hit $6.35 billion, an increase of 43.7% between 2000-03 alone (Fig. 5). During this period, imported farm machinery rose 44.8% and exports increased 41.2%. A detailed breakdown of Chinese imported and exported farm equipment can be found in Tables 6, 7, 8 and 9.

The imports and exports of agricultural machinery during the first half of 2004 (Figs. 6 and 7) indicated that these trends were escalating. During this 6-month period, total import/export volume increased by 57.88% to $4.73 billion. Imports increased 64.5% during the first half of '04 and exports rose 45.3%.

TABLE 5. CHINESE IMPORTS AND EXPORTS OF FARM MACHINERY — 2002-04

	Export Value	Import Value
2002	15.21%	19.55%
2003	21.31%	42.19%
First Half-2004	14.92%	32.32%

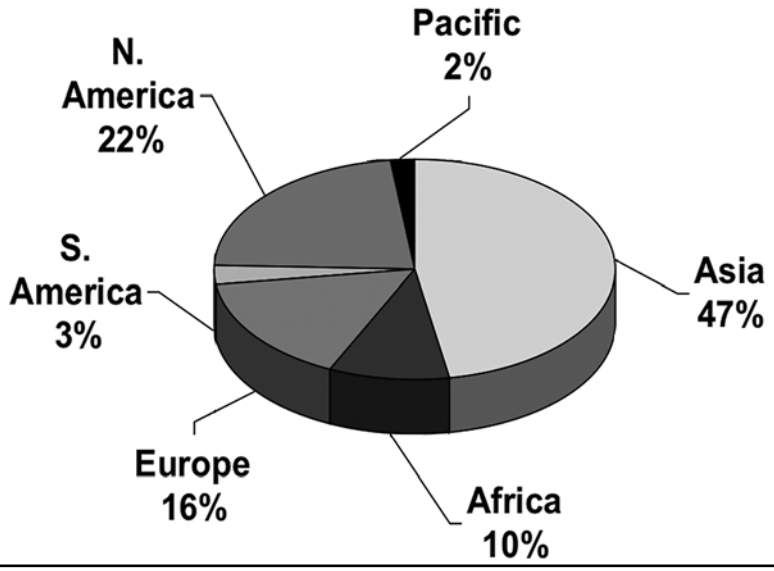
TABLE 6. CHINA'S IMPORTS OF AGRICULTURAL MACHINERY — 2003

Products	Units/Tons	+(-)% vs. '02	USD (millions)	+(-)% vs. '02
Diesel Engines	646,080	40.4	875.80	28.4
18 hp and under	3,208	32.6	4.56	52.7
Spare Parts	167,390t	31.8	1,557.61	66.4
Drainage/Irrigation Machinery	16,340,530	61.3	688.97	51.1
Spare Parts	12,839t	20.0	184.16	22.5
Tractors and Tractor Trucks	2,177	40.5	102.20	31.9
Spare Parts	565,380t	27.3	29.07	55.4
Diesel Engine Generator Sets and Spare Parts	2,288,300	72.5	561.09	33.8
Harvesting Machinery and Spare Parts	1,755,605	79.6	78.51	39.9
Plant Protection Machinery and Spare Parts	209,382	30.0	15.21	-4.3
Implements and Spare Parts	190,403	10.0	19.24	44.7
Poultry Machinery and Spare Parts	549,475	26.1	22.57	(12.2)
Farm Vehicles and Trailers	421	(17.7)	8.76	15.1
Grain Processing Machinery and Spare Parts	142,561	43.2	65.34	84.4
Milk Processing Machinery and Spare Parts	467,926	24.7	41.82	5.5
Other Agricultural Machinery	58,680	39.1	28.42	126.2

Source: National Bureau of Statistics of P.R. China

Importing Technology. As vital as importing high-quality, mechanized equipment has been in improving the productivity of China's farms, in the longer term, its "technology agreements" with foreign manufacturers will provide the underpinning of the country's future as a major

FIGURE 6. CHINA EXPORTS BY REGION



Beyond its own Asian region, North America was the number one destination for Chinese exports of agricultural equipment in 2003, followed by Europe and Africa.

TABLE 7. CHINA'S EXPORTS OF AGRICULTURAL MACHINERY — 2003

Products	Units/Tons	+(-)% vs. '02	USD (Millions)	+(-)% vs. '02
Diesel Engines	193,745	29.4	227.43	21.6
18 hp or under	920,065	8.4	116.48	10.9
Spare Parts	630,243t	18.1	376.56	10.3
Drainage/Irrigation Machinery	42,511,447	61.7	370.18	46.7
Spare Parts	891,467	19.0	209.83	26.9
Tractors and Tractor Trucks	69,941	12.0	92.24	31.2
Spare Parts	7,737,5778t	6.3	107.28	–5.5
Diesel Engine Generator Sets and Spare Parts	25,974,709	69.6	325.08	148.1
Harvesting Machinery and Spare Parts	36,755,697	51.8	192.95	119.9
Plant Protection Machinery and Spare Parts	13,463,148	66.9	27.86	17.6
Implements and Spare Parts	34,642,030	14.8	57.29	50.8
Poultry Machinery and Spare Parts	10,853,729	22.6	51.28	48.9
Farm Vehicles and Trailers	21,126	66.5	61.46	81.1
Grain Processing Machinery and Spare Parts	8,695,005	25.2	41.36	33.5
Milk Processing Machinery and Spare Parts	837,942	53.3	10.19	7.3
Other Agricultural Machinery	2,801,334	27.6	11.31	9.1

equipment maker.

