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The Current and Future World Food Situation:

Is There an Emerging Food Shortage?

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The Current and Future World Food Situation:

Is There an Emerging Food Shortage?

There has been an enormous increase in world agricultural production in the past half century. World population rose from 2.5 billion in 1950 to 5.3 billion in 1990, a 110 percent increase. Population growth in developing countries accounted for most of the increase, from 1.7 to 4.1 billion people. Food production not only kept up but per capita food availability increased. World grain production went from 631 million metric tons in 1950 to 1.78 billion in 1990, a 182 percent increase. Grain output per person actually rose by 40 percent between 1950 and 1984. Chinese grain production rose from 100 million tons in 1950 to 350 million in 1994. During the period 1978-1984 of most rapid improvement, Chinese grain production increased by 50 percent per person. These gains were achieved by the spread of modern, science-based agriculture around the world, generally referred to as "the green revolution." However, global agricultural growth slowed from 3.0%/year in the 1960s, to 2.3%/year in the 1970s, to 2.0%/year from 1980 to 1992.

Current Tight Stocks

Current world supplies are tight for the major grains and prices have risen substantially over the last year. The FAO puts global reserves at only 14 percent of annual consumption, while 17 percent is considered a minimum desirable reserve. USDA predicts that the world stocks-to-use ratio in 1995/96 will fall to 10.7 percent for the coarse grains (primarily corn). This is the lowest level in USDA's data base starting in 1960/61. U.S. corn production is down 27 percent in 1995 to 7.4 billion bushels from 10.1 billion last year. China has moved from exporting to importing corn.

The world stocks-to-use ratio is predicted to fall to 17.6 percent for wheat, the lowest level since 1973/74. Russia had the worst harvest in 30 years at 66 million tons versus 80 million last year and a peak of over 120 million in 1978. Both the European Union and the U.S. have stopped the use of export subsidies, with Europe actually taxing exports. And for rice, USDA predicts a world stocks-to-use ratio of 11.7 percent, the lowest since 1972/73.

Table 1 shows world production and stocks for the last six years. Wheat production peaked in 1990/91 and stocks are predicted to fall below 100 million tons in 1995/96. Coarse grain stocks will be substantially lower in 1995/96 and rice stocks somewhat lower. Oilseed production and stocks are up over the last two years, though. Figure 1 also shows that world wheat production peaked in 1990/91. Carryover stocks reached a high point in 1985/86.

Corn, wheat and soybean prices have risen sharply in 1995 as shown in Table 2. Figure 2 shows that corn prices are nearing the levels last reached in 1988 during a major drought in the American Midwest. In 1988 prices raced to levels that five years earlier in 1983, were needed to ration the very short crop. The problem in 1983 was that a massive idling of land by the government was followed immediately by a severe drought. However, the large carryin of stocks available in 1988 were, in fact, quite adequate to buffer the situation, and by fall the market had quickly settled back from the overbought emotional price levels of the late spring and summer. Against this frame of reference, currently we are testing these twin 1980s market peaks.

Figure 3 shows the production drops and stock situations for corn in the U.S. in 1983 and 1988. Essentially, the drought of 1988 brought stocks down from extremely burdensome levels and set the stage for a more balanced period of production and use. After 1988, land set asides ranging from 0 to 10 percent, an emerging ethanol industry, the loss of the market to the former

Soviet Union, and a brief period of Chinese competition for exports blended together to strike the right chord against a rebuilding of excessive corn stocks.

Global Outlook

Lester Brown of the Worldwatch Institute in Washington, D.C., claims that the world faces an impending food crisis. He foresees an era of food shortage in which prices will soar. Brown believes that the limits of agricultural land, water, and current technology are being reached. The old formula for increasing yields will no longer work, in particular the response to more fertilizer. The world grain harvest has fallen since 1990 while 440 million people have been added to the world's population.

Brown predicts enormous grain imports by China in the future, reaching 369 million tons by 2030, which is nearly twice the world's total current grain trade. His prediction is based on China's very rapid economic growth and continued population growth of one percent per year. The Chinese have been spending much of their increased income on improving their diet. Meat consumption increased from 8 kilograms/capita in 1977 to 32 kg/capita in 1994.

