vegetable-equivalent calories and especially protein in wealthier countries. Eventually, the food-consumption curve levels off, as the demand for food eventually becomes saturated at high income levels. There is evidence that a diminishing fraction of per capita income is spent on food as income increases even in relatively poor countries (Figure 4-23).

Figures 4-21 and 4-22 seem to indicate a fairly regular relationship between a country's level of economic activity (as measured by GNP per capita) and its per capita consumption of grain equivalents. We used this relationship to indicate the historical development of per capita food consumption demand at different levels of industrialization. The relationship we chose to use in World3 is shown in Figure 4-24. Note that industrial output per capita IOPC is used as the index of industrial development, as is the case throughout the model. To translate the available data, which were in terms of GNP per capita, to the model units of industrial output per capita IOPC, we used the relationship described in Figure 3-19. The four points indicated by dots in Figure 4-24 were calculated from total world food production figures in four different years, as indicated in Figure 4-25. Notice that the value of indicated food per capita IFPC never falls below the subsistence value of 230 vegetable-equivalent kilograms per person-year.

This relationship, represented in World3 as the indicated food per capita table IFPCT (Figure 4-26), is essentially a description of the relative value put on food production by societies in the past. It therefore represents the shift in socioeconomic values as economic development proceeds. Societal value judgments may of course continue to change through time. Hence there is little reason to describe the curve in Figure 4-26 as a "normal" or "desired" curve. Given actual food distribution patterns, the curve does not even necessarily generate adequate food for the total population. The curve simply generates the food per capita historically generated with the societal value structure that seemed to pertain in most countries of the world over the period 1900–1970. To simulate a world with a different value structure after 1970

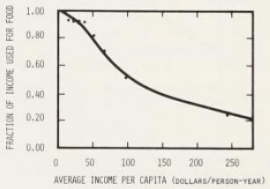

Figure 4-23 Fraction of income used for food at different income levels in Madras, India
Source: PSAC 1967, vol. 3, p. 49.

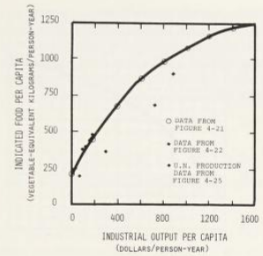

Figure 4-24 Indicated food per capita as a function of industrial output per capita

	1938	**1948**	**1960**	**1968**
	(billion kilograms)			
Cereals	640	673	951	1179
Pulses	—	29	34	44
Potatoes	221	262	285	314
Sweet potatoes	—	57	112	134
Oilseed	48	47	75	101
Soybeans	14	13	27	43
Total grain	923	1081	1484	1815
Total minus 10 percent processing loss	830	970	1,340	1,630
Population (million persons)	2,250	2,473	3,005	3,483
Food per capita (vegetable-equivalent kilograms per person-year)	370	390	450	470

Figure 4-25 World production of major commodities, selected years
Note: All major commodities are included so that the final numbers can be viewed as a good approximation of the total food output.
Source: U.N. 1970a, p. xxxi.

(for instance, one in which a higher value is put on food relative to industrial output), one would simply shift the indicated food per capita IFPC curve by setting new values for the table IFPC2T in the following equations: