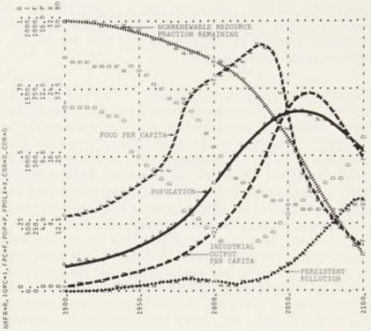

Figure 7-21 Run 7-16: resource, pollution, and land yield technologies
Note: The scale of IOPC has been increased from 1,000 to 2,000 dollars per person-year.
To increase food production, new agricultural technologies are implemented, augmenting the resource and pollution technologies of the previous run; they increase the land yield LY by a factor of 2 in 1975. This policy successfully raises the level of food in the short run, but in the long run the high yields cause increased land erosion, which later decreases the available food. After the year 2050 the higher rate of erosion depresses yields (and thus food per capita FPC) below the values observed in the previous run. As a result, population POP and industrial output per capita IOPC decline earlier than in Run 7-15, which assumed no new land yield technologies.

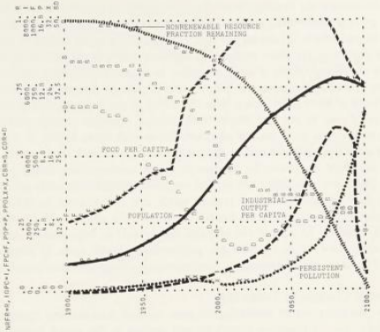

Figure 7-22 Run 7-17: resource, pollution, and agricultural technologies
Note: The scale of IOPC has been increased from 1,000 to 8,000 dollars per person-year.
The resource, pollution, and land yield technologies of the previous run are supplemented in 1975 by an improvement in land maintenance technologies. These new technologies ensure that higher land yields do not lead to any significant increase in land erosion. The reduced constraints in the resource, pollution, and agriculture sectors allow population POP and industrial output per capita IOPC to continue to grow until the effects of resource depletion are again evident, as in the reference run. Both population POP and industrial output per capita IOPC decline after the year 2080.

nologies are implemented in 1975, which reduce the amount of erosion caused by intensive land cultivation. One might expect that the combined effects of increased resource, pollution, and agricultural technologies would ensure that population POP and industrial output per capita IOPC could continue to grow for the duration of the run. However, Run 7-17 shows that growth is halted in the year 2080, only 20 years later than in the previous run.

In Run 7-17 the reduction of the growth-limiting pressures from the resource, pollution, and agriculture sectors allows population POP to grow to over 12 billion people and industrial output per capita IOPC to reach almost 5,000 dollars per person-year by the year 2080 (note that the scale for industrial output per capita IOPC has been changed). Per capita resource usage levels off at 7 times the 1970 level of per capita usage as industrial output per capita exceeds 1,400 dollars per person-year. However, the increases in population and in affluence cause the resource usage rate to grow to over 23 times its 1970 value by the year 2080. Even though the policies tested in this run include a reduction of per capita resource usage by a factor of 8 in 1975, resources have been depleted by the year 2080 to the point where the fraction of capital allocated to obtaining resources begins to rise. This rise in resource costs forces a decline in industrial output per capita IOPC similar to that exhibited by the reference run (Figure 7-7).

Runs 7-12 through 7-17 illustrate that discrete technological advances designed to remove the pressures limiting growth in the system are ineffective in avoiding the overshoot and decline behavior mode. Unless accompanied by social policies, technological improvements tend to be short-term solutions that only postpone an ultimate