Chinese yield increases have slowed. Rice yields which rose 4%/year in the 1970s increased by only 1.6%/year in the 1980s. Based on the pattern of other high population density countries that industrialized such as Japan, Korea, and Taiwan, Brown sees a large loss of agricultural land to urbanization and industrialization. With substantial foreign exchange earnings, for example, a $30 billion trade surplus with the U.S. in 1994, China will be able to buy grain and have an enormous impact on the world market.

The projections of Nikos Alexandratos of the FAO in Rome differ substantially from those

of Lester Brown. The FAO forecasts are based on demand and supply analysis disaggregated by country and by commodity. The demand projections are based on population and income growth. For the supply forecasts, experts were consulted concerning feasible levels of agricultural growth.

Alexandratos believes the slowdown in production growth has primarily been a response by the major grain exporters to low prices and to agricultural and trade policy reform. The production of the major grain exporters fell from an average of 621 million tons annually in 1984-86 to an average 602 million in 1990-92. However, the average annual production for the same years increased from 1,040 million to 1,135 million tons of grain for the rest of the world. He predicts a slowdown in agricultural growth to 1.8%/year for 1990-2010, but this still exceeds the projected 1.5%/year population increase. Alexandratos concludes that the world can increase agricultural production faster than population and in line with the growth of effective demand, probably at non-increasing real prices.

In terms of particular regions, the former Soviet Union will probably not be an important importer or exporter in the near future. They do not have the foreign exchange to buy imports and production is unlikely to improve soon because the privatization of farming is going slowly. Meat consumption, which was formerly heavily subsidized, has already decreased sharply and reduced the demand for feed. There is also substantial opportunity to improve the grain-to-meat ratio in livestock production and to reduce large post-harvest losses. In the long-run the region clearly has the potential to be an agricultural exporter, which it was historically. On the other hand, the European Union is likely to have a declining role as an exporter in the future due to production limits and agricultural and trade policy reform.

Sub-Saharan Africa poses the most serious food problem. Population growth has

exceeded the increase in agricultural production. Agricultural production increased by 3.1%/year between 1980-1990, a very respectable rate, but population grew by 3.6%/year. The very high rate of population growth suggests its reduction must be part of the solution. There has been a 50 percent growth in hungry people since 1970 to 175 million and their number is expected to reach 300 million by 2000.

More on China

Chinese population growth will be about 1%/year to 2020. The rate of increase in food consumption and meat consumption in particular, will slow even if economic growth remains high, in accordance with Engel's law. In recent years the Chinese have given less attention to agriculture and reduced their support of agricultural research. Real investment in agricultural research was stagnant from 1983-1990. There should be a strong response to a growing food deficit by the Chinese government and by the market, if it is allowed to freely operate to use prices to stimulate production and curtail consumption. The vulnerability of being dependent on other nations for food can be expected to be a strong incentive for China. There is still an opportunity to raise yields substantially, and thus production, in China. Some experts believe the current production area is undercounted, and hence yields are overestimated.

Jikun Huang, Scott Rozelle, and Mark Rosegrant of the International Food Policy Research Institute (IFPRI) in Washington, D.C., forecast that Chinese grain imports will be about 40 million tons/year between 2000-2020. This would be a considerable level, but only a fraction of Lester Brown's projection. The imports would be mostly wheat. They point out that China simply does not have the logistics systems, in terms of port facilities and transportation network,

to handle huge imports. They do project a grain deficit of over 200 million tons/year by 2020 if Chinese agricultural research investment falls by 1%/year rather than increasing by 3%/year as assumed in their baseline forecast.

Justin Yifu Lin, a well-known agricultural economist and director of the China Center for Economic Research at Peking University, predicts future Chinese grain imports of 25-50 million tons, which agrees with the IFPRI forecast. Lin believes China can remain basically self-sufficient if administrative controls are removed allowing the market to function and the necessary investment in agricultural research is made. He points out that the Chinese agricultural sector as a whole grew at an impressive 5.4 percent annual rate during the period 1984-94. Foodgrain production stagnated due to the government's traditional low-price procurement and rationing policy.

