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THE 1952-77 RECORD

Starting with an output of 154.5 million metric tons in 1952, total grain output in the People's Republic of China reached 270 million metric tons in 1977, an increase of 75 percent (Table 3). The average annual rate of increase of 2.3 percent exceeded the average population growth rate of 2.1 percent.[23]

Gross value of agricultural output (GVAO) rose from 40.05 billion yuan (in constant 1952 prices) to 78.82 during 1952-77, a jump of 97 percent or 2.9 percent per year (Table 1). Unlike other agricultures characterized by dynamic technological and productivity advances, growth in inputs outpaced growth in output, rising 131 percent (Table 4). As a consequence total factor productivity dropped 15 percent or 0.6 percent a year (Table 5). The increase in resource use was particularly noteworthy for inputs purchased from outside agriculture: power equipment and machinery, and modern current inputs such as fuel and electric power, chemical fertilizers, and chemicals for disease and insect control. (See Tables 4 and 5 and Appendix 1, Tables 11, 12, 14, 15, and 17.) Modernization in this context refers not only to the provision of inputs from the outside that are qualitatively new and different from the traditional varieties, but also the transfer of traditional agricultural activities and processes of an intermediate character from agriculture to the outside. Thus mechanical power not only replaced draft animals, but the feed (or equivalent farm output) saved became an end product of the sector, either directly or indirectly when used to produce livestock products. Under the Chinese-Soviet definition of gross output value, grain imports when embodied in livestock product also add to gross value of agricultural output. Because of this double counting, the Chinese-Soviet-type GVAO becomes increasingly misleading if taken as a measure of the sector's contribution to the national economy. Part of the difference between the higher growth rates for GVAO and for grain output is attributable to double counting.

This is not to minimize the critical importance of modern nonfarm-supplied inputs in agricultural development. Two aspects may be noted. First, modern inputs underpin the generation of new, low-cost income streams in agriculture. Second, they ease the two principal constraints operating in agriculture—time and space as imposed by nature—by permitting transfers of agricultural activities to an industry not so constrained.[24] In other words, the final output of the sector is the joint product of internal and external inputs. As such the problem does not lend itself to neat accounting solutions.

With this caveat in mind, the value added by agriculture (VABA) as an indicator of the sector's contribution to the gross domestic product of the People's Republic is used. VABA, as defined here, is gross of depreciation charges on farm machinery, equipment, and service buildings. VABA increased by only 42 percent as compared with 97 percent for GVAO, or by an annual rate of 1.7 percent (Table 1). In net terms (not attempted in this study), the pace of increase in sector contribution to the Chinese national economy would be slower still. The modest rate of increase in agriculture's contribution has meant a stagnant or declining value added per worker (Table 5). Value added is traceable to the employment of so-called primary factors of production: labor, land, and capital. These factors as an aggregate rose by 62 percent during 1952-77, as compared to a 42 percent increase in VABA, leading to a primary factor productivity decline of 12 percent (Table 5).

The Chinese productivity under the CCP was none too impressive. Nor was the sector's capacity to generate value added. Agriculture managed to deliver end products in quantities large enough and rising fast enough to meet the elemental needs of China's expanding population, not through finesse, but by a massive injection of resources, particularly those of external origin. This record contrasts sharply with the agricultural productivity gains of Japan, South Korea, and Taiwan.[25]

Grains as a group showed an average annual output growth rate of 2.3 percent during 1952-57 compared with the GVAO

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Table 3— Quantity and value of output of grains, soybeans, and cotton, 1952 to 1977

