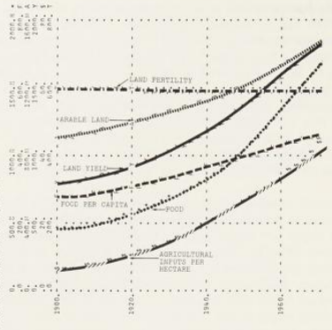

Figure 7-4 Run 7-3: agriculture sector behavior, 1900–1970

Increases in arable land AL and land yields LY cause a rise in food production over the historical period. The increase in land yields is primarily attributable to greater agricultural inputs per hectare AIPH (fertilizers, pesticides), for the land fertility LFERT remains nearly constant. Food per capita FPC also grows during the 70-year period but at a much slower rate than total food F, since the population is also increasing.

In the model, land yield LY is assumed to be a function of both the agricultural inputs per hectare AIPH applied to the land and the land fertility LFERT, defined as the ability of the soil to produce crops without the use of modern agricultural inputs. The increase in LY shown in Run 7-3 can be attributed to the increasing AIPH, for LFERT has actually decreased slightly over the 70-year period. This behavior seems to be consistent with available data, for Figures 4-4 and 4-5 indicate high rates of growth of agricultural inputs, and Chapter 4 gives some evidence (such as Figure 4-7) that land fertility may indeed be decreasing.

Nonrenewable Resource Sector Variables The historical time trends of the nonrenewable resource sector can be summarized as follows:

1. Exponential growth in the consumption of resources, caused by:
   a. Increasing population.
   b. Increasing per capita resource usage.
2. The fraction of capital allocated to obtaining resources FCAOR remains constant over time. This behavior actually reflects two trends: a tendency toward

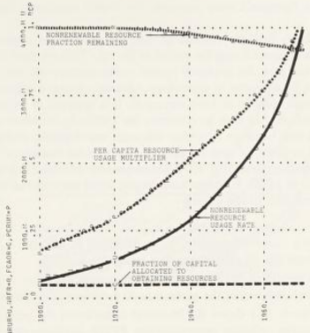

Figure 7-5 Run 7-4: nonrenewable resource sector behavior, 1900–1970

The rate of usage of nonrenewable resources NRUR grows exponentially at 4 percent per year over the historical period. This continuous increase is caused by the growth in both population POP and resource usage per capita PCRUM. Per capita resource usage rises as a result of industrial development. The increase in resource usage occurs at no additional increase in unit costs (see FCAOR in graph), in accordance with historical trends. In 1970, over 90 percent of the initial supply of nonrenewable resources remains to be used.

increases in resource costs over time due to depletion effects, and advances in cost-reducing resource technologies that tend to offset these depletion effects.

Run 7-4 (Figure 7-5) shows the behavior of the nonrenewable resource sector variables over the 70-year historical period of the simulation. In this figure, the nonrenewable resource usage rate NRUR grows exponentially at an average of 4 percent per year over the period. According to data collected by the National Commission on Materials Policy, the production of world resources grew historically at a rate of 4.1 percent per year between 1950 and 1970 (NCMP 1972). The growth in the nonrenewable resource usage rate NRUR can be divided into two components: growth in population POP and growth in the per capita resource usage multiplier PCRUM. In the model, population grows at an average rate of 1.2 percent per year, which is the historical average growth rate for the 70-year period. Per capita resource usage grows at 2.8 percent per year in the model, compared with the historical world average growth rate of 2.6 percent per year from 1950 to 1970 (U.N. 1969, NCMP 1972). This increase in per capita resource usage is caused by industrial development