CHANGES IN WORLD CONSUMPTION OF CALORIES AND PROTEINS OVER THE LAST DECADE[1]

CHARLOTTE CHATFIELD, MARJORIE L. SCOTT AND JEAN MAYER

IT is often stated that the world's food supply is not keeping pace with the growth of population. In particular it has been asserted that the rate at which the population of underdeveloped areas is increasing is bringing hundreds of millions of people nearer starvation, every year. On the other hand, some observers have claimed that "the world is rich" and that with careful planning, adequate research, and concerted action it will be possible not only to maintain the present per caput consumption levels despite the increase in population, but to bring about a gradual improvement in the world's nutrition. The expression of both points of view has often been tinged by emotion. A comprehensive study of facts has not usually been presented. The purpose of this article is to contribute the most reliable data available in terms of per caput food supplies at the present time as compared with the prewar period. It is of course apparent that the period covered—the last decade—cannot be regarded as representative of past or future trends. In appraising the changes which have taken place during that time, it must be remembered that it has been characterized by the most destructive war in the history of mankind. In particular, many farmers were killed, large numbers of livestock were lost, irrigation systems and water works were disrupted, and farm implements were destroyed as were many factories which produced agricultural equipment. The production of fertilizers was interrupted and the soil in many regions was consequently impoverished. On the other hand, it is estimated that during this decade the population of the world increased by an average of close to 20,000,000 people a year, from 2,174 millions in 1938 to 2,354 millions in 1948, an increase of 8.3 per cent. Table 1 gives the 1938 and 1948 populations of each continent and main

[1] From the Nutrition Division, Food and Agriculture Organization of the United Nations.

region of the world. Food supply data, whether pre or postwar, are subject to a certain margin of error. So are population figures in many parts of the world. The figures presented in this article illustrate *trends* and should not be regarded as absolute, even though they are the best figures available.

The data on available food supply[2] are based chiefly on information received by the Food and Agriculture Organization of the United Nations from its member governments. Each government is asked to furnish to FAO, on a yearly basis, information on production, trade, and net available supply of human foodstuffs. In the national "food balance sheets" this information is computed so as to give, on a per caput basis, the amount of each major foodstuff available for consumption. These figures are in turn translated, with the help of the FAO "Food Composition Tables for International Use," into the amounts of calories, proteins, and fats available for consumption, due allowance being made for "refuse" (though not for waste of edible material after the stage at which foods enter the kitchen). The four criteria used here in comparing the national average diets are total calories, total proteins, animal pro-

Table 1. World population: 1938 and 1948 (in millions).

	1938	1948	Percentage Increase
Africa	171	193	12.9
North America	141	160	13.5
Middle America	41	50	22.0
South America	87	105	20.7
Asia (Excl. USSR)	1,153	1,247	8.2
USSR (Postwar Area)	192	197	2.6
Europe (Excl. USSR)	376	389	3.5
Oceania	11	12	12.0
Total	2,174	2,354	8.3

Source: Estimates prepared by FAO, based chiefly on official statistics furnished by the Statistical Office of the United Nations.

[2] No attempt is made to discuss actual or potential production of foods nor policies of usage and distribution of agricultural commodities. The reader is referred to "The State of Food and Agriculture, 1949" (FAO, Washington) for a more complete discussion of the subject.

	No. of Countries	Population (Millions)
Calories and Protein		
Prewar	51	1,639
1948–1949	51	1,777
Change (Per cent)		+8.4
Milk Equivalent		
Prewar	46	1,581
1947–1948	46	1,710
Change (Per cent)		+8.2

Table 2. Number of countries and population entering into the analysis of supplies of calories, protein, and milk.

teins, and milk proteins. The aggregate population and number of countries available for comparison of national averages are shown in Table 2. Comparison of available per caput supplies of fruits and vegetables, significant though they are from a nutritional standpoint, have not been included since statistical data on fruits and vegetables are usually unreliable. Similarly, it is felt that inter-regional comparisons of fat consumption may be misleading in the present content because climate and diet patterns may modify them considerably.

The following additional observations are pertinent:

1. The physiological requirements for calories are not identical throughout the world, in particular because of differences in climate. However, it will be readily seen (Figure 1) that differences in available calories throughout the world are of a completely different order of magnitude from possible differences in calorie requirements due to variations in physiological needs.[3]

It may be further noted that above a certain level (often put at 3,000 calories) variations in calorie consumption probably reflect differences in waste and degrees of "over consumption" rather than variations in supplies needed to satisfy physiological requirements. This may not apply, however, to extremely cold countries.

[3] The Nutrition Division of FAO convened in September 1949, an international expert committee on energy requirements to consider proposals of methods of calculation of calorie requirements taking into account such factors as climate and protection against environmental temperatures, age distribution of population, modes of activity, body size of adults, etc.

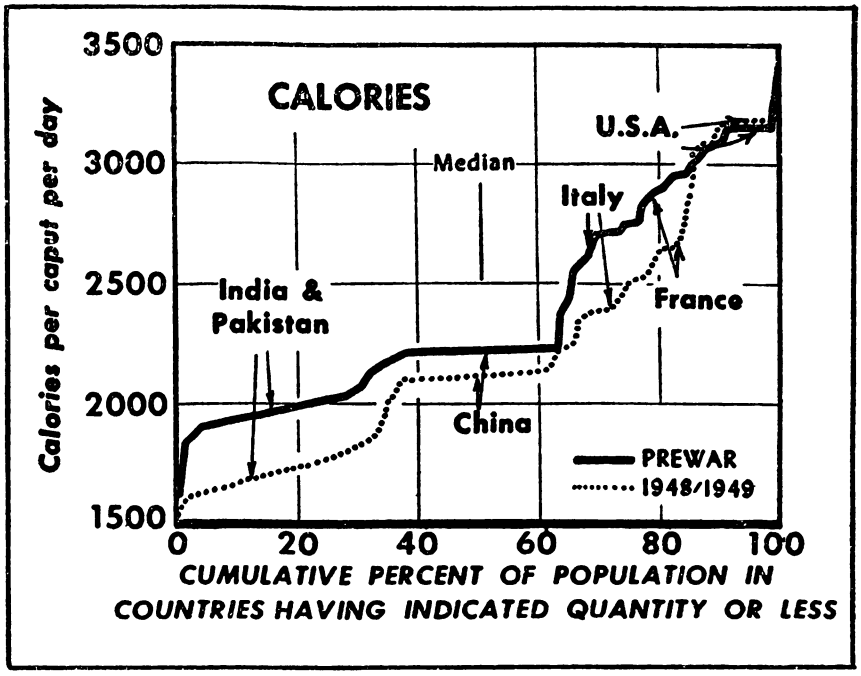

Fig. 1. Cumulative per cent of population in countries having indicated quantity of calories or less in the prewar period and in 1948–1949.

2. Differences in the consumption of total proteins are not as striking as differences in consumption of other nutrients. However, it may be noted that even between countries with an equally low consumption of animal proteins, e.g. China and India, there are large differences in the consumption of vegetable proteins which may have considerable nutritional significance.

3. The consumption of animal proteins has often been regarded as an excellent index of the state of nutrition, not only because they contribute to the diet those amino acids most likely to be lacking in vegetable proteins, i.e. lysine, methionine, threonine, and tryptophan, but also because consumption of animal proteins generally varies in the same direction as consumption of B vitamins and most minerals.

4. Milk has been chosen as a basis of comparison because of its importance in the nutrition of certain age groups, i.e. infants, children, pregnant and nursing women. It has been deemed preferable to use milk protein rather than total milk for the purpose of this comparative study as the nutritional significance of milk

in human diets is associated with its proteins, minerals, and water-soluble vitamins rather than with butter fat. The variations recorded for milk consumption do not, therefore, reflect total milk production since an important proportion of milk diverted to butter manufacture and animal feeding was modified in the postwar period by such factors as government restriction and subsidies, consumers' demand, etc.

The charts presented here are "cumulative distribution curves." They have been drawn so that the abscissa of a point represents the percentage of the total population having an amount equal to or less than the quantity represented by the ordinate of this point. Countries are plotted in the order of increasing supply and the ordinate of the medium of the segment of the curve representing a given country corresponds to the average available supply for this country, while the projection of this segment on the axis of abscissae is proportional to the population of the country.

The total population covered represents slightly more than 75 per cent of the total population of the world. The largest single unit which is not included is the Soviet Union; the other main area on which our information is incomplete is constituted by the dependent territories in Africa. It is felt, however, that these two deficiencies do not affect too seriously the validity of our conclusions on the comparative increases of food supplies and populations. Both areas are, generally speaking, sparsely populated and possess great potentialities for the development of food production.

The data presented as "prewar" represent an average of the last three or four prewar years (1935–1939). As far as "postwar" is concerned, for most of the countries they are based on 1948–1949. However, for a few countries, notably in Asia, the figures are based on 1947–1948 or 1947 data. A few names of countries typical of various consumption levels are placed on the charts for purposes of illustration.

All the curves show that supplies of calories, proteins, and milk for a high proportion of the total population of the world

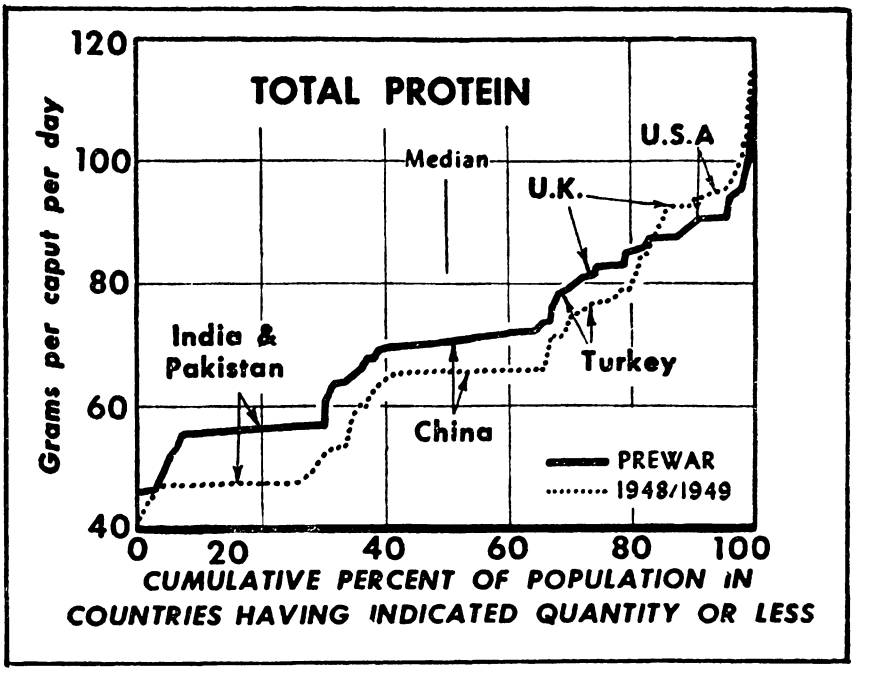

Fig. 2. Cumulative per cent of population in countries having indicated quantity of total protein or less in the prewar period and in 1948–1949.

remain at low levels, and, further, that the disparities in distribution have widened in recent years. At the left hand of each curve which covers the poorest countries, quantities have generally decreased, or at best have remained stationary. Small differences at the extreme lower end may be more serious than larger differences at relatively better levels.

Figure 1 shows that 22 per cent of the total population was formerly at or below the level of 2,000 calories; this proportion is now 35 per cent. Similarly, the proportion at or below 2,500 calories has risen from 65 per cent to 75 per cent. Whereas 77 per cent of the population obtained less than 2,800 calories before the war, there are now about 85 per cent in this category. At the median, i.e. 50 per cent of the population, the calorie level now is about 2,120, as compared with 2,240 prewar. The aggregate calorie supply for all countries increased by less than 1 per cent so that, with an 8 per cent increase in population, the

