5

THE PROJECTIONS

Hua Guofeng, in unveiling the new 1976-85 Ten-Year Plan, gave the following specific targets: population growth to be lowered to less than 1 percent a year in three years; grain output to increase 48.0 percent between 1977 and 1985, or at an average rate of 4.5 percent a year; gross value of agricultural output to grow at 4 to 5 percent a year; increased wages to be awarded step by step; and consumption of nonstaple foods to be stepped up.

By adopting an average population growth rate of 1 percent, an income elasticity of demand for food of 0.8 percent, and a growth rate of 4.5 percent for all agricultural output, one can determine the rate of increase of real per capita disposable (or personal) income implied by the Plan. The scenario envisions the Chinese achieving food balance without significant internal constraints on food consumption so that income elasticities will operate. By means of the ordinary time-rate relative change equation derived from a standard log-linear demand function, we have the following relationship:

$$\frac{\Delta d}{d} = \frac{\Delta P}{P} + e\ \frac{\Delta y}{y}$$

where the ratios refer respectively to the rate of demand increase per year, population growth rate per year, and per capita (disposable) income growth per year. The coefficient e stands for income elasticity of demand for all food taken collectively. Solving for the unknown income growth rate, implicit in the Plan targets under the assumed scenario $\Delta y/y$ yields 4.4 percent [(4.5 percent – 1.0 percent) ÷ 0.8]. This rate is compared to the historical rate of household income rise, crudely estimated in the preceding section at 1.3 percent for 1952-77.

Aggregate Demand Projections

In the following projections, future increases of 4 percent per year in real per capita disposable income are to be the highest level consistent with the new income-consumption policy. A higher figure would be difficult to reconcile with the development strategy discussed earlier, especially if the overall GNP growth rate is taken to be around 6 percent per year.

For all scenarios presented in Table 7, stable relative price structure is assumed. The high estimates presume unsuccessful population control, a relatively relaxed income-consumption policy for the people (against an implicitly assumed overall GNP growth rate of about 6 percent a year), and an average income elasticity (0.8) that assumes gradual relaxation of market restrictions. Gradual relaxation would raise e beyond what it would be if $\Delta y/y$ alone were operative. It is recognized that e falls as households enjoy long-term income improvement. In other words, the constant elasticity consumption function employed shifts as development proceeds. The assumed value of e is thus an average for the period.

The low projection assumes effective population control, a nominal income-consumption improvement policy for the masses, and continued tight rationing of basic foods as well as queuing. To stretch the raw farm supply, special effort will be made to absorb the "food yuan" in the hands of relatively affluent households by inflating the value added through fancy packaging, canning, and labor service embodied in processing and food service. The government also resorts to high-priced nonagricultural consumer goods to help soak up the consumers' purchasing power and to hold disincentive for work in check. Such developments are likely in any future scenario, but would be accentuated if austerity is the official posture.

The medium or probable projections assume an intermediate scenario. The present trend toward more moderate, pragmatic economic policies and programs would continue. For these policies to produce planned growth in productivity and output, an annual 2.5 percent increase in household income accompanied by freer expenditures on food would be required.

Table 7—Projections of demand for all agricultural output, 1977 to 2000

Projections	ΔP/p	Δy/y	e	Percent Increase in Demand for GVAO (Δd/d)		Projected GVAO 2000[a]
				Per Year	Total for Period	
	(percent)			(percent)		(billion 1952 yuan)
High	2.0	4.0	0.8	5.2	221	257.4
Low	1.0	1.5	0.4	1.6	46	117.1
Probable	1.5	2.5	0.6	3.0	97	158.0

Note: GVAO stands for gross value of agricultural output.

[a] Projections obtained by multiplying the 1977 GVAO trend value (80.2 billion yuan) by one plus the percent increase from 1977 to 2000.