The accelerating Chinese demand for feedgrain is apparent in Figure 4, a history of Chinese corn production, use and trade. The underlying growth in demand for corn seems to be about 7 or 8 million metric tons per year. The Chinese trade events of 1995, a fall in exports from 10.3 million metric tons (mmt) in 1994, coupled with imports of 4.3 mmt, overstate the underlying growth rate of demand considerably. From 1990 through 1993 China was briefly a major competitor of the U.S. for the world corn trade.

Although Chinese corn yields have steadily increased, they are still only about 60 percent of the U.S. level as shown in Figure 5. This suggests that there is plenty of capacity for China to expand production simply by adopting existing technology more intensively, in terms of genetics, fertilizer, chemical weed control, etc. Improved feed efficiency and better transport from grain production to grain use regions will likely be part of the solution as well.

Final Comments

Most of the longer term increase in worldwide agricultural production will have to come from raising yields, as has been the case for a long time. However, there is additional land which can be brought into production. In the United States, there are millions of acres in the set-aside and conservation reserve programs, although the environmental impacts need to be considered. Argentina has a substantial "unused or underused production potential," as even Lester Brown indicates. He feels Argentina could double its grain exports from the current 10-12 million tons if the incentives were right.

Of even greater importance, the long anticipated impact of biotechnology on crop yields may now be near. Caution does suggest we wait to see actual results in farmers' fields. Corn borer resistant varieties of corn produced by genetic engineering will be commercially available in the U.S. in 1996. Scientists at the University of California at Davis recently created rice plants resistant to bacterial leaf blight, a major disease problem, by manipulating genes.

We do not, of course, have a crystal ball. Like everyone else, we can not foresee the future and are quite ready to admit it. The next couple of years will be interesting as the supply side response comes into view. If there is no major exogenous shock, such as a 1988 level drought in the U.S. Midwest, we suspect stocks should rebuild to comfortable levels over the next few years as the current higher prices ration demand and stimulate increased production. Overall, the next several years would be a more favorable period for agriculture, with a somewhat higher price plateau, than the years before 1995.

On the other hand, the Pacific Ocean appears to be entering the La Nina phase of its

temperature cycle, a pattern which preceded the droughts of 1983 and 1988 in the U.S. Midwest. A major U.S. drought in 1996 will literally explode the market by dollars per bushel. Expectations would be raised to unrealistic levels, including a land market boom like the mid-1970s, and eventually probably a bust similar to the early and mid-1980s.

Table 1

World Production and Ending Stocks

(million metric tons)

	90/91	91/92	92/93	93/94	94/95	95/96
Wheat						
Production	588.0	542.1	561.8	559.4	523.0	533.5
Stocks	145.4	132.8	144.9	140.7	113.2	97.1
Coarse grains						
Production	821.5	805.0	865.3	790.1	864.8	786.9
Stocks	134.5	134.6	162.8	122.3	130.4	89.1
Rice, milled						
Production	350.5	349.5	352.3	352.4	360.5	359.5
Stocks	58.8	56.7	54.3	49.8	49.3	42.8
Oilseeds						
Production	215.7	224.4	227.5	227.4	260.1	255.9
Stocks	23.4	21.8	23.5	20.1	27.1	24.5

Sources: USDA, Agricultural Outlook, October 1995; and USDA, Grain: World Market and Trade, December 1995.