Year	Rice	Wheat	Coarse Grains[a]	Potatoes (Grain Equivalent)[b]	Total Grain Quantity[c]	Value[d]	Soybeans Quantity	Value[d]	Cotton Quantity	Value[d]
			(million metric tons)			(billion yuan)	(million metric tons)	(billion yuan)	(million metric tons)	(billion yuan)
1952	68.45	18.10	51.50	16.35	154.40	18.95	9.52	1.33	1.30	2.21
1953	71.25	18.30	50.70	16.65	156.90	19.23	9.93	1.39	1.17	1.99
1954	70.85	23.35	49.25	17.00	160.45	19.88	9.08	1.27	1.06	1.81
1955	78.00	22.95	54.95	18.90	174.80	21.56	9.12	1.28	1.52	2.58
1956	82.45	24.80	53.40	21.85	182.50	22.61	10.23	1.43	1.44	2.45
1957	86.80	23.65	52.65	21.90	185.00	22.81	10.04	1.41	1.64	2.78
1958	93.00	25.00	52.00	30.00	200.00	24.70	10.50	1.47	1.60	2.72
1959	79.00	24.00	41.00	21.00	165.00	20.34	11.50	1.61	1.35	2.29
1960	73.00	21.00	36.00	20.00	150.00	18.50	8.20	1.15	0.90	1.53
1961	78.00	16.00	44.00	24.00	162.00	19.97	7.90	1.11	0.89	1.51
1962	78.00	20.00	53.00	23.00	174.00	21.45	7.70	1.08	1.00	1.70
1963	80.00	22.00	56.00	25.00	183.00	22.56	7.04	0.99	1.10	1.87
1964	90.00	25.00	59.00	26.00	200.00	24.66	6.94	0.97	1.50	2.55
1965	90.00	25.00	60.00	25.00	200.00	24.66	6.84	0.96	1.65	2.80
1966	96.00	28.00	66.00	25.00	215.00	26.51	6.80	0.95	1.81	3.07
1967	100.00	28.00	76.00	26.00	230.00	28.36	6.95	0.97	1.94	3.29
1968	95.00	25.00	70.00	25.00	215.00	26.51	6.48	0.91	1.81	3.07
1969	99.00	27.00	69.00	25.00	220.00	27.13	6.20	0.87	1.77	3.01
1970	110.00	31.00	75.00	24.00	240.00	29.59	6.90	0.97	2.00	3.40
1971	117.00	31.00	75.00	23.00	246.00	30.33	7.90	1.11	2.32	3.77
1972	112.00	36.00	69.00	23.00	240.00	29.59	8.70	1.21	2.13	3.62
1973	118.00	35.00	73.00	24.00	250.00	30.82	10.00	1.40	2.55	4.33
1974	127.50	38.00	74.50	25.00	265.00	32.67	9.50	1.33	2.50	4.24
1975	126.50	41.00	77.50	25.00	270.00	33.29	10.00	1.40	2.40	4.08
1976	125.50	45.00	76.50	25.00	272.00	33.54	9.00	1.26	2.35	3.99
1977	126.50	40.50	76.50	26.50	270.00	33.29	9.50	1.33	2.20	3.74

Sources: The 1952-57 figures for all categories except soybeans were taken from the People's Republic of China, State Statistical Bureau, *Ten Great Years* (Peking: Foreign Languages Press, 1960); the 1958-77 figures are from U. S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, *People's Republic of China Agricultural Situation: Review of 1977 and Outlook for 1978* (Washington, D. C.: USDA, 1978). The 1952-77 figures for soybeans are from People's Republic of China, Ministry of Agriculture, Bureau of Planning, *A Collection of Statistical Data on Agricultural Production of China and Other Major Countries* (Peking: Agricultural Publishing House, 1958); the 1958 figures are from State Statistical Bureau, *Ten Great Years*; the 1959 figures are from *Jen-min Jih-pao*, January 22, 1960.

Notes: Values are in constant 1952 yuan. Additional notes on this table appear in Appendix 2.

[a] Coarse grains include millet, corn, kiaoliang, barley, buckwheat, oats, proso-millet, small beans, green beans, broad beans, and peas.

[b] Potatoes were converted at a ratio of four metric tons of potatoes to one metric ton of grain.

[c] Total grain does not include soybeans.

[d] The 1952-57 figures were calculated with 1952 prices developed in Ta-Chung Liu and Kung-Chia Yeh, *The Economy of the Chinese Mainland: National Income and Economic Development, 1933-59* (Princeton: Princeton University Press, 1965). Aggregate prices for 1958-77 were calculated as sums of the prices of each type of grain, weighted by its average proportion in total output between 1951 and 1957.

annual rate of increase of 2.9 percent. Rice output increased 2.5 percent; potatoes, 1.3 percent; coarse grains, 2.3 percent; but soybeans decreased 0.5 percent. Wheat output grew 3.0 percent per year. (All growth rates here and elsewhere in this study are estimated from the exponential growth function.)

Cotton production rose by 3.2 percent a year. The highest nongrain output increase is registered, not surprisingly, by livestock products, with the annual rate standing at 4.2 percent.

In the base year 1952, grain output of 154.4 million metric tons was valued at 18.95 billion yuan (in 1952 prices), and accounted for 47.3 percent of a total GVAO of 40.5 billion yuan.[26] Livestock products contributed 12.4 percent, soybeans, 3.3 percent, and cotton, 5.5 percent. The re-

Table 4—The aggregate input index, 1952 to 1977

Year	Agricultural Labor Force[a]	Labor Input Index[b]	Sown Area Adjusted for Irrigation and Multiple Cropping[c]	Land Input Index[d]	Value of Farm Capital[e]	Capital Input Index[f]	Current Input Index[g]	Aggregate Input Index[h]
	(million)		(million hectares)		(billion 1952 yuan)			
1952	168.677	100.0	130.7	100.0	11.292	100.0	100	100
1953	169.940	100.7	132.6	101.5	12.024	106.5	107	102
1954	171.575	101.7	135.5	103.7	12.166	107.7	118	105
1955	174.134	103.2	137.9	105.5	11.885	105.3	128	108
1956	176.396	104.6	145.1	111.0	12.430	110.1	161	115
1957	177.267	105.1	145.0	110.9	13.084	115.9	164	116
1958	178.193	105.6	142.7	109.2	15.532	137.5	204	124
1959	179.688	106.5	139.5	106.7	14.014	124.1	220	125
1960	180.925	107.3	136.7	104.6	12.455	110.3	235	126
1961	182.544	108.2	134.0	102.5	11.887	105.3	186	118
1962	185.017	109.7	136.0	104.1	12.604	111.6	198	122
1963	188.107	111.5	138.3	105.8	14.132	125.1	220	128
1964	192.005	113.8	139.9	107.0	15.308	135.6	244	134
1965	196.471	116.5	142.2	108.8	17.103	151.5	271	141
1966	201.265	119.3	142.7	109.2	18.106	160.3	290	146
1967	205.476	121.8	143.1	109.5	18.542	164.2	306	151
1968	210.076	124.5	143.5	109.8	18.399	162.9	321	154
1969	214.946	127.4	144.0	110.2	18.519	164.0	341	159
1970	220.702	130.8	144.7	110.7	19.893	176.2	367	166
1971	226.582	134.3	146.1	111.8	21.468	190.1	400	174
1972	232.388	137.8	146.9	112.4	23.697	209.9	435	183
1973	238.274	141.3	148.4	113.5	23.280	206.2	464	189
1974	244.111	144.7	149.8	114.6	25.317	224.2	506	199
1975	250.010	148.2	151.7	116.1	26.703	236.5	552	209
1976	255.956	151.7	152.6	116.8	27.669	245.0	596	219
1977	262.052	155.4	153.5	117.4	28.371	251.2	659	231

Notes: For all indexes, 1952 = 100. Additional notes on this table appear in Appendix 2.

[a] This column is taken from Appendix 1, Table 11.

[b] This index was derived by dividing the agricultural labor force by 168.677.

[c] These figures are from Appendix 1, Table 14.

[d] These figures are from Appendix 1, Table 14.

[e] Includes the value of livestock holdings from Appendix 1, Table 15, the value of poultry (value of livestock holdings times 0.0385) and the value of machinery, estimated by multiplying total horsepower of tractors and irrigation power equipment from Appendix 1, Table 18, by the weighted average of 1952 draft animal prices from Appendix 1, Table 15.

[f] This index was derived by dividing the value of farm capital by 11.292.

[g] This column is from Appendix 1, Table 14.

