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An Analysis of Certain Estimates of Food Requirements and Demand¹

By Marguerite C. Burk

Current pressure of demand on our food supplies, resulting from the accelerated defense program, has renewed the general interest in the food needs of our civilian population. Concepts of food needs vary from minimum quantities of food required to maintain health and activity to full consumer demand. Several significant studies of food requirements and demand based on specified assumptions, made in the last 10 years, are summarized and compared in this article.

FROM TIME TO TIME, there has been occasion in recent years, to make estimates of food requirements for the civilian population of the United States and of consumer demand for food under certain assumed conditions. The purposes of such estimates and the methods used in making them have been varied: To indicate the magnitude of food requirements if all of our people were to have adequate diets; to provide Government agencies administering wartime food plans and controls with information on minimum food needs of the civilian population and on consumer demand for food; to indicate the potential demand for food and other agricultural products on an over-all basis under various assumptions as to economic conditions within the country; to show the areas of desirable adjustments within agriculture to meet food requirements or demand, or both, giving attention to the need for soil conservation.

Nine sets of estimates of food requirements or demand for food have been selected for study and these are given in table 1. They vary widely as indicated by the fact that the food-energy content ranges from about 3,050 calories per person per day to almost 3,900, and that the indexes of per capita food consumption which have been derived from the data range from 106 to 133 percent of the 1935-39 average. Accordingly, this article endeavors to review the assumptions, methods, and implications, of these estimates as a guide to their use as well as to bring out the reasons for the differences among them. Although other estimates of food requirements and demand were made fre-

quently for administrative use during the war, they are not included in the following analysis because of the emergency character of their assumptions. Similar estimates made before 1942 have also been excluded.

All but two of the nine sets of estimates that are considered were published by the Department of Agriculture. Members of the staff of the Department assisted in preparing the other two. One of these was published by the Twentieth Century Fund; the other was utilized by the Council of Economic Advisers in the *Annual Economic Review*, 1950. The estimates can be classified readily into three types:

1. Estimates of quantities necessary to meet nutritionally adequate food plans of the Bureau of Human Nutrition and Home Economics.²

(a) Moderate-cost diet and "best-adapted diet" estimates used in testimony of O. V. Wells before the Select Committee of the House of Representatives Investigating National Defense Migration, 1942. (Cols. a, b, and c, table 1.)

(b) Estimates with the low-cost diet as minimum for the year 1942 published in USDA Tech. Bul. 963, *Efficient Uses of Food Resources in the United States* by Raymond P. Christensen, 1948. (Col. d)

² These food plans have been given by the Bureau of Human Nutrition and Home Economics in several publications, including *PLANNING FOR GOOD NUTRITION* by HAZEL K. STIEBELING and FAITH CLARK in *Food and Life, 1939 Yearbook of Agriculture and Miscellaneous Publication No. 662* *HELPING FAMILIES PLAN FOOD BUDGETS*, December 1948. Weighted averages for the whole population for the low-cost and the moderate-cost plans are available in the mimeographed releases, *PRICING OF DIET PLANS*, BHNHE 354 Rev. (9/15/48) Forms 3A and 3B.

¹ The research on which this article is based was made possible by funds provided by the Agricultural Research and Marketing Act of 1946.

(c) Estimates with moderate-cost diet as minimum published in USDA Misc. Pub. 581, *High Level Food Consumption in United States* by W. W. Cochrane. 1945. (Col. e)

2. Demand for food under certain assumed conditions.

(a) Estimates of potential human consumption used by Assistant Secretary Charles F. Brannan in *USDA Testimony Proposing Long Range Agricultural Policy and Programs*, before Congressional Committees on Agriculture, April and October 1947. (Col. f)

(b) Demand for food, as well as other goods and services, in 1960 under prosperous conditions—Twentieth Century Fund, *America's Needs and Resources*, 1947. (Col. g)

(c) Estimates of demand in 1955-65 under conditions of full employment, given in *Long-Range Agricultural Policy, A Study of Selected Trends and Factors Relating to the Long-Range Prospect for American Agriculture*, prepared by the BAE at the request of the House of Representatives Committee on Agriculture, March 1948. (Col. h)

3. Demand for food under certain assumed conditions plus supplementary requirements to bring consumption of low-income families up to an adequate diet level.