Table 2

Prices (per bushel)

U.S. Futures Contracts*

	Lifetime low	Lifetime high
Corn (CBT) Dec. 95	$2.48	$3.39
Wheat (CBT) Dec. 95	3.42	5.12
Soybeans (CBT) Jan. 96	5.82	7.50

***As of January 7, 1996.**

Figure 1

WORLD WHEAT

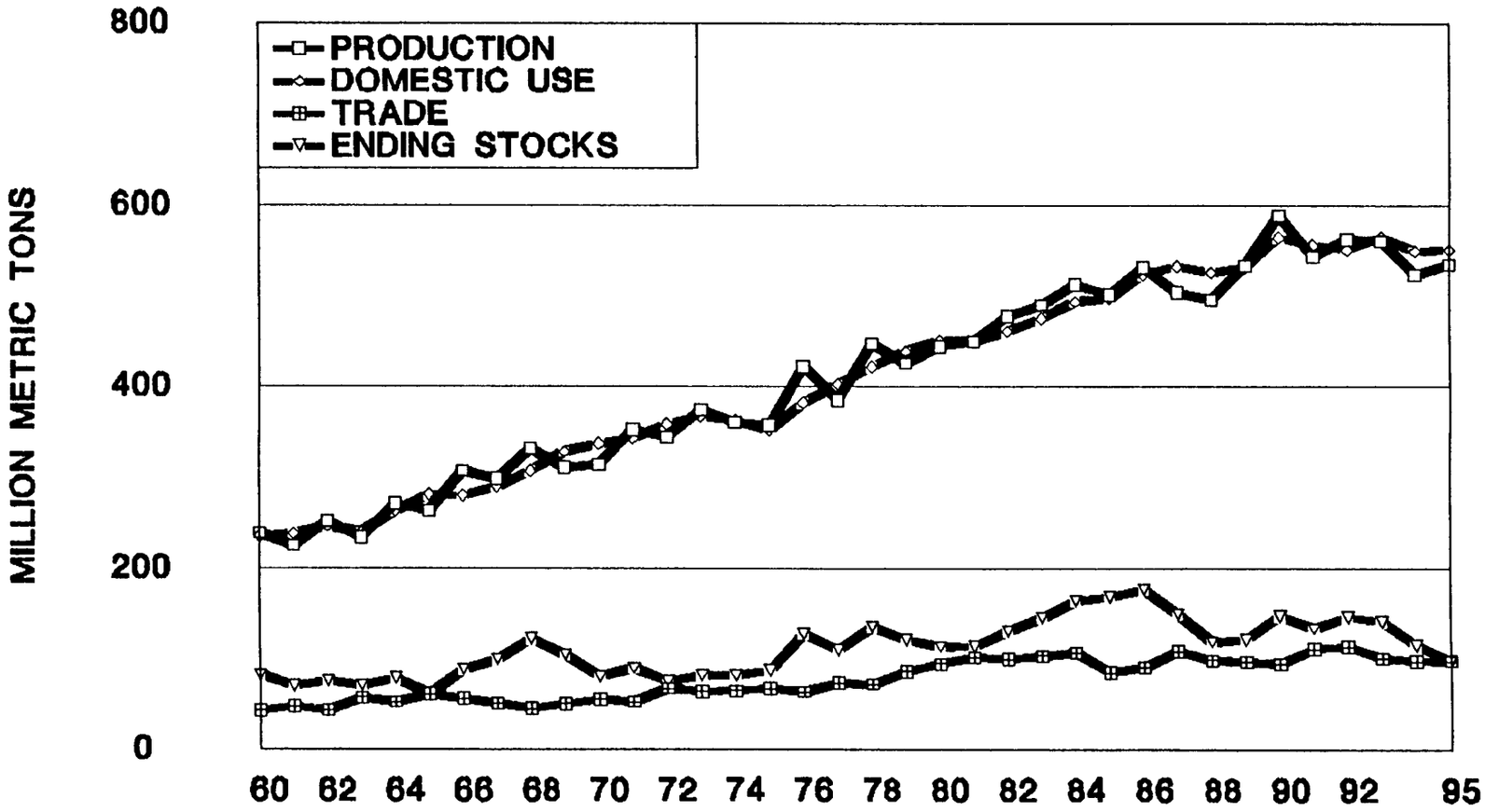


Figure 2

DECEMBER CORN FUTURES

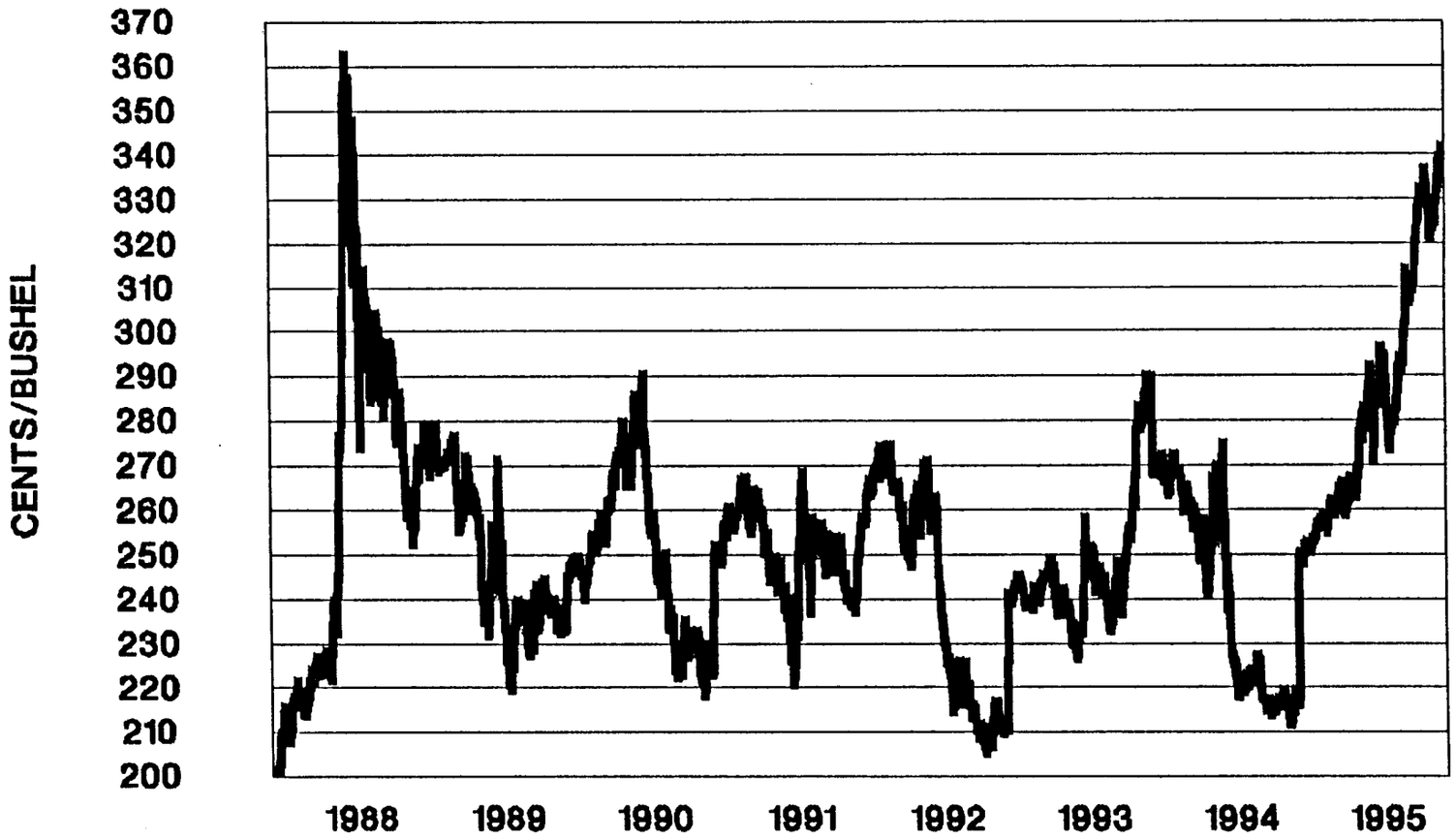