[h] This index is the weighted average of the other four input indexes in this table. The weights are 50 percent for labor, 25 percent for land, 10 percent for capital inputs, and 15 percent for current inputs.

maining 30 percent was contributed by vegetables, fruits, pulses, nuts, and miscellaneous products.[27]

As measured by the aggregate input index, real resources cost (in 1952 prices) required to generate output growth rose by 131 percent between 1952 and 1977 (Table 4). In production function analog, the aggregate input index is also a theoretical index of output in the absence of any technical change (and under certain assumptions about the markets and technical properties

of the function).[28] The GVAO index, as seen earlier, rose by only 97 percent (Table 5). Technically, there have been downward shifts in the aggregate agricultural production function in the People's Republic. This suggests the conclusion that the Chinese output growth has been realized at high resource cost, especially when compared with other East Asian nations.

It is our belief that the command economic system and the Chinese development strategy tend to undermine producer-worker

Table 5—Factor productivity index, total and primary, and value added per worker, 1952 to 1977

Year	Gross Value of Agricultural Output Index		Aggregate Input Index[c]	Total Factor Productivity Index[d]		Value-Added Index[e]	Primary Input Index[f]	Primary Factor Productivity Index[g]	Value Added Per Worker[h]
	Un-adjusted[a]	Adjusted[b]		Un-adjusted	Adjusted				
									(1952 yuan)
1952	100	100	100	100	100	100	100	100	218.3
1953	103	101	102	101	99	102	103	99	222.8
1954	106	103	105	101	98	106	104	102	227.6
1955	115	110	108	106	102	114	105	109	241.5
1956	120	113	115	104	98	118	108	109	247.0
1957	125	118	116	108	102	122	110	111	254.2
1958	139	131	124	112	106	135	113	119	280.1
1959	112	106	125	90	85	105	111	94	215.6
1960	95	90	126	75	71	87	108	80	177.3
1961	100	94	118	85	80	94	107	88	190.5
1962	111	105	122	91	86	105	109	96	209.1
1963	122	115	128	95	90	114	114	100	223.5
1964	132	125	134	99	93	123	118	104	235.3
1965	141	133	141	100	94	128	123	104	240.7
1966	150	141	146	103	96	135	126	107	247.7
1967	159	150	151	105	99	143	128	112	256.0
1968	149	140	154	97	91	131	129	101	229.4
1969	152	143	159	95	90	131	131	100	224.1
1970	168	158	166	101	95	144	134	107	240.9
1971	171	161	174	98	93	143	139	103	231.6
1972	179	169	183	98	92	146	144	101	231.6
1973	189	178	189	100	94	153	146	105	237.1
1974	194	183	199	97	92	155	151	103	234.2
1975	198	187	209	95	89	156	155	101	230.5
1976	198	187	219	90	85	156	159	98	224.4
1977	197	186	231	85	81	142	162	88	199.7

Note: Additional notes on this table appear in Appendix 2.

[a] This index was computed from Table 1.

[b] In this column, 6 percent underrecovery is assumed for 1952. This is reduced 1.5 percent a year until 1956.

[c] This column is from Table 4.

[d] These columns were derived by dividing the gross value of agricultural output index (unadjusted or adjusted) by the aggregate input index.

[e] This column was calculated from Table 1. The output value underlying this index is not adjusted for underrecovery.

[f] This index includes land, labor, capital, and nonpurchased fertilizer, the last from Appendix 1, Table 17.

[g] This index was derived by dividing the value-added index by the primary input index.

[h] This column was derived by dividing the value added by agriculture (from Table 1) by the agricultural labor force (from Table 4).

incentive, discourage cost-reducing innovations, distort economic signals, and exaggerate aversions toward risk. The bureaucratic controls needed to insure compliance with the central design mean irresponsiveness, rigidity, and delay. In the larger (power-oriented) Communist context, decentralization cannot be total. When attempted as a localized partial scheme giving local responsibility without commensurate power to command resources or to alter mixes for greater efficiency, it often destabilizes the system. Decentralization and recentralization and other forms of experimentation come and go in Soviet-type economies without notable success. This is not to say that such a system is about to break down. In fact, the central virtue of the system from the standpoint of Communist leadership values and goals is its ability to bring about larger savings ratios than are generally attainable in market economies and to con-

centrate resources thus mobilized for the central purposes of the state. Given high savings ratios, growth is going to be vigorous despite difficulty in resource allocation and management. It will be especially so in high-priority heavy industries where output is more standardized and workers and management are more easily monitored. Difficulties are much greater in consumer goods industries where the problems of a bureaucracy mediating between millions of consumers and thousands of state enterprises become intractable. And the more affluent the consumers, the greater are the difficulties for the planners, as quality, diversity, assortment, and after-sales service become increasingly more critical.[29]

The planner's problems are compounded in agriculture. The producers are more numerous, the spatial dimension looms large, and parameters are location-specific. The human factor takes on singular importance at the local level. Organizational and incentive issues require a delicate balancing between private and collective activities, compulsory and free marketing, and agricultural and nonagricultural production.