(a) Estimates of demand in 1950, with full employment, plus supplementary requirements, published in USDA Misc. Pub. 562, *What Peace Can Mean to American Farmers*, 1945. (Cols. i and j)

(b) Estimates of demand with high income in 1954 plus supplementary requirements for low-income families, prepared for the Council of Economic Advisers, basic to statement on page 108 of *The Annual Economic Review*, 1950. (Cols. k and l)

Assumptions and Methods of Each Study

MODERATE-COST AND BEST-ADAPTED DIETS.—The estimates of average food requirements under the moderate-cost diet, used by O. V. Wells in 1942, prepared in conjunction with the Bureau of Human Nutrition and Home Economics, utilized the distribution of population by age and sex, and by urban, rural and nonfarm, and rural farm location. The estimation of average requirements under the best-adapted diet necessitated a distribu-

tion of families by income group. This was based on certain assumptions as to national income, population, and price level for 1942. Implicit in the calculations were total national income of 90 billion dollars, a population of 133.9 million, and consumers' price index of 107 (1935-39 = 100).

Wells' best-adapted diet estimates really represented a composite estimate based upon the three diet plans of the BHNHE. That is, the low-cost diet plan was used for the nonfarm families with incomes under \$1,000 and for the farm families with incomes under \$750; the BHNHE moderate-cost plan for nonfarm families with incomes of \$1,000 to \$3,000 and for the farm families with incomes from \$750 to \$1,500; the BHNHE liberal-cost plan for nonfarm families with incomes over \$3,000 and for farm families with incomes over \$1,500. Consumption of nonfarm single individuals was carried at the moderate-cost plan, that of military personnel as an average of the moderate- and liberal-cost plans, and the low-cost plan was used for all others, such as institutional personnel.

A third set of estimates was made which allowed families with consumption rates above those in the best-adapted diet plan to continue their relatively high level of consumption. At the same time, all deficit diets were raised to the best-adapted level. Examination of family purchase data indicated that an average of about 10 percent would be required for each food group.

CHRISTENSEN'S ESTIMATES.—In his bulletin *Efficient Use of Food Resources of the United States*, Christensen calculated requirements for the year 1942 substituting the low-cost adequate diet as a minimum. Using the 1942 survey of food consumption (USDA Misc. Pub. 550) for average food consumption per person by income groups, for urban, rural nonfarm, and rural farm families, he raised those groups whose averages fell below the low-cost adequate-diet plan to the recommended quantities. No adjustment was made for averages which exceeded the quantities recommended in the low-cost plan. On page 12 of his bulletin Christensen shows only the percentage increase in over-all food consumption required to raise the population to these averages, by food groups. However, his basic work sheets have been used to derive the data in table 1 of this article.

In addition to requirements calculated in the above manner, he prepared some estimates of "pos-

TABLE 1.—Comparison of several published estimates of requirements and demand for food per capita, by food group¹
(Retail weight equivalent)