Figure 3

U.S. CORN

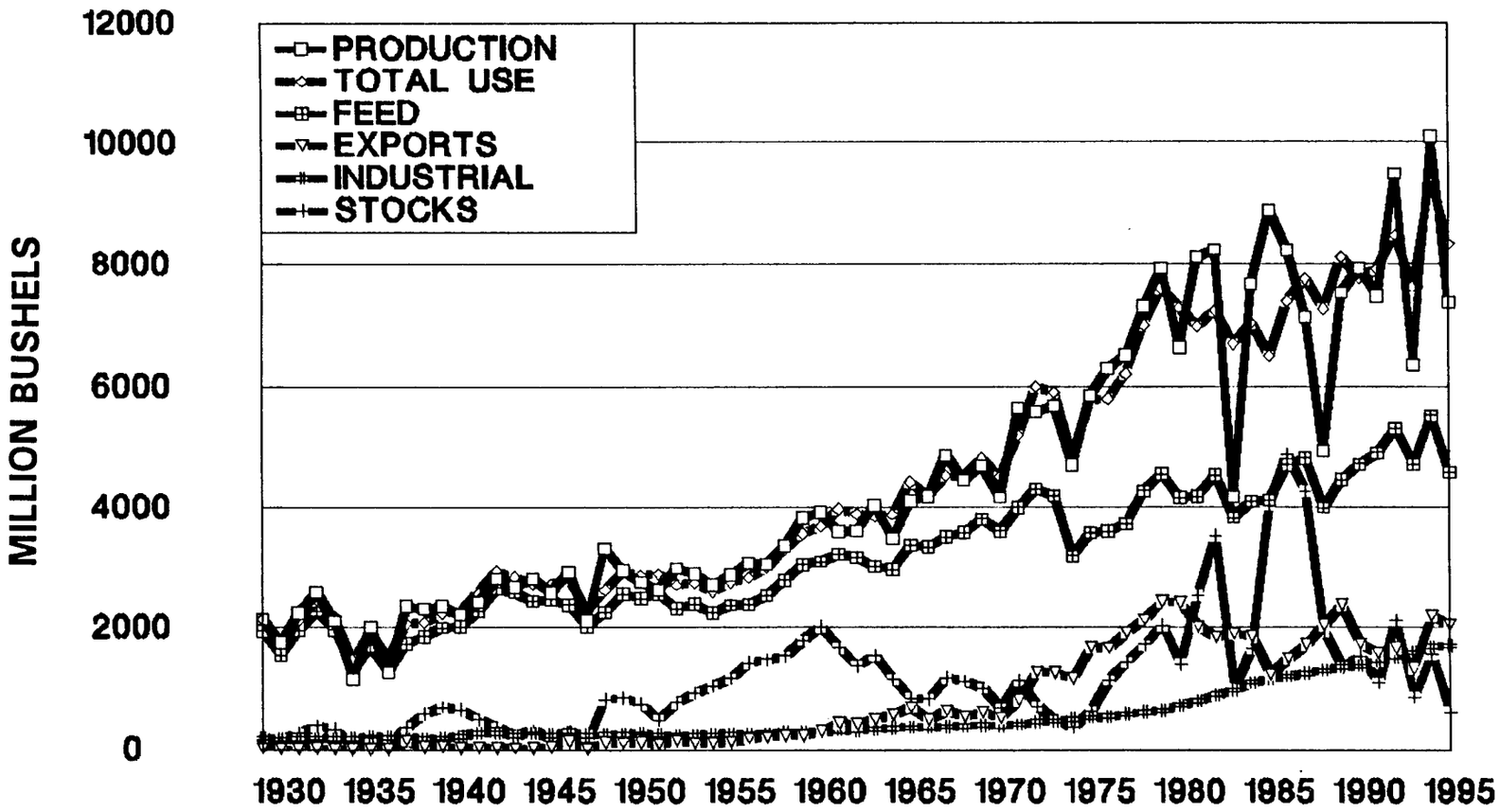


Figure 4

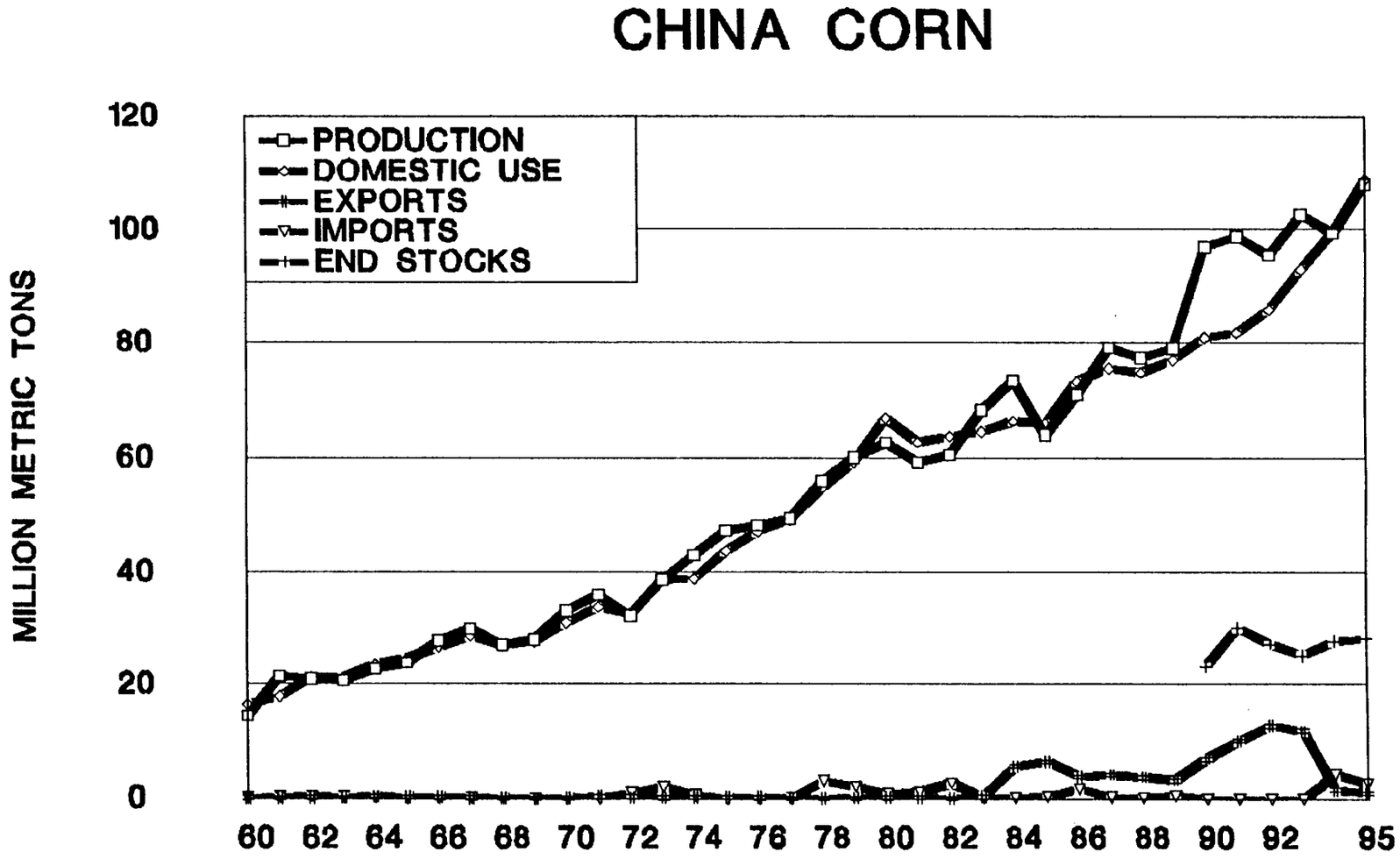
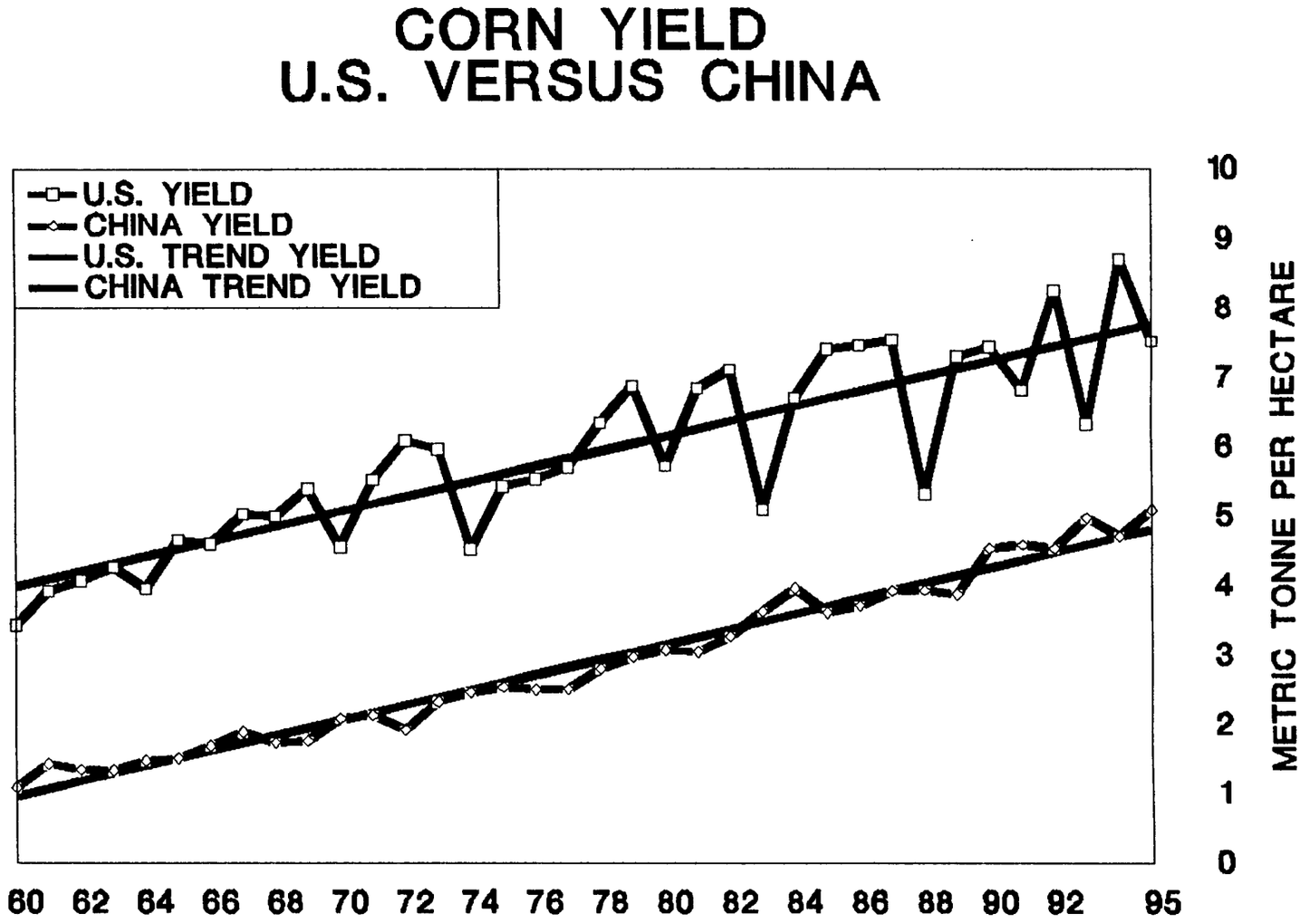

CHINA CORN
MILLION METRIC TONS
120
100
80
60
40
20
0
PRODUCTION
DOMESTIC USE
EXPORTS
IMPORTS
END STOCKS
60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 95

Figure 5


CORN YIELD
U.S. VERSUS CHINA
U.S. YIELD
CHINA YIELD
U.S. TREND YIELD
CHINA TREND YIELD
METRIC TONNE PER HECTARE
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