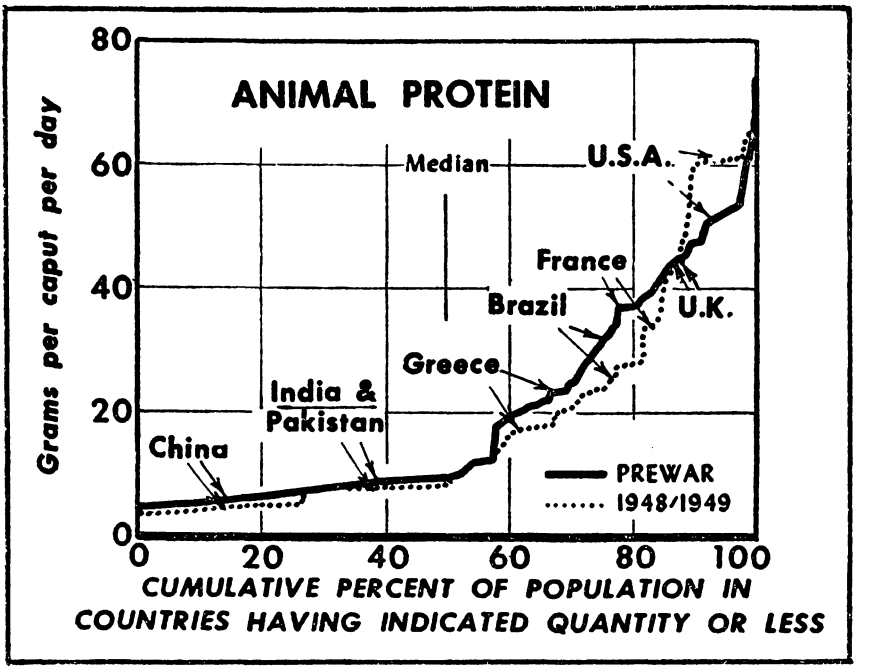

Fig. 3. Cumulative per cent of population in countries having indicated quantity of animal protein or less in the prewar period and in 1948–1949.

per caput average of 2,220 calories is lower than the prewar average 2,390 by about 7 per cent.

Figure 2 shows that less protein is available to more than 80 per cent of the population than in the prewar period. This is due to reduction in the per caput supplies of grains as well as animal foods. At the median point in population the protein level is about 66 grams, as compared with 71 grams prewar. The aggregate protein supply has increased by less than 2 per cent. The per caput averages 66.2 and 70.7 respectively are practically the same as the median values and correspond to a 6 per cent decrease.

From the nutritional standpoint the shifts in animal protein supplies shown in Figure 3 are probably even more significant and more serious than those in total protein although, naturally, the changes are smaller in absolute terms. At the median, the level is only about 8 grams in both periods. There has been a general decrease for most countries which consumed in the pre-

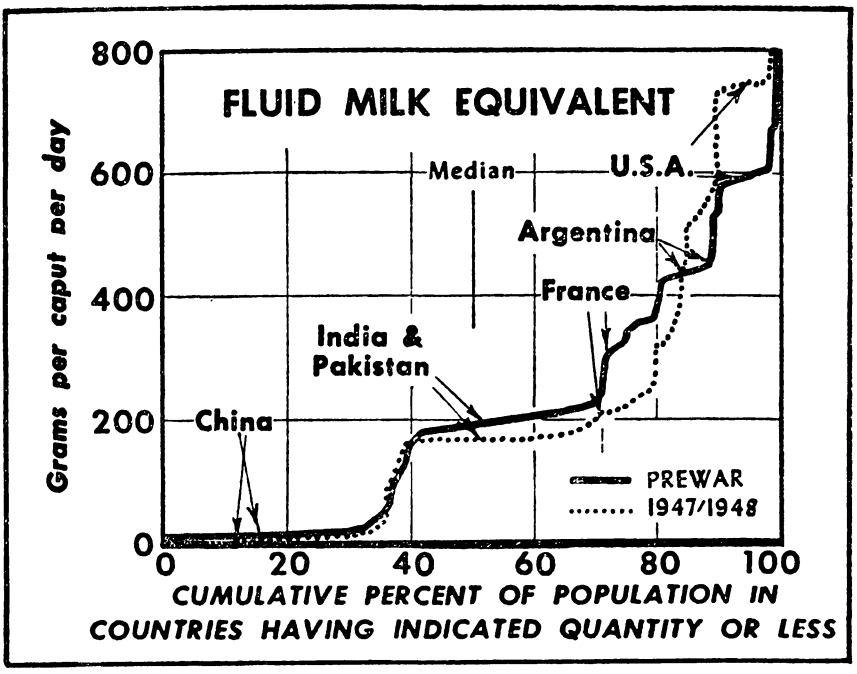

Fig. 4. Cumulative per cent of population in countries having indicated quantity of fluid milk equivalent or less in the prewar period and in 1948–1949.

war period only 3 to 9 grams per day, as well as for those which had 19 to 42 grams per day. At the upper end of the curve there have been appreciable gains. In 1948–1949 the aggregate quantity for all countries was 2 per cent above prewar, but the average quantity per caput was 18.5 grams as compared with 19.6 grams per day prewar, i.e. a drop of 6 per cent.