In farming the basic clash between the household and the planner tends to be at its sharpest. The fact that the Chinese household has seen little increase in income and consumption since the 1950s does not make the planner's task any easier. The Chinese worker, in or out of agriculture, rates low in effort compared with his East Asian counterparts. The Chinese enterprise manager does not perform any better. These problems have been generally observed in all the Marxist-socialist economies modeled after the Soviet command system.[30] Against this background, caution may be well advised in projecting the efficacy of China's post-Mao policies under Deng.

The new policy, by elevating the role of material incentives, should help on the cost or productivity side. This has been taken into account in making projections to the year 2000. It is, however, unlikely that major breakthroughs will take place in the future as long as the command system remains in place, which is expected.

Turning to the components of resource cost, our estimate of effective sown acreage adjusted for irrigation and multiple cropping shows an annual rate of increase of 0.5 percent (Appendix 1, Table 14). The agricultural labor force grew at 1.8 percent a year, whereas farm capital (livestock and equipment) increased at 3.8 percent annually (Appendix 1, Tables 11 and 16). The primary input index rose 62 percent over the 25-year period, or at an annual rate of 2 percent (Table 5). Livestock inventories grew 3 percent a year, whereas tractors and power irrigation equipment (in horsepower units) showed an average annual growth of 22.8 percent each (Appendix 1, Tables 15 and 18). Cultivated land area is estimated at 107 million hectares for the entire period, although some increases may have occurred in the first plan period. The multiple-cropping index rose at a moderate rate of 0.6 percent a year, reaching 158 percent in 1977 (Appendix 1, Table 14).

Current inputs as a whole increased by 560 percent during 1952-77, or at an annual rate of 6.9 percent. All fertilizers (in nutrient terms) registered an annual increase of 4.4 percent with organic fertilizer rising at 3.2 percent and chemical fertilizer at 17.2 percent. Total nutrients amounted to 31.49 million metric tons in 1977 compared to 10.23 million metric tons in 1952. In the latter year they consisted of 22.99 million metric tons of organic nutrients and 8.50 million metric tons of chemical-based nutrients (Appendix 1, Table 12). The 1977 application rate was 186 kilograms of total nutrients per hectare of sown land with chemical fertilizers accounting for only 50 kilograms. The latter rate is low by East Asian standards, amounting to about one-tenth the Japanese rate of chemical fertilizer application and one-fifth the Taiwanese rate. Although the total nutrient application rate is much higher by international standards and Chinese crop yields per unit of sown land area are roughly commensurate with total fertilization, there is scope for further increases in both. It is useful to remember that there are qualitative differences between organic and chemical fertilizers in release and absorption properties. There is also much scope for qualitative improvement of chemical fertilizers with expected future decline in the relative importance of low-quality nitrogen fertilizer produced in small-scale rural plants using locally available coal as the base. The payoff will depend on concurrent development of new high-response seed varieties.

The State Statistical Bureau (SSB) recently published, for the first time since 1958, statistics in a systematic compendium form. The releases are on a limited scale and without notes and explanations. *Beijing*

Review, July 6, 1979, pages 37-41, published SSB output data for 1977 and 1978 on major industrial and agricultural products, along with gross value aggregates, year-end population, and current natural rates of increase. The issue, October 5, 1979, honoring the 30th birthday of the People's Republic carried shorter comparative statistics from 1949 and 1952 data published earlier. It also resolved the mystery about the treatment of soybeans and the potato-grain conversion rate in official data fragments that filtered out of the People's Republic during the "information blackout period." It is now clear that these grain statistics included soybeans but continued to use the four-to-one ratio in converting potatoes into grains (contrary to CIA's long-standing assumption).