By 1993, China had signed 105 contracts with foreign companies to introduce manufacturing technologies for agricultural machinery. Of these agreements, 100 were signed between 1978 and 1990, and most involved licenses for trade and technical consultancy (Table 9). Seven contracts were for tractor technology. These accounted for 6.7% of the total. More than 70 of the agreements covered engines and its spare parts, and made up a bulk of the licensed technology (68.5%). Most of the rest (24.8%, or 26 contracts) were for ag implements, animal husbandry and product processing machinery. According to Yuan, as of 2005, "most of these machines have not been put into massive production."

Joint-Venture Potential. According to Yuan, China began to set up foreign-funded ventures for the manufacture of agricultural machinery in 1984, but real joint ventures were set up after 1990.

Currently, there are at least 10 foreign-funded joint-ventures to build ag equipment in China (Table 10). "More and more foreign farm machinery companies are recognizing that it is the only way to directly sell their farm machinery into the Chinese market because of various difficulties and problems," says Yuan. He specifically points to the prices of imported farm machines, which, he says, are very high while the purchasing power of most Chinese farmers do not allow for the purchase of the expensive, foreign-made equipment. "Foreign manufacturers understand that cooperation with Chinese manufacturers to cut the selling prices and using the lower cost of Chinese labor is a good way to produce their farm machines in China," says Yuan.

"Chinese manufacturers are also interested in cooperating with foreign farm machinery companies to produce advanced farm machines in China and to improve the technical performance, quality and reliability of agricultural equipment as well as managing production systems," Yuan adds.

"I want to stress that foreign farm machinery companies have advan-

tages of high technologies, but their products must satisfy the practical needs of Chinese users, including market selling price," says Yuan. "China is a big potential market for foreign agricultural machinery companies. There are bright prospects for international cooperation in China."

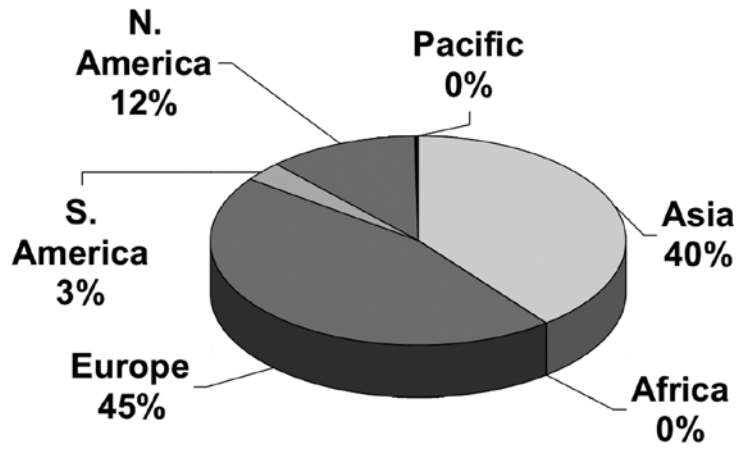
The U.S.-China Comparison

China is the world's most populace country and one of the largest producers and consumers of agricultural products. Roughly half of China's labor force is engaged in agriculture, even though only 10% of the land is suitable for cultivation and agriculture contributes only 13% of China's GDP.

China's cropland equals only 75% of the U.S. total, but China produces about 30% more crops and livestock than the U.S. because of intensive cultivation, China is among the world's largest producers of rice, corn, wheat, soybeans, vegetables, tea and pork.

Incomes for Chinese farmers are stagnating, leading to an increasing wealth gap between the cities and countryside. Government policies that continue to emphasize grain sulfsufficiency and the fact that most farmers cannot buy or sell the land they work have contributed to this situation. In addition, inadequate port facilities impede both domestic and international agricultural trade.

FIGURE 7. CHINA IMPORTS BY REGION



Europe is the leading source of farm machinery imported by China's farmers. North American manufacturers supply slightly more than 10% of China's ag equipment.

Compared to the U.S., China is almost the same size, but only has one-half of the arable land, and 4.6 times the population. The present population of the U.S. stands at 246.1 million and is growing at a rate of about 1% per year (depending on one's estimates of emigration and illegal immigration). If the number of legal immigrants coming into the United States increases, the rate of U.S. population growth will increase. China has a population of 1.1 billion, and despite the government's policy of one child per couple, it is growing at a rate of 1.4% or 15 million per year.

Statistics suggest that the U.S. produces and consumes about 47 times more good and services, per capita, than China does. Because achieving and maintaining such consumption levels depends upon the availability of resources and the health of the environment that sustains them, our position is very tenuous when projections of future resource availability are considered.