This points to an income elasticity of 0.6. Moderate policies would bring less social control. They would mean more housing, shortage of which has been a key restraint on family formation. Meanwhile rural economics would still favor large families with many labor units. In short, this projection assumes a population growth rate of 1.5 percent a year, placing it higher than that of Peking's planners. The medium projections place the annual demand increase for all agricultural output at 3 percent, compared with 5.2 and 1.6 percent for high and low projections.

The grain demand projections distinguish between direct demand for foodgrains and indirect demand for feedgrains. From this perspective, the loss in calories that results when grains are converted into meats and other livestock products becomes an important consideration. Recent Chinese estimates put the output value of animal husbandry at 13.9 percent of "total agricultural production value."[32] This figure is close to the study's estimates, which for 1977 place the value of livestock product at 11.97 billion yuan, about 15 percent of the gross value of agricultural output. Shigeru Ishikawa states that livestock production requires 4.3 times as much land as production of an equivalent amount of grains.[33] This is in line with commonly accepted calorie-equivalent grain-meat conversion rates of two to one for poultry, four to one for pork, and six to one for beef. China will continue to rely heavily on field and household wastes as a feed supplement, but future incremental meat production will have to rely increasingly on grains.

The medium projections of Table 8 are considered the more probable magnitudes for 2000. Direct demand for foodgrains is projected to rise slowly at 2.1 percent a year, but indirect demand for feedgrains is expected to grow at more than three times that rate. Such a growth rate, 6.5 percent, would be in line with the experiences of Japan and Taiwan (see Table 8, footnote c). The increase in indirect demand derived from the high-income elasticity of livestock product demand helps explain the grain import explosion of Japan and Taiwan, which occurred as income levels soared, domestic grain output rose, and the Engel curves for (direct) grains leveled off and then fell. The future indirect demand estimated here takes into account future displacement of work animals by machines in addition to population growth, income change, and other standard factors.

All grain demand is projected to increase at 3 percent a year. Total demand over the 23-year period is expected to grow 97 percent to 538 million metric tons. In the benchmark year 1977, domestic grain output (trend value) was 273 million metric tons and total grain consumption 278.8 million metric tons.[34]

Aggregate Supply Projections

One of the main resource provisions of the Ten-Year Plan for agriculture appears to be to increase chemical fertilizer output in 1980 by 58 percent over 1977.[35] This is slightly higher than the historical annual growth of 18 percent. The Plan also mentions a goal of one "large chemical fertilizer plant" in each province by 1985, and continued encouragement for construction

Table 8—Projections of direct and indirect grain demand, 1977 to 2000

Projections	ΔP/P	Δy/y	Income Elasticity[a]			Projected Δd/d				
						Per Year				
			Direct Demand	Indirect Demand	All Demand[b]	Direct Demand	Indirect Demand	All Demand	Total Increase For Period[c]	Total Grain Demand in 2000[d]
	(percent)						(percent)		(percent)	(million metric tons)
High	2.0	4.0	0.30	2.5	0.74	3.2	12.0	4.96	204	831
Low	1.0	1.5	0.20	1.0	0.36	1.3	3.5	1.54	42	388
Medium	1.5	2.5	0.25	2.0	0.60	2.1	6.5	3.00	97	538

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

[a] Estimated income elasticities of demand for grain are averages for the period. They are considered plausible for China in relation to international statistical estimates. They are also more or less consistent with the elasticity estimates for China of the Food and Agriculture Organization of the United Nations.

[b] These figures are weighted averages of direct (0.8) and indirect (0.2) demand. Indirect demand is derived from consumer demand for livestock products.

[c] The total increase was calculated by compounding the yearly rates of increase (r) of all demand over the 23-year period using this formula: $(1+r)^{23} - 1$.

[d] This column was calculated by multiplying the 1977 trend value for grain output (273 million metric tons, excluding soybeans) by one plus the rates of increases of all demand in decimal form.

of local plants. The general thrust suggests probable continuation of the 1952-77 annual expansion rate of 7 percent for all current inputs (from Appendix 1, Table 12). In this study the 7 percent figure is used for the remainder of the century.