A comparison of these estimates with the new official data is summarized in Table 2. Because the differences will make only marginal changes (as discussed in the notes to the table in Appendix 2) to the historical growth rates, which were estimated from the fitted exponential functions, the present estimates are kept. Also, in the interest of completing the study for early circulation, 1978 was not included in the time series. It was also felt that because of the length of the series, the historical growth rates would be little affected by the inclusion of one more year. It should be noted that insofar as 1977 was used as the base year for the later projections for 2000, the trend values for 1977 rather than the actual values as estimated in our series were employed as benchmarks. Trend values for 1977 would be virtually unchanged if the 1977 estimates were modified in light of the new official releases.

With no information on stock changes, it is difficult to estimate China's grain consumption. The grain consumption and stock change estimates in Table 6 are strictly for heuristic purposes. These crude estimates show a present Chinese strategic food reserve of just under 50 million metric tons, a figure roughly equivalent to total net grain import over the period. Total grain consumption rose 81 percent or 2.4 percent a year between 1952 and 1977. Grain consumption per capita showed only a negligible rise, from 270 kilograms to 289 kilograms.

The estimation procedure assumes that the planner determines consumption for the current year on the basis of current supply availability (output plus net import or minus net export) while abstracting from supply fluctuations. Operationally, it is assumed that the planner uses the average of the supplies of the current year and the two preceding years. The adjusted moving average is centered on the year immediately preceding. In the presence of a trend, it is necessary to recenter it on the current year by applying the trend factor as an adjustment. The trend factor is the average long-term grain output growth rate of 2.35 percent. In other words, the moving average is multiplied by 1.0235. The moving average method is a plausible way to approximate planner actions for consumption and thus stocks.

The simple moving-average method is applied to the 1950s when, because of the relative food security afforded by a friendly Soviet Union, stock operations in China were assumed to be not for strategic buildup but for smoothing out supply fluctuations only. The same assumption applies to the early post-Leap years because of the country's inability to mount a reserve stock program during the food crisis following the Great Leap Forward. However, because of the large percentage increase in current supplies in those years, estimated stock changes resulted in some accumulations. Beginning with 1965 an annual set-aside of 0.5 percent of the current supply is assumed for the reserve stock buildup. The calculation involves multiplying the moving average adjusted for the trend by a factor of 0.995 (Table 6). This procedure yields an accumulated strategic reserve of 48 million metric tons by 1977, which is consistent with the 40 million metric ton figure for the mid-1970s announced by Zhou Enlai on several occasions. The long-term target stated by Li Xiannian is a reserve of 80 million metric tons.

Gauging Household Income Growth Rise Through GVAO Estimates, 1952-77

Although the procedure may raise more questions than it answers, it is tempting to estimate the probable magnitude of the historical rise in real per capita income in the hands of the Chinese household.

Evidence abounds suggesting that the income growth that filtered down to the

Table 6—Estimated consumption of grains, excluding soybeans, 1952 to 1977

Year	Output	Exports	Imports	Current Supply[a]	Estimated Consumption[b] Total	Estimated Consumption[b] Per Capita[c]	Estimated National Stock Change[d]
				(million metric tons)		(kilograms)	(million metric tons)
1952	154.40	0.65	. . .	153.7	153.7	270	0.0
1953	156.90	0.76	. . .	156.1	156.1	268	0.0
1954	160.45	0.88	. . .	159.6	159.6	268	0.0
1955	174.80	1.13	. . .	173.7	166.9	274	+6.8
1956	182.50	1.18	. . .	181.3	175.5	281	+5.8
1957	185.00	1.15	. . .	183.8	183.8	287	0.0
1958	200.00	1.16	. . .	198.8	192.4	294	+6.4
1959	165.00	1.17	. . .	163.8	173.8	260	−10.0
1960	150.00	1.18	. . .	148.8	157.8	231	−9.0
1961	162.00	0.37	6.2	167.8	163.9	236	+3.9
1962	174.00	0.56	5.3	178.7	169.0	240	+9.7
1963	183.00	0.66	5.7	188.0	182.4	254	+5.6
1964	200.00	0.70	6.8	206.1	195.4	266	+10.7
1965	200.00	0.70	5.7	205.0	203.4	271	+1.6
1966	215.00	0.87	5.6	219.7	214.1	279	+5.6
1967	230.00	0.68	4.1	233.4	223.4	285	+10.0
1968	215.00	0.74	4.4	218.7	228.1	284	−9.4
1969	220.00	0.80	3.9	223.1	229.2	279	−6.1
1970	240.00	0.86	4.6	243.7	232.7	277	+11.0
1971	246.00	0.92	3.1	248.2	242.7	282	+5.5
1972	240.00	0.90	4.6	243.7	249.6	284	−5.9
1973	250.00	2.14	7.6	255.5	253.6	282	+1.9
1974	265.00	1.98	6.8	269.8	261.1	285	+8.7
1975	270.00	1.44	3.5	272.1	270.7	290	+1.4
1976	272.00	0.90	2.1	273.2	276.7	291	−3.5
1977	270.00	0.70	6.9	276.2	278.8	289	−2.6
Total		25.18	86.9				+48.1