Item	Unit	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
		O. V. Wells testimony, for 1942 ²			Christensen: low-cost diet as minimum for 1942	Cochrane high-level food consumption in 1950	Brannan: potential human consumption	Twentieth Century Fund: demand in 1960, adjusted	BAE long-range prospects: demand under high-employment 1955-65	BAE, What Peace Can Mean		BAE estimates for Council of Economic Advisers	
		Moderate cost diet	Best-adapted diet	Best-adapted diet plus allowance for higher consumption						Estimated demand under full employment in 1950	Supplemental requirements, average for whole population	Demand under high income in 1954	Supplemental requirements, average for whole population ²
Index of per capita food consumption, 1935-39=100		3 109	3 109	3 119	3 106	3 120	133	123	121	120	124 total	117	120 total
Dairy products													
Nonfat solids basis	Quarts	300	295	324	259	303	(306)	272	267	250	26	260	13
Fat solids basis, including butter	Pounds	4	4	4	4	4	1,014	4	875	885	56	820	38
Potatoes and sweetpotatoes	do	155	157	173	175	141	136	151	⁵ 132	124	25	⁶ 112	---
Beans, peas, nuts	do	12	15	16	21	14	17	16	19	21	3	19	---
Tomatoes and citrus	do	100	122	134	157	112	128	⁷ 95	122	120	8	122	4
Leafy, green and yellow vegetables	do	166	160	176	125	157	102	115	124	114	1	124	6
Other vegetables and fruit	do	195	202	222	161	241	302	264	254	244	1	254	---
Meats, poultry, fish ⁸	do	131	127	140	128	155	192	190	171	173	---	171	6
Eggs	do	⁹ 37	⁹ 39	⁹ 43	⁹ 34	⁹ 39	41	39	44	42	---	44	1
Fats and oils including butter and fat													
pork cuts	do	⁹ 57	⁹ 56	⁹ 62	⁹ 61	⁹ 62	73	74	72	76	---	68	---
Flour and cereals	do	186	182	200	211	196	201	218	¹⁰ 193	193	---	⁶ 170	---
Sugar and sirups	do	⁹ 57	⁹ 59	⁹ 65	⁹ 53	⁹ 93	132	118	117	122	---	⁶ 106	---
Calories per person, per day ¹¹	Number	3,090	3,050	3,350	3,200	3,420	3,875	3,780	3,620	3,640	90	3,400	40

¹ See accompanying text for sources and description of assumptions and methods used.

² Prepared in conjunction with the Bureau of Human Nutrition and Home Economics.

³ Estimated by author after making rough adjustments to put these data on basis comparable with other sets of estimates.

⁴ Not available.

⁵ Held at 1946 rate of consumption.

⁶ Held at 1948 rate of consumption.

⁷ Published figure was 106, but average from 1936 survey data exceeded 1936 per capita consumption.

⁸ Excludes fat pork cuts.

⁹ Excludes substantial quantities used in bakery products and heavy use in public eating places. In the case of sugar, excludes use in dairy products, canned goods, candy, and beverages.

¹⁰ Held at 1947 rate of consumption, unrevised estimate.

¹¹ Estimated by the Bureau of Human Nutrition and Home Economics from data as shown in this table.

sible consumption changes" which are the estimates of changes from the 1942-45 average that would raise all diets to an adequate level. These are essentially judgment estimates of quantities which would supply an adequate diet, not estimates

of demand, but they do stay within a 10-percent increase in the cost of diet, and they were made to meet nutrient deficiencies. Because these are examples of how certain nutrition goals might be accomplished and are not calculated estimates of de-

mand or of requirements, the data were omitted from table 1 and are not discussed here in detail.

COCHRANE'S "HIGH LEVEL".—The estimates of "high level food consumption" developed by W. W. Cochrane in the publication by that name, involved much the same technique as that used by Christensen for his requirements. Cochrane assumed a total national income of 105 billion dollars with a consumers' price index of 105, food price index of 106, and a population of 144 million people—the projection at that time for 1950 under full employment. The "good adequate level" of food consumption which Cochrane worked out involved the use of the quantities recommended in the BHNHE's moderate-cost diet for those income groups in which the average rate of "actual" food consumption was less than 90 percent of rate considered to be adequate, except for potatoes and sweetpotatoes, where 80 percent of adequacy was the point of substitution. "Actual" food-consumption estimates were based on the consumption patterns by income groups in 1935-36, as derived from the consumer purchase data by Theodore Norman, Hildegard Kneeland, and Selma Goldsmith, and as somewhat further developed by Cochrane. After considerable discussion of the income approach to higher food consumption, Cochrane recognized the fact that a supplemental food program might be necessary for low-income families as well as the fact that a major educational program for better nutrition would have to be carried on to persuade people to consume larger quantities of certain foods. But Cochrane did not consider the problem of over-consumption of some foods by the higher income groups which, in effect, he magnified by the addition of the supplemental requirements for other foods.

