

Conclusions and Implications for Policy

5.1. Summary of Results

5.1.1. The experiments

The purpose of this study was to estimate the effect of selected climatic variations on crop yield and farm profitability in Finland. In Section 2, yield-weather functions for barley were established for two regions (Helsinki and Oulu) using data for 1846–1983. At first, monthly climate data were employed, but since the results were not satisfactory, new yield functions were developed using daily data for 1959–1983. The same method was used for spring wheat in Section 3, but for a network of locations in southern and central Finland. Daily values of ETS and precipitation, as well as minimum and maximum daily temperatures were allocated to 12 growth phases of the crop and used as explanatory variables in these studies. In Section 4, yield functions for both barley and oats were developed using cross-sectional data from different locations over much of Finland for the period 1979–1981. In this case the explanatory variables were only effective temperature sum and growing season precipitation.

To illustrate the impact of climate on yields, the estimated yield functions were applied to simulate yield levels under different climatic conditions at present technological levels. The effect of cooler- or warmer-than-normal conditions was studied by applying the estimated functions to meteorological data which characterized warm and cool periods recorded in the recent past. In addition, outputs from the Goddard Institute for Space Studies (GISS) general circulation model were used to derive climatological information on the possible conditions in Finland under doubled concentrations of atmospheric carbon dioxide. These data were also employed in the yield simulations.

Table 5.1. Summary of yield estimates for barley, spring wheat and oats in southern and northern Finland under different climatic scenarios. Baseline values are absolute; scenario estimates are percentage changes relative to the baseline.

Scenario type	Scenario period	Section of study	Climate ^c		Estimated crop yields (kg/ha) (coefficients of variation in parentheses)			
			ETS (degree -days)	May-October precipitation (mm)	Barley	Spring wheat	Oats	
			Southern Finland ^a					
Baseline	1959-83	2,3	1263	342	3075 (14%) ^d	2300 (20%) ^e	-	
	1971-80	4	1231	342 ^f	2315 (14%) ^g	-	2386 (7%) ^g	
	1861-70	4	-8%	+2%	-8% (+38%)	-	-5% (+43%)	
	1921-30	2	-4%	+26%	+10% (-32%)	-	-	
Cool periods	1974-82	2,3	-5%	+6%	+4% (+12%)	-15% (+40%)	-	
	1931-40	2	+12%	-1%	+1% (-3%)	-	-	
Warm periods	1966-73	4	+15%	-1%	+12% (-22%)	-	+6% (-21%)	
		2,3	+2%	-3%	-8% (-22%)	+10% (-40%)	-	
2 × CO ₂	Future	2,3	+37% ^d	+50% ^d	+9% (-42%)	+10% (-20%) ^h	-	
	Future	4	+33%	+50%	+21% (-26%)	-	+18% (-5%)	