Sources: The grain output figures are from Table 3. The 1952-57 grain export figures are from Nai-Ruenn Chen, *Chinese Economic Statistics: A Handbook for Mainland China* (Chicago: Aldine, 1967); the 1958-59 figures are interpolations; the 1960-67 figures were pieced together from USDA sources by Feng-Hwa Ma in *The Foreign Trade of Mainland China* (Chicago: Aldine, 1971), p. 23; the 1968-70 figures are linear interpolations; and the 1971-77 figures are from U. S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, *People's Republic of China Agricultural Situation: Review of 1977 and Outlook for 1978* (Washington, D. C.: USDA, 1978), p. 23, and U. S. Central Intelligence Agency, Office of Economic Research, "China: Agriculture in 1978," ER79-10206, Washington, D. C., April 1979, p. 6. Grain import figures for 1961-70 were assembled from various CIA studies and Alexander Eckstein, *China's Economic Revolution* (Cambridge: Cambridge University Press, 1977); the 1970-77 figures are from the same sources as the grain export figures for the period.

Note: Additional notes on this table appear in Appendix 2.

[a] These figures are the difference between exports and imports added to output. They represent total domestic availability without regard to changes in stocks.

[b] The 1952-64 figures are averages of current supply. The 1965-77 figures take stock changes into account.

[c] These figures are the results of dividing total estimated consumption by the population estimates from Appendix 1, Table 16.

[d] These figures are the difference between current supply and estimated total consumption.

households has been a small part of the total annual gain in national production. There have been virtually no pay raises in China since the 1950s, and meager improvement of the observable general level of living attests to that. Household income gains that have been realized were largely the result of fuller employment and in-

creased labor force participation.

As already suggested, if household income gains had kept pace with real GDP growth and food had not been rationed, a 5 percent Chinese annual GNP growth would have generated an annual increase of some 4.4 percent in total food consumption. The latter figure (Δ d/d) is the sum of population

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growth rate (Δ p/p = 2.1 percent) and per capita GNP growth (Δ y/y = 2.9 percent) times the income elasticity of demand for food (plausibly e = 0.08 for China). Food production and consumption did not rise by 4.4 percent per year in China. Rationing, which lowered income elasticity by denying its full expression, and the partial filtering down of the GNP gains explain how the People's Republic has been able to get by with an overall agricultural output growth of only 2.9 percent a year.

With Δ d/d = 2.9 percent as given by the historical average rate of growth of GVAO, Δ p/p = 2.1 percent and e put at 0.6 to reflect food market restrictions, the magnitude of Δ y/y can be inferred. In these terms Chinese household incomes (or technically, per capita disposable income, which is the same as personal income in China) by inference have risen at a rate of 1.33 percent a year during 1952-77.

Chen Muohua, one of China's Vice-Premiers, in a major policy article in the *People's Daily* (August 11, 1979, page 2), on "four modernizations," elaborated on the country's retardation against an unusual backdrop of comparative incomes drawn from the United States and Japan. He highlighted the need for modernization. He used the figure U.S. $139 (in current prices presumably) as the 1976 "national income per capita." This was compared with $7,028 for the United States and $4,193 for Japan. It is reasonable to suppose that the Vice-Premier had made use of comparable statistics for consistent international comparisons. In these terms, it would seem clear from the magnitude of the U.S. and Japanese per capita figures cited in the article that "national income" referred to personal income.

Vice-Premier Chen also gave per-capita incomes for some earlier years, all in U.S. dollars. Without usable Chinese price indexes, it is difficult to obtain growth rates from them. Taking the year 1965 to mark off the period to 1976 and using the lowest rate of consumer price increase among the socialist countries (that is the Soviet Union's 16 percent increase over the period) to apply to China, Chen's 1965 per capita figure of $78, translated into 195 (1965) yuan or 226 (1976) yuan. The 1976 per capita income of $139 converts to 268 (1976) yuan using the same source for the exchange rate. An increase from 226 yuan to 268 over 11 years yields an average rate of growth of 1.5 percent compared to the 1.33 percent inferred above from food consumption estimates. The comparison supports the study's estimates of agricultural output, income, and demand in the People's Republic during the historical period under review.[31]

FOOTNOTES

[23] Average growth rates presented in this study are all compounded rates estimated from the standard exponential function in natural logarithmic transformation fitted to the time series shown in the tables above. The population series by Aird is in Appendix 1, Table 16.

[24] For a fascinating discussion of the differences between agriculture and industry, see Nicholas Georgescu-Roegen, "Process in Farming Versus Process in Manufacturing," in *Economic Problems of Agriculture in Industrial Societies: Proceedings of the International Economic Association, Rome, 1965*, ed. Ugo Papi and Charles Nunn (London: Macmillan, 1969), pp. 497-528.

[25] For empirical evidence on productivity growth in these countries, see Vernon W. Ruttan and Yujiro Hayami, eds., *Agricultural Growth in Japan, Taiwan, Korea, and the Philippines* (Honolulu: University of Hawaii Press, 1979); and Anthony M. Tang, "Research and Education in Japanese Agricultural Development," *Riron Keizai Gaku* [Economic Studies Quarterly] February 1963, pp. 27-41; May 1963, pp. 91-99.

[26] From Table 1. The table presents two GVAO estimates based upon different definitions of agricultural output. The definition used for the pre-1957 figures is broader and includes the value of fishery, processing, and side-occupation activities in the countryside. For a precise definition, see Appendix 2, Table 1. The definition used for the post-1957 figures, standard in current usage, comes close to what is generally understood to cover agricultural production. The GVAO reference in the text above uses the post-1957 definition.

[27] Growth rates in this section are calculated from Tables 1, 3, and 15.

[28] For those who feel uncomfortable with the production function analog because of the difficulties with the required assumptions in the Chinese context, the straightforward quantity index approach might be preferred. The productivity analysis in this study stands in either case.

[29] The literature on the strong and weak points of the Soviet-type command economies is vast. A good, concise introduction is Robert W. Campbell's *The Soviet-type Economies: Performance and Evolution*, 3rd ed. (Boston: Houghton-Mifflin, 1974). For an authoritative summary on conditions tending to reduce efficiency of centralized planning, see Bela Balassa, "Proposals for Economic Planning in Portugal," *Economia* 43 (May 1976): 117-24. Balassa discusses the need for simple, overriding goals for effective centralized planning and the difficulties created by rising affluence, by increasing sophistication of the economy, and by the mixture of ownership and control of the means of production as is found in Chinese agriculture (pp. 119-23).

[30] Balassa's recent work ("Proposals for Economic Planning") sheds considerable light, consistent with this generalization, on comparative growth performance between socialist and nonsocialist economies classified by level of development.

[31] In passing we note that against a per capita personal income of $139, the CIA estimate of Chinese GNP per capita of $379 (U.S. Central Intelligence Agency, "Handbook of Economic Statistics, 1979," ER79-10274, Washington, D.C., August 1979, pp. 22 and 50) for 1976 is too high even for a country whose overriding concern is growth. A Chinese private consumption ratio of about 37 percent is clearly too low when compared with the Soviet ratio of 56 percent in 1976 (CIA, "Handbook," 1979, p. 62), even though the latter includes government outlays for education and health.