POTENTIAL HUMAN CONSUMPTION.—The estimates of "potential human consumption" presented by Assistant Secretary Brannan in his testimony involved no estimates as to national income. The aggregates were derived by using a population of 142 million people (as of July 1946). The estimates were prepared by raising the consumption of all families with incomes below \$2,000 to the average rates of consumption of families above \$2,000, in 1941 (equal to \$3,250 in 1950 prices). The estimates of "potential human consumption" are in effect estimates of what people would like to eat if they had sufficient income. Possible means of

achieving these potential rates of food consumption were considered in other sections of the testimony given before the Agriculture Committee in connection with hearings on long-range agricultural policy.

TWENTIETH CENTURY FUND STUDY.—The only set of data reviewed in this article which was not published under Government auspices is found in the book *America's Needs and Resources* published by the Twentieth Century Fund in 1947. These estimates were prepared from data supplied by Dorothy S. Brady (at that time with the Bureau of Labor Statistics) and Hazel K. Stiebeling (Bureau of Human Nutrition and Home Economics). They assumed for the year 1960 a total national income of 161 billion dollars, consumers' price index of 132 (1935-39 = 100), and a population of 155 million. The distribution of the population on and off farms by income level was derived from the distribution of farm and nonfarm family units by income levels multiplied by the average size of family for each income bracket. The per capita consumption of each major group of foods was developed from data on consumer purchases in 1936 and 1942 and adjusted to the 1940 price levels by interpolation. These averages by income group were multiplied by the population estimated to be in that income group in 1960.

Because the data were based on quantities purchased by families and did not include allowances for foods distributed through restaurants and other public eating places nor for use in some manufactured food products, the estimates as developed and published were not directly comparable with those made by the Bureau of Agricultural Economics. Therefore, they have been adjusted to a comparable basis by increasing the 1960 figure for each food group by the percentage difference between actual consumption in 1936, based on disappearance data of the Bureau of Agricultural Economics, and the 1936 survey data referred to in the table. The adjusted estimates are given in table 1. The estimates of demand in 1960, as developed for that publication, did not allow for any changes in price relationships or for trends in consumption. The publication of the Twentieth Century Fund also included a set of estimates of needs of the population derived by multiplying the age and sex distribution of the population by the quantities in the moderate-cost diet plan. These

estimates are so close to those used by O. V. Wells that they have not been reviewed for this study.

BAE LONG-RANGE PROSPECTS.—In the winter of 1947-48 the BAE prepared a special report, *Long-Range Agricultural Policy: A Study of Selected Trends and Factors Relating to the Long-Range Prospect for American Agriculture*, at the request of the House Committee on Agriculture. Included were estimates of what the demand for individual food commodities and major food groups might be under certain assumptions as to employment and economic activity. With high employment, disposable income might reach 200 billion dollars in the period 1955 to 1965 with a consumers' price index of 145 (1935-39 = 100) and a population of 158 million people. The average rates of consumption by individuals in different income groups, based on data in the 1936 and 1942 consumer purchase studies, were multiplied by the number of people who might be in those income groups under the projected level of population, national income, and employment. In order to allow for influences other than income, the averages of projected consumption for some food items, as indicated by the income distribution, were adjusted in accordance with historical trends in their consumption. This adjustment attempted to take into account such factors as gradual improvement in knowledge and practice of nutrition and shifts in the pattern of consumption as supplies change over time, and as the methods and channels of marketing of food commodities change. The estimates probably are still unsatisfactory from the standpoint of possible major changes in price relationships which may occur, and from the standpoint of possible major changes in the marketing of food commodities. Furthermore, as they are estimates of effective consumer demand, they do not allow even the minimum quantities of food necessary for good health for some low-income families who could not afford them or would not want to buy them.

EARLIER BAE ESTIMATES.—A set of estimates had been prepared by the BAE late in the war for its publication *What Peace Can Mean to American Farmers*. These estimates were worked out on the basis of a \$150-billion total national income in the year 1950, a consumers' price index of 124 (1935-39 = 100), and an index of 130 for food prices, with a population of 144 million people.

These estimates were derived by means of three

approaches. First, the total population was broken down into income groups and multiplied by estimates of consumption by individuals in the various income groups, derived from consumer purchase studies for 1935-36 and 1942. The average consumption for the entire population was then calculated. Estimates were also prepared on the basis of relationships of average income per person and average consumption of individual foods and of all foods combined. Third, long-time trends in consumption of individual foods were ascertained. The results of these three approaches were combined in arriving at the final estimates of demand.

Supplemental requirements were then considered. These requirements were to apply only to families with annual incomes of less than \$1,500. The differences between the quantities recommended in the low-cost diet of the BHNHE (plus a 10-percent overage to allow for differences in distribution) and the estimated average per capita consumption of the lowest income groups were multiplied by the population in each group in 1950. No deduction was made for the consumption of items which might exceed the quantities recommended in the low-cost diet. Only the total quantities which might be necessary to supply such a supplement to the diets of low-income families were given in the publication, but these have been calculated on a national average basis for table 1 of this article. Supplemental requirements determined in this way involve only average consumption by income groups and do not allow for the fact that the consumption rate of a substantial number of people falls below the average. The publication noted that a supplemental food program might be necessary to handle these requirements.

SUPPORTING DATA FOR 1950 ECONOMIC REVIEW.—The report to the President by the Council of Economic Advisers, January 1950, contains some projections of food consumption based on a set of estimates of demand in 1954 under the assumptions of a 238-billion dollar disposable income, 1948 prices, and a population of 156 million. These demand estimates, prepared by the BAE at the request of the Council, were derived in exactly the same way and in some instances they are identical with those used in the BAE data for 1955-65. Several adjustments were necessary from the estimates made in 1947-48 because of recent experiences with consumption of butter, fluid milk, potatoes, cereal

products, and sugar. The projected demand for butter and fluid milk was adjusted downward slightly. The estimates for potatoes (and sweet-potatoes) and for cereal products were held at the 1948 rates of consumption, which were substantially lower than the unrevised estimates of 1946 or 1947 average consumption which had been used for the report on long-range prospects. The projection for sugar and sirups was also held at the 1948 rate under the assumption that essentially the same price and supply relationships would be maintained.

Supplemental requirements to provide families with incomes below \$2,000 with an adequate diet were worked out on a completely new basis by BHNHE and BAE. Information from the study of food purchases in 1948 by urban families was used to determine the percentage increase in the consumption of major foods which would be necessary to bring the consumption by all urban families who had incomes, in 1948, of less than \$2,000 up to the quantities in the BHNHE low-cost diet plan.³ The relationships between urban-rural rates of consumption found in a 1942 study, made by the Bureau of Human Nutrition and Home Economics and the Bureau of Labor Statistics⁴ were used to estimate the percentage increase necessary to bring average consumption for the whole country to a level high enough to provide both urban and rural low-income families with quantities equal to the rates provided for in the low-cost adequate diet. These percentages were applied to the 1948 disappearance data per capita in terms of retail weight to get the average supplement per capita.

Comparison of the Estimates

The several sets of estimates of requirements and demand are difficult to compare in over-all terms because those based on food plans do not include sufficient allowance for eggs, sugar, and fats, used in restaurants and other public eating places and in commercially produced baked goods, dairy products, canned foods, candy, and beverages. This

³ Based on unpublished data concerning frequency distributions of families by amounts of specified food groups used per person, from 1948 Food Consumption Survey by BHNHE.

