

Figure 7-8 Run 7-6B: capital sector variables from the reference run

This and the following run depict the mechanisms that forced population POP and industrial output per capita IOPC to decline in the preceding reference run (Figure 7-7). As resources are depleted, a larger fraction of capital must be allocated to obtaining resources FCAOR after the year 2000. FCAOR rises quite steeply because of the high rate of growth of the nonrenewable resource usage rate. The increase in FCAOR reduces the amount of capital allocated to producing industrial output so that both industrial output IO and industrial output per capita IOPC decrease after the year 2015. The lower industrial output IO causes a reduction in total agricultural investment TAI and therefore in the amount of agricultural inputs per hectare AIPH allocated to producing food.

changes that have already been institutionalized continue to evolve. The reference run is most useful as a basis for comparison as we go on to test the sensitivity of the model to possible errors in parameter values and to possible changes in technologies and values.

7.4 SENSITIVITY TESTS

In the derivation of all the model relationships we employed existing information to establish a priori the direction and magnitude of causal influences. For several relationships, however, the available information regarding the magnitude of influence is relatively scarce, so we tried to approximate reasonable estimates of those parameters. Because it is entirely possible that the parameter values we chose contain significant errors, it was necessary to test the sensitivity of the model's behavior to changes in these uncertain parameters. This section presents sensitivity tests of four

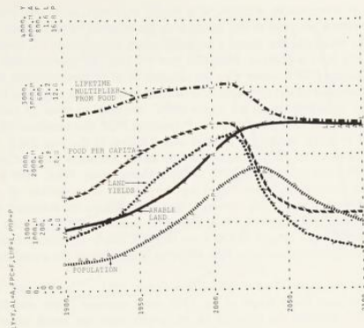


Figure 7-9 Run 7-6C: agriculture sector variables from the reference run

As the level of agricultural inputs per hectare AIPH decreases after the year 2015 (Run 7-6B), land yield LY begins to fall. The resulting drop in food production causes food per capita FPC to decline after 2015. The lower food per capita FPC in turn reduces the lifetime multiplier from food LMF, which eventually raises the death rate and stops population growth.

system parameters in the global model: nonrenewable resources initial NRI, the fraction of industrial output allocated to agriculture FIOAA, the average lifetime of industrial capital ALIC, and the industrial capital output ratio ICOR.

These sensitivity tests are not meant to represent a thorough sensitivity analysis of World3, for the model includes many more uncertain parameters than the four listed here. These tests represent only a few of the many simulation runs that could be made to test the sensitivity of the basic behavior mode to errors in the estimation of parameters. These runs are presented merely as examples of the model's behavior under different numerical assumptions. Other sensitivity tests have been described in the individual sector chapters. It is important to remember here that we are testing the sensitivity of the model's behavior, not the influence of parameter changes on the numerical values of variables at certain points in time. A parameter is therefore judged to be insensitive if, after being varied within its limits of uncertainty, the behavior mode of overshoot and collapse is still evident in the model.

Nonrenewable Resources Initial NRI—Double NRI The initial value given to the stock of nonrenewable resources NR was described in Chapter 5 as yielding a 1970 static index for aggregated world resources of 250 years. Although this value