Currently, about 1,500 kg of agricultural products are produced annually to feed each American while the

TABLE 8. CHINA'S MARKET FOR EXPORTS AND IMPORTS OF AG MACHINERY — 2003

Countries & Regions	EXPORTS				IMPORTS			
	No.	Mil. USD (Millions)	Var.%	Accounted for %	No.	USD (Millions)	Var.%	Accounted for %
Total	**185**	**2131**	**41.20**	**100.00**	**82**	**4219.0**	**44.80**	**100**
Asia	40	994.00	28.14	46.63	22	1662.0	19.32	39.40
Japan	148.04	29.61		1176.0	46.84			
Korea	36.49	21.95		285.0	115.66			
Africa	51	203.00	86.58	9.54	20	8.0	563.933	0.19
Europe	42	336.00	44.68	15.77	31	1914.0	46.47	45.36
France	17.36	–6.08	181.0	200.42				
U.K.	53.90	108.02		186.0	0.12			
Germany	86.26	36.42		1066.0	58.31			
Italy	48.77	96.44		93.46	45.38			
S. America	36	58.00	49.45	2.73	5	123.0	46.02	2.91
N. America	3	469.00	51.07	22.00	2	497.0	25.22	11.77
U.S.	434.63	49.55		444.0	20.66			
Pacific	13	43.00	50.35	2.01	2	2.0	30.48	0.05

TABLE 9. TIMELINE OF PROJECTS THAT INTRODUCED MANUFACTURING TECHNOLOGY INTO THE CHINESE AG EQUIPMENT INDUSTRY — 1978-1986

Project	Chinese Co.	Main Imported Contents	Forms	Foreign Country	Foreign Co.	Date of Contract
Tractor DFH-54	First Tractor Works	Manufacturing Technology and Equipment	License	USSR		
Large & Medium -Sized tractors	Shenyang, Tianjin & Changchun Tractor Works	Same as Above	License	USA	John Deere	12/09/83
Medium-Sized 4WD Tractors	First & Shanghai Tractor Co.	Manufacturing Technology of Chassis and Necessary Equipment	License	Italy	Fiat	07/06/86
Forestry Tractor Model 518	Harbin Tractor Works	Same as above	License	USA	Caterpillar	29/12/86
Deutz Tractors	Shandong Tractor Co.	Design & License Manufacturing, Technology & Documents	Lincense	Germany	Deutz	09/06/86
Small-Sized Tractors	Xingtai Tractor Factory	Manufacturing technology	License	Italy	Goldoni	10/31/84
Internal Combustion Engine (1st Project)	Shanghai Int. Com. Eng. Research Inst.	Design & Training	Consulting	Britain	Ricardo	11/18/78
95 Series Diesel Engines	Weifang Machinery Works	Design Drawings	Consulting	Britain	Ricardo	03/19/79
Internal Combustion Engines (2nd Project)	Shanghai Internal Combustion Engine Research Inst.	Improvement	Consulting	Britain	Ricardo	11/13/80
Internal Combustion Engine (2nd project)	Same as Above	Technical Know-How & Documentation	Consulting	Britain	Ricardo	03/10/82
Internal Combustion Engine (3rd project)	Beinei Engine Co.	Improvement of Design	Consulting	Britain	Ricardo	11/07/83
492Q Gasoline Engine	First Tractor Works	Same as Above	Consulting	Britain	Ricardo	10/16/82
100 Series Diesel Engine	Shanghai Internal Combustion Engine Research Institute	Technical Documentation	Consulting	Britain	Ricardo	07/30/84
Internal Combustion Engine (4th Project)	Same as Above	Improvement	Consulting	Britain	Ricardo	10/31/84
Engines (4th Project)	Beinei Engine Co.	Improvement	Consulting	Japan		09/84
490, 41114 and B495Q diesel engines	Shanghai Internal Combustion Engine Research Institute	Improvement of Direct Injection	Consulting	Austria	Lister	03/23/85

Chinese make do with only 594 kg per capita per year. To produce food for each person in the U.S., a total of 1.9 ha of cropland and pasture land is used, whereas in China only 0.4 ha/person is used. The data confirm that each person in China is fed essentially a vegetarian diet and that they have nearly reached the carrying capacity of their agricultural system.

The Chinese have not been as fortunate and still depend on about 1,200 hours per hectare of manual farm labor, compared with only 10 hours per hectare in the U.S.

Source: D. Pimentel, M. Pimentel, Dept. of Entomology, Cornell University

TABLE 10. FOREIGN-FUNDED AG EQUIPMENT ENTERPRISES IN CHINA (1994-2004)

Date of Establishment	Name of Venture	Major Products	Chinese Partner	Foreign Partner	Total Investment (Millions of USD)	% Investment by Foreign Partner
September 1994	Yarman (China) Agricultural Machinery Co., Ltd.	Rice Combines	Yarman Farm Machinery Co.		30.0	100
May 12, 1997	Deere-Jiamusi Combine Combines	Jiamusi Combine Factory	John Deere Co.		29.9	60
September 8, 1998	Kubota (Suzhou) Agricultural Machinery Co.	Rice Harvesters	Kubota Farm Machinery Co.			100
March 18, 1999	Harbin-New Holland Beidahuang Tractor Co., Ltd.	Tractors (100-180 hp)	New Holland			70
August 8, 2000	Deere-Tianjin Tractor Co., Ltd.	Tractors (80-130 hp)	Tianjin Tractor Plant	John Deere		51
April 9, 2001	Shanghai-New Holland Farm Machinery Co.	Tractors (100 hp and under)	Shanghai Tractor Co.	New Holland	75.8	60
December 5, 2001	Tractors (80-120 hp)	First Tractor Co., Ltd.	Valtra			
June 2004	Iseki Farm Machinery (Changzhou) Co., Ltd.	Rice Harvesters, Transplanters	Japanese Iseki Farm Machinery Co.		4.2	100
Grain Driers		Japan Kaneko Farm Machinery Co. Korean				

PART II

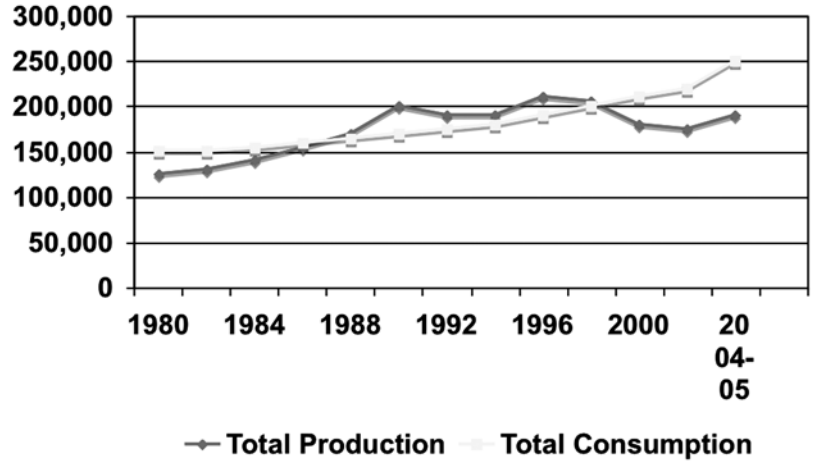
A Powerful Producer: China's Worldwide Impact on Grain Production

"China is solely responsible for the decline in global grain inventories since 1999," says a November 2005 report from Merrill Lynch."We believe that it is highly likely that China will emerge as a major grain importer but we do not know whether this will happen in the next 6 or 24 months."

China is the second largest grain and soybean producer in the world behind the U.S. It accounted for 17% of the global grain and soybean production in 2005, according to USDA estimates.

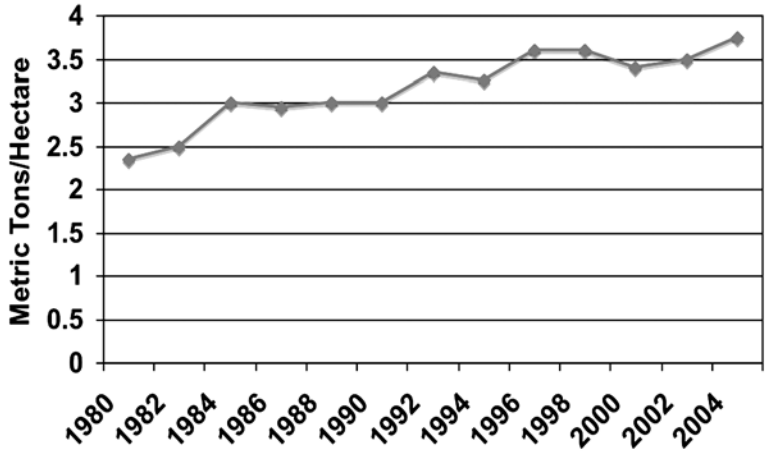
However, according to the Merrill Lynch report, production of grains and soybeans in China has been declining since 1998, driven by a reduction in the harvested area

FIGURE 1. CONSUMPTION-PRODUCTION OF GRAINS



Since 2000, China's domestic consumption has outpaced its domestic production for key crops including corn, soybeans and wheat.

FIGURE 2. CHINA GRAIN YIELDS 1980-2004



Chinese productivity is not growing fast enough to offset land decline and the flattening of yields. A composite yield analysis for corn, soybeans and corn shows that yields have stalled since the mid-90s.

and stalling yields. Simultaneously, an increasing population has been driving up demand for more food. It is expected that China's consumption will continue to outpace domestic production because of declining harvested area and stalling yields.

USDA data show that China has not been self-sufficient in meeting its domestic grain and soybean demand since 1999. As reflected in Fig. 1, since 2000, China's domestic consumption has outpaced its domestic production for key crops (corn, soybean and wheat).

In the 2005-06 agricultural year, China is forecast to consume more than double its soybean production. According to Table 1, China is also forecast to consume more corn and wheat than it produces.

Declining Harvested Area. The harvested area for key crops (corn, soybeans and wheat) peaked in 1998 and has been declining since then. Most of the decline is due to the shift from growing crops to growing fruits and vegetables and raising livestock. In addition, some of the land is being lost to urban sprawl and industrial development. While China has made progress in bringing some of this land back for grain and soybean in the past couple of years, it is still estimated to be 9% below 1998.

The flattening of yields for key crops contrasts with a steady rise in U.S. yields and has also attributed to the declining production in China. A composite yield analysis in China (Fig. 2) shows that yields for key crops in China have stalled since the mid-'90s. This stalling is a result of relatively slow adoption of the latest advances in biotechnology and farming techniques as well as problems with soil erosion and availability of irrigation in China.