World distribution of milk products is shown in Figure 4 in terms of the fluid milk equivalent, based, as explained previously, on the grams of milk (3.5 per cent protein) which would provide as much protein as the total of all dairy products consumed. The figures covering 46 countries are mainly for 1947–1948; they were estimated in a few cases from 1947 data, for one country from 1946 data. As in Figures 1 to 3, the contrasts are sharp between the most and the least favored countries; more of the population than prewar now consume less than 200 grams per day and more consume less than 300 grams per day. The percentage having more than 700 grams per day has

Calories	
(Trillions per Day)	
Prewar	3,913
1948–1949	3,940
Change (Per cent)	+0.7
Total Protein	
(Thousand Metric Tons per Day)	
Prewar	116.0
1948–1949	117.6
Change (Per cent)	+1.4
Vegetable Protein	
(Thousand Metric Tons per Day)	
Prewar	83.8
1948–1949	84.8
Change (Per cent)	+1.2
Animal Protein	
(Thousand Metric Tons per Day)	
Prewar	32.2
1948–1949	32.8
Change (Per cent)	+1.9
Milk Equivalent	
(Thousand Metric Tons per Day)	
Prewar	321
1947–1948	341
Change (Per cent)	+6.2

Table 3. Aggregate amounts of calories, protein, and milk equivalent available for human consumption.

increased. At the median point, the present level of 165 grams per day contrasts with the prewar level of 190 grams per day. The aggregate supply represents a gain from prewar of about 6 per cent, i.e. almost as much as the gain in population (8 per cent). The average per caput quantity is thus nearly the same as in the prewar period, i.e. about 200 grams per day.

Two main conclusions can be derived from this comparative study. The first one is that the decade during which the second world war took place has been marked by an aggregate increase in supply of calories and proteins of 1 to 2 per cent (Table 3), an increase in population of 8 per cent and therefore a resultant decrease in per caput food supply for the world at large of about 6 to 7 per cent (Table 4). That period, it has been noted, was characterized by widespread destruction of agricultural facilities as well as by an increase in world population of 200,000,000. Second, the effect has been felt very unequally according to regions. Generally speaking, regions with a low consumption status have sunk even lower while countries where food situation was good have maintained themselves or improved.

We do not intend in this article to take sides with the optimists or with the prophets of doom. But we hope that the

Calories			
Median		*Average*	
(Number per Caput per Day)		(Number per Caput per Day)	
Prewar	2,240	Prewar	2,390
1948–1949	2,120	1948–1949	2,220
Change (Per cent)	– 5.4	Change (Per cent)	– 7.1
Total Protein			
Median		*Average*	
(Grams per Caput per Day)		(Grams per Caput per Day)	
Prewar	71	Prewar	70.7
1948–1949	66	1948–1949	66.2
Change (Per cent)	– 7	Change (Per cent)	– 6.4
Vegetable Protein			
		Average	
		(Grams per Caput per Day)	
		Prewar	51.1
		1948–1949	47.7
		Change (Per cent)	– 6.7
Animal Protein			
Median		*Average*	
(Grams per Caput per Day)		(Grams per Caput per Day)	
Prewar	8	Prewar	19.6
1948–1949	8	1948–1949	18.5
Change (Per cent)	0	Change (Per cent)	– 5.6
Milk Equivalent			
Median		*Average*	
(Grams per Caput per Day)		(Grams per Caput per Day)	
Prewar	190	Prewar	203
1947–1948	165	1947–1948	200
Change (Per cent)	– 13.2	Change (Per cent)	– 1.5

Table 4. Calories, protein and milk equivalent available for human consumption—per person per day.

data presented here will allow any discussion on food supplies and populations to be on a more documented basis. Finally, attention may be called to the fact that inequality in the distribution of food may be an even more serious problem, from the nutritional standpoint, than insufficiency in total supplies.

Summary

1. Data are presented on prewar and postwar aggregates, averages and distribution of food supplies available for human

consumption for approximately 75 per cent of the world's population.

2. During the decade 1938–1948 there has been a rise in the population of about 8.3 per cent and rises in the aggregate supplies of calories, total protein, vegetable protein, animal protein and milk protein ranging from 0.7 per cent to 6.4 per cent.

3. The average net available supply per caput has therefore decreased by the corresponding difference.

4. Maldistribution of available supplies according to regions has become more acute during this period.