SECTION 5

Results and Policy Implications

5.1. Introduction

This section summarizes the results of three investigations conducted within the framework of the Soviet case study for analyzing the impacts on and necessary adjustments to agriculture in the Leningrad, Cherdyn and Central region of the European territory of the USSR, in response to possible climatic changes. In these investigations there were two central problems:

(1) The analysis of impacts of climatic changes on the yield of agricultural crops and the improvement of the methods of such analysis.
(2) The elaboration of a method to aid decision makers in planning the future development of agriculture, involving the use of economic models that can incorporate environmental factors including information on the likely impacts of climatic changes.

The first problem was considered in two sections that describe experiments conducted on two different crops in contrasting areas within the subarctic farming zone of the European USSR. In the Leningrad region changes of winter rye yield were estimated in response to different climatic change scenarios (Section 2). In the drier Cherdyn region in the eastern part of the zone, estimates were made of the responses of spring wheat yield to climatic variability (Section 3).

The second problem was considered in an illustration of the use of a regional optimization model for the Central region of the European USSR, to demonstrate how changing climate can be accommodated in planning strategies to stabilize regional production or to minimize expenditures (Section 4).

M. L. Parry et al. (eds.), *The Impact of Climatic Variations on Agriculture*

5.2. Summary of Results

Each experiment in this case study has been conducted according to specific circumstances and assumptions (including, for example, model type, location, crop type, climatic scenarios, technology, soils, etc.). As such, it is not possible to make direct comparisons between the results from different investigations. However, some idea of the broad tendencies of responses can be presented. Before attempting to summarize the impacts, however, it is important to review the climatic scenarios and to show how they differ.

5.2.1. Review of the scenarios

The scenarios of temperature and precipitation change are depicted in *Figure 5.1(a)* and *5.1(b)*, respectively. A common "baseline" climate was adopted in the Leningrad and Cherdyn regions, representing the 1951–80 period. For the Central region of the European USSR, the baseline period is shorter (represented by climatic data from the 1960s and 1970s). The vertical bars on the diagrams indicate that the GISS general circulation model 2 × CO_2 scenario was analyzed in the Leningrad and Cherdyn regions as a step function "shock" scenario, assuming no gradual transition between the present equilibrium climate and the 2 × CO_2 climate. Sensitivity analyses conducted in the Cherdyn region, and the synthetic scenarios of changes in temperature alone of 0.5 °C, 1.0 °C and 1.5 °C above the baseline in the Central region, were of the same type, though in the latter case a technology trend was assumed between 1980 and 1995.

The remainder of the experiments were of a slow-change, transient nature (Section 2). They include scenarios of temperature and precipitation changes up to the year 1995, based on the Vinnikov and Groisman empirical approach for the Leningrad region (sloping lines in *Figure 5.1*), an extension of the Vinnikov and Groisman results to the year 2005, and then a projection of the scenario through to the year 2050 by interpolating between these estimates for 2005 and the GISS 2 × CO_2 climate (assumed to occur in 2050). However, the impacts of this scenario have been analyzed only up to the year 2035. All of the experiments with scenarios of transient climatic changes were conducted assuming a concurrent change in agrotechnology (based on recent or projected trends).

Once developed, the scenarios provided the inputs for the impact models, as illustrated in *Figure 1.6* in the introductory section to this report.

5.2.2. Short-term sensitivity of crop yields to climate

Investigations of the impacts on crop yield of climatic variations during the baseline periods have shown that above-average temperatures during the growing season are favorable both for winter rye in the Leningrad region and for spring wheat in the Cherdyn region. Fluctuations in precipitation, however, completely alter this assessment. For example, in the drier Cherdyn area, even given beneficial temperature conditions such as occurred in the years 1974 and 1981,