From 1980 to 1990, China's composite-yield for three key commodities (corn, soybeans and wheat) grew at a very brisk 4.5% compounded average growth rate. U.S. yield growth during the same period was 2.5%. China's agricultural productivity growth slowed dramatically in the 1990s. From 1990 to 2000, the composite yield grew only 0.8%, (this was below the U.S. growth of 1.4%). In the past 5 years, the productivity growth has improved with the composite yield growing at 2.1%. U.S. productivity grew at 1.8% during the same time, but off a much higher base. While China's productivity gains are now outpacing consumption growth, the gap between production and consumption is unlikely to be closed until the end of the decade.

Lower Chinese End Stocks. As Chinese production started to fall short of domestic consumption in 2000, China started to use its stocks to meet the shortfall. As China draws down its stocks of corn, soybeans and wheat, it must import more to meet its growing domestic consumption. It is noted that while China has been a significant importer of soybeans since the late 1990s, the country is yet to start importing significant quantities of corn or wheat, drawing down its

TABLE 1. RECENT PRODUCTION AND CONSUMPTION TRENDS OF KEY CROPS IN CHINA (000'S TONS)

	01/02	02/03	03/04	04/05	05/06
Corn					
Production	114,088	121,300	115,830	130,290	126,000
Total Domestic Consumption	123,300	126,500	128,400	131,500	
Production-Consumption	(9,212)	(5,200)	(12,570)	(1,210)	(8,000)
Soybeans					
Production	15,410	16,510	15,394	17,400	17,000
Total Domestic Consumption	28,310	35,290	34,375	40,212	44,750
Production-Consumption	(12,900)	(18,780)	(18,981)	(22,812)	(27,750)
Wheat					
Production	93,873	90,290	86,490	91,950	95,000
Total Domestic Consumption	108,742	105,200	104,500	102,000	101,000
Production-Consumption	(14,869)	(14,910)	(18,010)	(10,050)	(6,000)

Source: USDA, Merrill Lynch estimates

strategic gain inventories instead.

Imports Will Continue to Grow. The Global Grain End Stocks to Use Ratio, a key measure of supply and demand, continues at historically low levels (17.7% in '05). The current estimate is at the lowest level since 1974. Much of this is driven by China.

In the long term, China must continue to increase its crop imports to meet rising consumption. In recent years, it has dramatically increased its imports of soybeans, corn and wheat, and it is believed it will continue on this trend.

As China grows its imports of corn and wheat, in theory, the U.S. should be able to capture market share in China similar to its global export market shares — nearly 60% for corn and 91% for wheat. This bodes well for U.S. farmers.

TABLE 2. CHINA'S RECENT IMPORTS OF KEY CROPS (000 TONS)

	01/02	02/03	03/04	-4/05	05/06
Corn					
Total Imports	39	10	2	2	200
U.S. Imports	20	N/A	1	N/A	N/A
U.S. % Total Imports	51%	N/A	50%	N/A	N/A
Soybeans					
Total Imports	10,385	21,417	16,993	25,802	27,500
U.S. Imports	4,461	7,500	8,287	N/A	N/A
U.S. % Total Imports	43%	35%	49%	N/A	N/A
Wheat					
Total Imports	1,092	425	3,749	6,747	2,500
U.S. Imports	221	89	1,466	N/A	N/A
U.S. % Total Imports	20%	21%	39%	N/A	N/A

Source: USDA, Merrill Lynch estimates

China's Self-Sufficiency Slipping

As shown in Figures 3, 4, 5 and 6, during the last 10 years, China's has increasingly relied on imports to meet its commodity needs. Stalled yields, slow adoption of new ag technologies and a decline in their harvested acreage due to urban sprawl are given as reasons for the country's shortfall trends.

Source: USDA, Foreign Agricultrual Service, June 2005

FIGURE 3.

China Soybean Supply/Demand

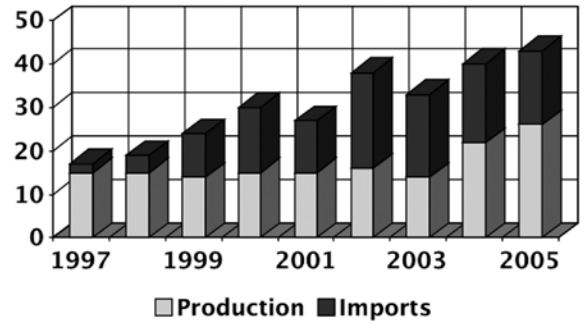


FIGURE 4.

China Wheat Supply/Demand

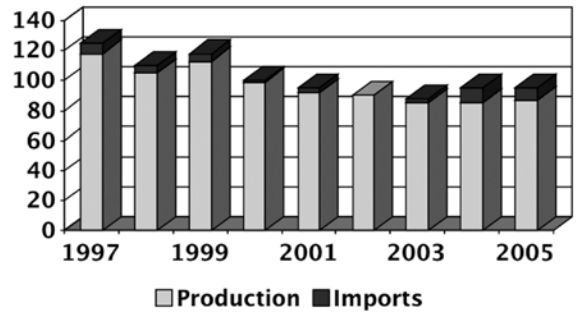


FIGURE 5.

China Corn Supply/Demand

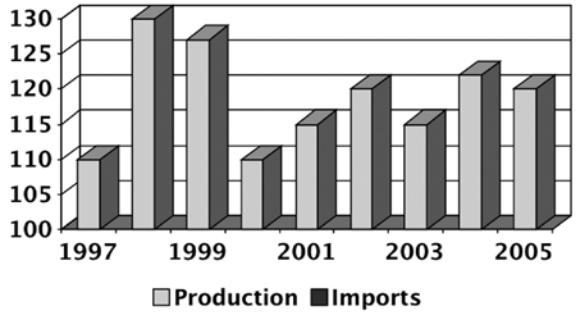
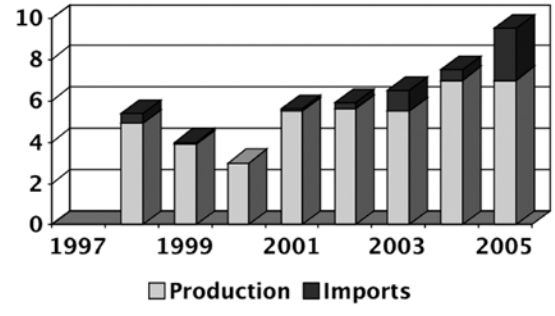


FIGURE 6.

China Cotton Supply/Demand



PART III

The Development of China's Farm Equipment Industry — 1949-2004

The evolution of China's agricultural machinery industry during the past 5 decades has been one of starts and stops, and hurry up and wait. According to Professor Yuan Jiaping of the Chinese Academy of Agricultural Mechanization Sciences, this is due to the "adjustment and reform of the national economy and transformation from planning economy to market economy." Figures 1 and 2 graphically illustrate the development of the farm equipment industry in China between 1962 and 2004.

According to Professor Yuan, the history of China's ag equipment industry can be divided into five stages.

Stage 1 — 1949 to 1960

Before the establishment of the "new" China in 1949, there were only 36 agricultural implement factories with 4,000 employees. This period was marked by three significant events in the late 1950s:

- 1955 — China manufactured its first farm crawler tractor.
- 1957 — China produced its first farm-wheel tractor.
- 1959 — China built its first tractor factory, now known as China First Tractor Group Co.

By the end of 1957, the number of agricultural machinery factories reached 276 with 123,000 employees. Since the late 1950s, China has focused on building its own agricultural industry. By the end of the '50s, Chairman Mao called for a "big jump" in farm equipment production and the number of agricultural machinery enterprises and employees increased rapidly, but, as Yuan puts it, "This was not normal development."

Stage 2 — 1960 to 1980

It its attempt to adjust its national economy, the Chinese government embarked on stringent measures that impacted the manufacturing sector. During this time, the number of ag machinery enterprises and employees were dramatically reduced.

In the 1970s, "The central government made another mistake and set its goal again to mechanize farming in China," says Yuan. The number of ag machinery enterprises and employees rose rapidly.

Stage 3 — 1980 to 1982

In 1978, China started its reform of the rural economy. Previously, the government controlled the purchase of tractors and other farm machinery for use at state farms. After 1979, farmers themselves were allowed to buy this equipment. This brought about significant changes in the structure of the tractor business.

Output of large and medium-sized tractors dropped quickly, but output of small-sized tractors increased greatly because farmers utilized equipment better suited to their small acreage.

Stage 4 — 1992 to 2003

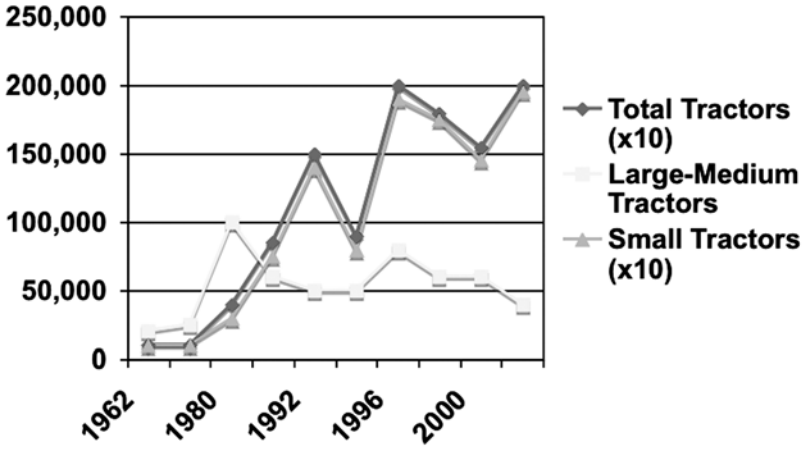
China's second round of economic reform in the early part of the 1990s saw further changes in the manufacture of farm machinery as the central government moved farther in the direction of a market economy. Output of tractors dropped initially, then rose and dropped again to its lowest levels in 2002.

Stage 5 —Second Half of 2003 to the Present

Starting in the second half of 2003, another era in China's ag equipment industry started as the central government encouraged individual ownership of farmland. In addition, the government also adopted new measures to promote agricultural mechanization, says Yuan.