⁴ UNITED STATES BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS, FAMILY FOOD CONSUMPTION IN THE UNITED STATES. U. S. Dept. Agr. Misc. Pub. 550, 157 pp. 1944.

results from the fact that the food plans are prepared for family use in the homes. However, approximate adjustments were made in the Wells, Christensen, Cochrane, and Twentieth Century Fund data, by the author of this article and indexes of over-all per capita level of the estimates were computed in relation to the average U. S. per capita consumption in 1935-39 (using the same technique as that used for the per capita consumption index for The National Food Situation). These indicate (1) that the estimates by Wells were slightly higher than those by Christensen, (2) that the Wells "best adapted plus overage," the Cochrane, and the Twentieth Century Fund estimates, those that appear in "What Peace Can Mean," and the BAE long-range estimates are comparable in over-all terms, all assuming full-employment conditions; (3) that the latest estimates prepared by the BAE, for the Council of Economic Advisers, are slightly lower. The Brannan estimates are substantially higher because they are estimates of "potential human consumption," not of prospective effective demand. They come closer to what people really want to eat, not what they can afford to eat (as demand estimates do) nor what they need (as estimates based on the idea of adequacy do).

In view of the stress of most of the studies reviewed in this article on the importance of consumer income in the consumption of food, it is enlightening to examine the levels of income assumed by the studies. No income estimates were made for the Christensen and Brannan studies. Others have been put on a comparable basis by the author; that is, in terms of national income per capita in 1950 dollars. On that basis the income assumptions and the year in which they were made were as follows: Wells data, \$1,075, 1941; Cochrane, \$1,190, 1943-44; Twentieth Century Fund, \$1,350, 1944; "What Peace Can Mean," \$1,440, 1945; BAE long range prospects, \$1,660, 1947; Council of Economic Advisers, \$1,700, 1949. The years in which the estimates were made appear to have had considerable effect on the level of incomes assumed. This undoubtedly reflects the changing ideas over the last 10 years as to what income per capita could be with full employment and makes allowances for increasing productivity.

But it is apparent that the differences among the estimates stem primarily from basic assump-

tions as to certain fundamental questions. (1) Are the requirements to be estimated primarily on the basis of nutritional needs, adjusted as closely as possible to existing food habits (essentially the concept of the food plans of BHNHE), with or without provision of additional quantities to meet the full demand of higher income families at some assumed levels of national incomes? (2) Are food needs to include at least minimum adequate diets plus supplemental demand of higher income families but without adjustment for possible excessive food consumption? (3) Should food needs be interpreted to mean the quantities of various foods which Americans would like to buy if they could afford to do so? Another possible alternative is to determine requirements for food solely on the basis of physiological needs for nutrients, disregarding food habits and problems of distribution, but this is so unrealistic that it is rarely used.⁵

Only the Christensen study attempted to estimate how many people could be fed if the quality and quantity of food were lowered to a minimum nutritional level.

Further comparison of the estimates and their implications can best be made by grouping the estimates into the studies which made use of suggested food plans and those which were concerned with prospective or potential demand.

Some Implications

STUDIES USING FOOD PLANS.—Estimates of food requirements, based on BHNHE's suggested food plans to supply adequate diets, are essentially suggestions as to what people "should" eat, not what they actually do eat. But the BHNHE does provide for the food preferences of families as much as possible within the limits set by food needs for adequate diet and by cost considerations. Many families who spend as much for their food as the total costs of the various food plans do not have adequate diets because of poor food habits, or lack of knowledge of good nutrition, or both.⁶

No attempt was made in these three studies to go into these problems: (1) How the incomes of

many low-income families can be raised to permit higher expenditures for food; (2) how the families of all income levels are to be persuaded to change their food-buying patterns to provide adequate diets; (3) what compensating shifts in consumption of some foods might be desirable if the consumption of other foods is increased as recommended.

In view of the increase in domestic food production since 1942, the adjustments in production necessary to supply the requirements used by O. V. Wells appear feasible of achievement with the possible exception of the substantial increase in milk production. However, USDA Misc. Pub. 595 *Peacetime Adjustments in Farming: Possibilities under Prosperity Conditions* indicates the favorable prospects for this increase in milk production with higher yield per cow. The over-all changes in production to provide the necessary quantities of major foods in Christensen's estimates, based on the low-cost diet plan, appear to be feasible as do those for Cochrane's estimates based on the moderate-cost diet plan.