Another major provision deals with achieving 85 percent "basic mechanization" by 1985; improving quality; promoting standardization of parts; doubling some machine numbers in eight years; raising the utilization rate of available machines to over 80 percent; and reducing by 20 percent the price of farm machines by 1980. Perhaps the most meaningful single target is the planned increase of gasoline allocation to agriculture of 1.2 times (or a yearly increase of 10.4 percent) between 1977 and 1985. Taking this as an indication of total mechanization, a farm capital growth rate for 1977-2000 of 6 percent was projected.

This takes into account the slower—but higher than the historical—growth of the other main capital component, livestock. The Plan gives prominent mention to setting up mechanized and semimechanized livestock farms and to increasing nonstaple food consumption. Household raising of pigs, long the mainstay of China's livestock program, is not given much attention. Emphasis seems to be on "commercial-type" animal husbandry that is also consistent with limited possibilities for further expansion of household livestock-raising based on household and field wastes and with the inordinately large planned grain output target. The 1952-77 average annual growth rates are 23 percent for farm machinery and 3 percent for livestock holdings. Because the 1952-57 weights were highly skewed against machinery, the overall farm capital growth rate was 4 percent per year (Table 4 and Appendix 1, Tables 15 and 18). Our 6 percent for projected capital growth rate indicates the increased emphasis on mechanization.

Another aim of the Plan is to bring population growth down to less than 1 percent in three years. As noted earlier, this study projects a 1.5 percent growth rate. But lower growth rates for farm population and farm labor force are plausible, especially under the new moderate policy that implies freer future rural-urban migration. Therefore, this report adopts a 1 percent annual growth rate for farm labor force for 1977-2000, compared with the historical rate of 1.8 percent (from Appendix 1, Table 11).

The Plan also calls for enough farmland capital construction to provide every 15 members of the rural population with one hectare of farmland "guaranteed" to produce stable high yields irrespective of the weather. This involves nearly half of the country's total acreage. The scheme is to be backed by state-budgeted investment for capital construction for the next 8 years equal to the total for the past 28. There are also provisions for large-scale development of grassland and opening up of 13 million hectares of wasteland for cultivation in the Northeast and Northwest by 1985. A more determined drive toward mechanization for relaxing labor-time bottlenecks in peak seasons may be expected to raise the utilization rate of land under cultivation. This study uses 0.9 percent (almost twice the historical rate) for annual increase in effective (sown) land area (from Appendix 1, Table 14).

In making alternative sets of supply projections, it is assumed that the equal growth targets for GVAO and total grains, increasing shares of which will be used as feed, will be achieved though not necessarily reaching planned rates of 4.5 percent a year.

It is also expected that the annual rate of increase for each of the four input categories for 1977-2000 essentially will be as subjectively inferred from the Plan and as adopted. For low supply projections, the total factor productivity index (TFPI) is assumed to continue to decline at its 1952-77 rate of 0.65 percent per year. For medium or probable projections, an annual increase of +0.5 percent per year is used. For the high projections, the implications of the Plan are accepted, recognizing that the contents of the Plan are still a matter of conjecture. In other words, it is supposed that factor productivity will rise markedly so that the input-output relationship will come out as planned. This was done as follows:

$$\underset{\substack{\text{Planned}\\ \text{GVAO}\\ (1985/1977)}}{1.48} = \text{TFPI}\ (0.5 \times \underset{\text{Labor}}{1.01^8} + 0.25 \times \underset{\text{Land}}{1.009^8} + 0.1 \times \underset{\text{Capital}}{1.06^8} + 0.15 \times \underset{\text{Current Inputs}}{1.07^8}).$$

The sum of the terms inside the brackets is the aggregate input index (AII, with 1977 = 100 percent) for 1985. The weights are the factor income share weights used elsewhere in developing the Chinese historical series.[36] The rates of input increases adopted earlier appear as 1 + (the rate) compounded over eight years to produce the component input index for 1985 (1977 = 100 percent). This sum comes to 1.228. TFPI (1.48/1.228) is thus 1.2; that is, the 1985 total factor productivity needs to be 20 percent higher than in 1977 if the 1985 output target is to be achieved on the basis of what we inferred to be planned resource commitments. The annual increase in TFPI adopted for the high projections is thus 2.3 percent.