According to China's State Statistics Bureau, in 2003, of the 8,000 enterprises engaged in manufacturing farm machinery, 1,469 of them employed 100 or more people. Of these, 481 are state-owned, accounting for 32.7% of the total; 918 are

FIGURE 1. CHINA'S TRACTOR PRODUCTION — 1962-2004



The output of Chinese-made tractors during the last 40 years clearly demonstrates the long-term growth trend of farm machinery in that country.

TABLE 1. GROSS INDUSTRIAL OUTPUT VALUE AND SALES INCOME OF AG EQUIPMENT (PRODUCTION BY FACTORIES EMPLOYING 100 OR MORE)

	Output Value		SalesIncome	
Year	Billion Yuan	Variation %	Billion Yuan	Variation %
2002	64.48	18.0	55.18	16.0
2003	75.34	22.0	69.59	26.0
First Half of 2004	43.74	20.0	40.08	22.0

held privately, which accounted for 62.5%; and 70, or 4.8%, are either partially or wholly financed by foreign investment (Figs. 3 and 4).

Despite the capability of China's manufacturing base to produce a wide range of farm machinery, Yuan concedes that the quality of product is not meeting worldwide standards. "The technical standards of China's agricultural machinery industry are lower than that of the developed countries," he says, "perhaps at level seen in the 1970s."

Growing by Leaps and Bounds. Nonetheless, China's gross industrial output of agricultural machinery increased 18% in 2002, 22% in 2003 and 20% during the first half of 2004 (Table 1). The output of ag machinery in 2003 and through the first half of 2004 are shown in Table 2.

"Output and sales of large- and medium-sized tractors during the first half of '04 exceeded their total output and sales in 2003..."

Production of large- and medium-sized tractors in the first 8 months of 2004 increased by 57.7% to 65,743 units, while sales increased 68.3% to 64,522 units. Both the output and sales of large- and medium-sized tractors during this period exceeded the total output and sales in 2003 (Fig. 5).

Output of small-sized tractors in the first 8 months of '04 reached 855,500 units, an increase of 1.9%. At the same time, small-sized 4WD tractors dropped 8.3% to 481,000 units and walking tractors increased 15.45% to 415,000 units.

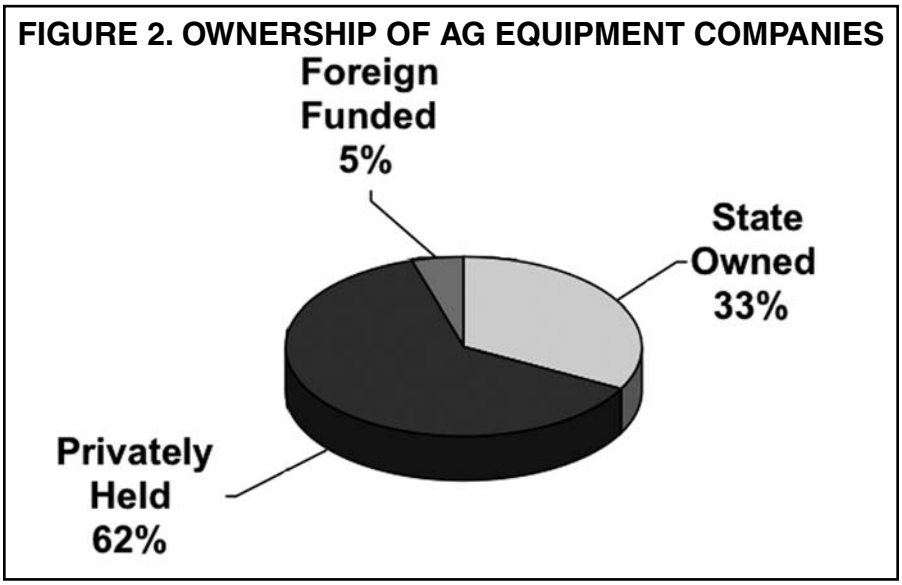
Output of large and medium-sized tractors are expected to reach 80,000 units in 2004, the highest output in recent years. Production of small-sized tractors is also expected to develop steadily at high levels as well.

The rapid development of China's economy have brought its ag machinery industry and foreign farm machinery companies good opportunities for their development in China.

New Policies to Drive Ag Growth. In early 2004, the State adopted new policies and took other actions designed to support rural areas, agriculture and farmers of China. These new incentives are also designed to promote the rapid development of China's agricultural machinery industry. These include:

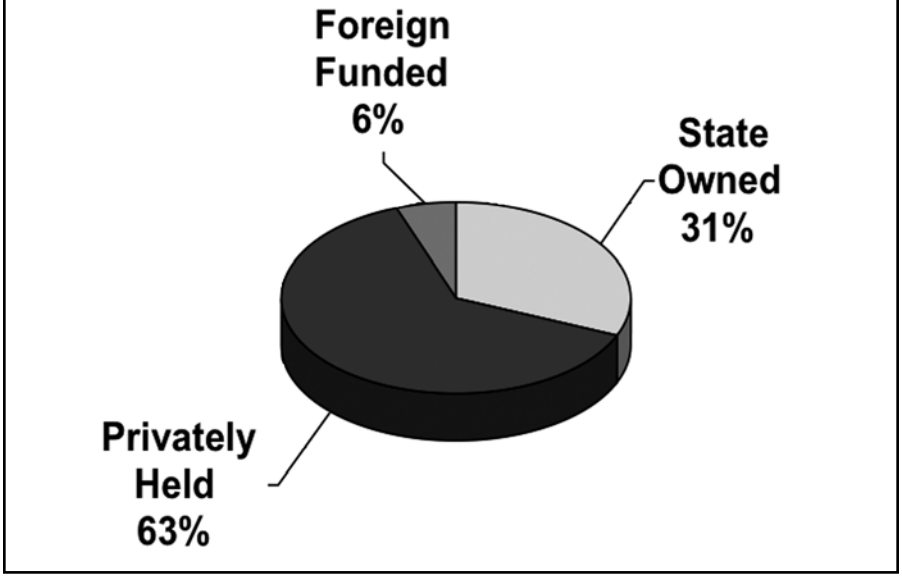
- "Law on the Promotion of Agricultural Mechanization" was put into effect November 1, 2004.
- The government will reduce the agricultural tax within 5 years.
- New subsidies will be provided to promote grain production.
- Subsidies will be given to farmers that purchase farm machinery.
- The Central government will provide 70 million yuan (30 million yuan will go to state farms) and local governments will provide 410

FIGURE 2. OWNERSHIP OF AG EQUIPMENT COMPANIES



Sales by Chinese manufacturing that was privately held in 2003 doubled the income generated by the state-operated firms that produced ag equipment that year.

FIGURE 3. SALES OF AG EQUIPMENT BY OWNERSHIP



In 2003, China's State Statistics Bureau reported that there were 1,469 companies with 100 employees or more that were involved in manufacturing farm machinery. Of these, nearly 63% were privately owned and 33% were operated by the government.

million yuan to farmers to purchase new farm equipment.

Currently, China's farm machinery manufacturers cannot supply the quality or quantity of equipment demanded by the Chinese agricultural industry, according to Yuan. In addition, he says, "The reliability of China-made farm machines is still unsatisfactory; the quality of farm machinery products has yet to be improved."

What the industry needs is new foreign farm machinery products and advanced technologies in order to meet the growing demand of the Chinese population for food and nutrition. As a result, the country's farming industry will continue to import machinery and Chinese manufacturers continue to seek foreign partners for cooperation in further developing new and advanced agricultural technologies.

TABLE 2. CHINA'S OUTPUT OF AGRICULTURAL MACHINERY — IN 2003 AND 2004

	Output in 2003		Total Output in Jan.-Aug. 2004	
Products	Output in 2003	Var. % 2003/2002	Output in Jan.-Aug. 2004	Var. % Jan.-Aug. 2004/2003
Large/Medium-Sized Tractors	48,544	–6.14	69.720	66.05
Small-Sized Tractors	1,864,540	–2.33	1,117,418	–5.41
Harvesting Machinery	205,894	5.99	161,859	–5.98
Barnyard Machinery*	138,688	0.53	86,198	4.49
Farm Transport Machinery	2,645,534	2.46	1,357,735	–9.52
Grain Processing Machinery	726,091	9.24	519,344	9.15
Feed Processing Machinery	130,873	0	86,390	4.72

**Barnyard machinery includes threshers, grain cleaners, grain dryers, seed graders and other equipment.*

Source: China General Confederation of Machinery Industry

PART IV

How the Chinese Government is Supporting Farm Mechanization and Development

In recent years, China has formed a framework of organizations to facilitate the continuing development of mechanized ag equipment and to improve farming practices throughout its rural landscape.

According to Professor Shujun, there are 31 agricultural mechanization management organizations at the provincial level, 346 at the regional level, 2,745 at the county level and 34,317 at the town level across the country. Additionally, there are 49 agricultural machinery test and appraisal organizations at the regional and city level, 122 agricultural machinery research institutes, 2,413 agricultural machinery technology extension organizations at the county level, 2,900 safety supervision and managing organizations for agricultural machinery, and 2,213 agricultural machinery education and training organizations.

The administrative regions above the county level in China have all developed organizations for agricultural machinery management, technology extension and supervision. More than 260,000 employees are engaged in agricultural machinery management, extension services, identification and supervision.

"To support its farm mechanization programs, China has 31organizations at the provincial level, 346 at the regional level, 2,745 at the county level and 34,317 at the town level."

In recent years, government agencies at each of the different levels have formulated a series of policies and procedures to support agricultural mechanization development.

First, these agencies provide subsidies to the farmers who purchase new agricultural machinery. Since 1998, the financial department of the Central Government has allocated special funding to subsidize farms suffering from unusual occurrences of plant diseases and insect infestations.

Enactment of the "Laws of Agricultural Mechanization Promoting" in 2004, gave substance to efforts to mechanize farming operations. Beginning in 1990, financial departments at each level provided 20-40% subsidies based on purchase price of the new machinery as well as supporting agricultural machinery R&D projects.

These groups also provide special funding support for new technology modeling and extension service projects in agricultural mechanization, such as mechanizing straw operations, grain drying in growing area, conservation tillage and mechanical water-saving systems.