Differences in requirements for the major food groups in these three studies are due in large part to varying emphases of the food plans at three levels of cost, and to gradual revisions in those plans in the past decade. O. V. Wells' estimates of requirements based on the moderate-cost diet plan and on the combination of the diet plans at three cost levels, ("best-adapted"), reflect the larger quantities of milk and leafy, green, and yellow vegetables provided for in the diets of higher cost. The greater emphasis of the revised low-cost diet plans on tomatoes and citrus fruit and on inexpensive cereal products and potatoes, is indicated in higher requirements for these items in Christensen's data. The Cochrane estimates of "high level" food consumption combine the moderate-cost diet as a minimum with the above-minimum rates of consumption derived from 1935-36 consumer purchase data, thereby arriving at higher requirements (than in the other sets of estimates) for other vegetables and fruits (other than leafy, green, yellow vegetables, tomatoes, and citrus), and for meat, poultry, and fish.

STUDIES WITH "DEMAND ESTIMATES".—Five of the sets of estimates in table 1 may be called estimates of demand. All were based to some extent on patterns of consumption by the several income groups, and all except the estimates presented by

⁵ For discussion along this direction, see note by GEORGE J. STIGLER. *THE COST OF SUBSISTENCE*. *Jour. Farm Econ.* 27:303-314. May 1945.

⁶ See UNITED STATES BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS, *NUTRITIVE CONTENT OF CITY DIETS*. U. S. Dept. Agr., Special Report No. 2. October, 1950.

Assistant Secretary Brannan⁷ utilized projections of total consumer purchasing power as well as the distributions of population by income group. Every one of these studies stressed the importance of full employment and high consumer incomes in estimating prospective demand for food. The estimates by the BAE for *Long-Range Agricultural Policy . . .*, *What Peace Can Mean . . .*, and for the Council of Economic Advisers also included some adjustments for long-time trends in consumption.

As noted above, the Brannan estimates of "potential human consumption" are materially higher for most foods than are any of the other estimates. Except for milk, even they could be supplied if necessary incentives for farmers were provided and reasonable time were allowed for shifts within agriculture. The adjustments in food output needed to supply the estimates of demand other than those in the Assistant Secretary's testimony are fairly comparable. But the latest BAE estimates would require smaller production of potatoes, cereal products, butter, and sugar, than would the other sets of demand estimates. These estimates take into consideration the postwar decline in rates of consumption. The major increase from present levels of output would be in livestock products.

Although the estimates of demand, other than those presented by Mr. Brannan, are not greatly different on an over-all basis, the estimates for certain food groups do vary considerably. The demand for potatoes and sweetpotatoes and for cereal products would be much higher, according to the data of the Twentieth Century Fund, than even in the earlier estimates of the BAE. No adjustments were made for long-time downward trends in these foods. Furthermore, the most recent estimates of BAE are even lower, for the reason indicated above. Estimates of future consumption of beans, peas, nuts, tomatoes and citrus, and eggs, based on Twentieth Century Fund information, indicate lower levels of consumption than do BAE estimates. The recent BAE estimate for eggs was adjusted slightly upward for the higher postwar rate of egg consumption, but there does not appear to be a ready explanation of differences for the other two food groups nor for the higher estimates for meats, poultry, and fish. The variations in the quantities of the fruits and vege-

tables other than those mentioned are relatively minor. The latest BAE approximation of what demand for sugar might be in 1954 involved holding per capita consumption at the 1948 rate, because of the lower rate of consumption in 1947-49, the legislation regarding sugar, and related controls.

Large increases in the production of fruit and dairy products, particularly fluid milk, compared with current output, would be necessary to meet the demand that might be expected under conditions of full employment in 1954, according to the latest estimates. Smaller increases in vegetables and meats would be necessary, and no increase would be likely for total domestic food consumption of potatoes and cereal products.