For the high aggregate supply projections for 2000, the annual rates of increase for each of the four categories of inputs are those worked out for the shorter Ten-Year Plan period. The TFPI improves at 2.3 percent a year. The low and the medium (or probable) differ from each other and from the high only by the annual change in TFPI: -0.5 percent (the 1952-77 rate rounded upward from -0.65 percent) for low projections and +0.5 percent for medium projections. The latter rate is purely judgmental. However, it is consistent with the Soviet experience in which total factor productivity changed from declines in the 1930s to moderate gains in the post-Stalin period. It is also consistent with China's move to relax restrictions on income and consumption for the farm households. Considerations discussed in Chapter 2 discourage the adoption of higher TFPI growth rates for the probable projections.

The aggregate supply projections are presented in Table 9. The medium projections anticipate a 92 percent increase in grain output between 1977 and 2000, to a total of 524 million metric tons. The annual rate of increase is 2.9 percent. GVAO is expected to reach 154 billion yuan in 2000 as compared to the 1977 trend value of 80.15 billion (all in 1952 prices). Further comment on supply projections appears in the consolidated demand and supply analysis below. If a reader wishes to infer stock and consumption changes from the consolidated statement, it is useful to recall Li Xiannian's announced long-term reserve stock target of 80 million metric tons and compare it to the estimated reserve of about 50 million metric tons in 1977 (Table 6).

Table 9—Domestic supply projections to 2000

Projections	Projected Indexes (1977 = 100 percent)			Projected Grain Output[d]	Projected Gross Value of Agricultural Output[e]
	Total Factor Productivity Index[a]	Aggregate Input Index[b]	Output Index[c]		
	(percent)			(million metric tons)	(billion 1952 yuan)
High	168.7	172.5	287	785	230
Low	89.1	172.5	154	420	123
Medium	112.1	172.5	192	524	154

Note: For the indexes, 1977 = 1.00.

[a] The total factor productivity index for high projections was obtained by compounding the annual rate of productivity increase of 2.3 percent, as inferred from the 1976-85 Ten-Year Plan; over the 23-year future period. For low projections, the compounding was based on the historical rate of annual productivity decline of 0.5 percent. Medium projections assume a modest annual rate of productivity increase of 0.5 percent as discussed and adopted in the text.

[b] A common index, as inferred from the Ten-Year Plan applies to all three sets of projections. The aggregate annual increase of 2.4 percent was first calculated as the weighted average of the following annual rates of increase: labor, 1 percent; land, 0.9 percent; capital, 6 percent; and current inputs, 7 percent. This aggregate rate is then compounded to the year 2000 to obtain the above index.

[c] These figures were derived by multiplying the total factor productivity index for 2000 by the aggregate input index for 2000.

[d] These figures were derived by multiplying the output index by the 1977 trend output (273 million metric tons).

[e] These figures were derived by multiplying the output index by the 1977 trend gross value of agricultural output (80.15 billion yuan).

FOOTNOTES

[32] See Ching Hua, "How to Speed Up China's Agricultural Development," *Peking Review*, October 1978, p. 12.

[33] Ishikawa, "China's Food and Agriculture."

[34] See Table 8 for projections based on alternative consumption and output benchmarks. The differences among alternative projections are small.

[35] Some of the details below are from Ching Hua, "How to Speed up China's Agriculture," pp. 8-12. The article attempted to flesh out the Plan's blueprint.

[36] For sources and methods, see notes to Tables 1, 4, and 5.