ESTIMATES OF REQUIREMENTS TO SUPPLEMENT DEMAND.—It is now generally recognized that even under conditions of full employment and high consumer incomes, some families in the United States would still have incomes so low that they could not afford to buy the quantities of food recommended in the BHNHE low-cost diet, or who with their present food habits would not choose to buy the quantities necessary for an adequate diet.

In connection with two sets of estimates of demand for food—for *What Peace Can Mean* and for the Council of Economic Advisers—the BAE and BHNHE prepared some indications of supplemental requirements for food which would bring low-income families up to an adequate diet. Although the methods of estimating these requirements were quite different, as described above, the average rates of consumption, including the supplement, are similar. It is generally assumed that the distribution of these supplements to low-income families might be handled directly, or the families might be supplied with funds which would be earmarked in some way to show that they were to be spent only for food. As far as supplemental requirements are concerned, the most important commodity is milk. Special milk-distribution programs for school children have been operated successfully, for both fluid milk and dry skim milk, and the extension to other vulnerable groups of citizens would probably not be difficult from an administrative standpoint.

In Conclusion

Recent studies of food purchases of individual families have indicated again that there is a much

⁷ Prepared by BAE under his direction.

greater chance that families with moderate or high incomes will achieve adequate diets than families with low incomes. At the same time, these studies have shown that many moderate and high-income families do not have nutritionally adequate diets. Therefore, it is apparent that a major educational effort as well as high levels of employment and income would be essential to the attainment by all families of even the minimum level of consumption used by these studies of food requirements.

Postwar experiences have demonstrated the dependence of agricultural well-being on the main-

tenance of a high level of domestic demand for food. The food-consumption rates of the last 3 or 4 years bear evidence that the demand for food is affected not only by the average level and distribution of real disposable income, but also by such factors as the alternative uses for consumers' purchasing power and the prices of food commodities relative to each other and to the prices of non-food goods and services. Accordingly, high levels of income do not in themselves assure the achievement of levels of demand for food indicated in the studies reviewed in this article.

Estimating Flood Damage to the Bean Crop in Michigan

By C. J. Borum¹

Timelessness and accuracy are paramount considerations in making estimates of sudden local damage to crops. Here is an account of one such appraisal and just how it was made.

WHEN A HURRICANE, flood, or freeze strikes a crop, the State Statistician and his staff must make a quick appraisal of the damage. A case in point occurred in Michigan during the latter half of July when heavy rains flooded much of the acreage of dry edible beans in Saginaw and Tuscola Counties where more than one-fourth of the State's crop is grown.

As often happens in such circumstances, unofficial reports of loss to the crop ranged from 5 to 50 percent. These reports reached the State Statistician's office only a few days before the end of July and the actual damage had to be assessed in time to permit the information to be used in the August crop report.

The story of how that was done is told here for several reasons. First, it is an excellent illustration of the kind of operation carried out by the State Statisticians that deserves some recognition. A job of that kind can be, and often is, carried out more objectively than many people realize. In the second place, the experience of the Michigan office should be useful to the Statisticians in other States when similar emergencies arise.

Someone from the Statistician's office must usually travel to the areas affected to get a picture of the situation at first hand. Sometimes this simply takes the form of a subjective appraisal based on a general inspection of the area and conversations with well-informed local people. Such a subjective approach sometimes gives misleading impressions, even to an experienced observer, and no one would deny that a more objective procedure would be highly desirable. The problem is to devise an objective procedure that can be applied quickly in a given emergency. There is usually not much time for preliminary planning and the field work must be done quickly if the findings are to be of real use. The flood situation described here is typical. But it was possible to get up a survey that did not require much more time than would have been taken by a subjective appraisal of the area on a field trip. Furthermore, after the survey was completed the estimates of damage and loss to the crop were estimates from which practically all personal judgment, with its possibilities of personal bias, had been eliminated.

Speed, as well as objectivity, was a primary consideration in planning the work. The entire survey had to be made in 2 days—August 1 and 2. A sample of 55 fields was all that could be covered in that time. Knowledge of the territory in-

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