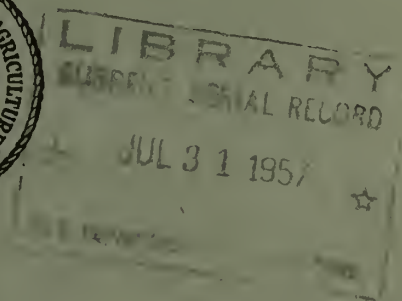


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Agricultural Economics RESEARCH



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UNITED STATES DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service
Agricultural Research Service

Contributors

MARGUERITE C. BURK, Head of the Consumption Section, Statistical and Historical Research Branch, AMS, spent a year in Europe recently, during which she reviewed food consumption statistics and analytical programs in 10 countries.

RALPH R. BOTTS, Agricultural Economist in the Farm Economics Research Division, ARS, for many years has done research on agricultural risks, credit, and insurance.

HENRY W. DILL, JR., Agriculturist in the Land and Water Section, Farm Economics Research Division, ARS, specializes in the use of airphoto interpretation to obtain quantitative data for economic analysis. He was formerly with the Soil Conservation Service, which he joined in 1935.

D. B. DELOACH is Chief of the Marketing Organization and Costs Branch, AMS. He is in charge of the AMS cooperative marketing research program with the State agricultural experiment stations.

CALVIN L. BEALE, a Demographic Statistician in the Farm Population and Rural Life Branch, AMS, was formerly employed at the Bureau of the Census. He has been engaged in work on area and residence classifications for several years.

MARC NERLOVE, formerly Analytical Statistician in the Agricultural Economics Division, AMS, was engaged in experimenting with new statistical techniques to measure economic factors which influence the supply of and demand for agricultural commodities. He is now on military leave with the United States Army.

HAROLD F. BREIMYER, as head of livestock outlook work in AMS is regularly engaged in both analysis and forecasting livestock prices. He offers a course in Agricultural Prices in the Graduate School of the U. S. Department of Agriculture.

AARON G. NELSON is Director of Research and in charge of educational work for the Farm Credit Administration at Omaha, Nebraska. Nelson is well known for his research on farm credit problems.

DAVID ROZMAN for the last 30 years has been engaged in research largely in agricultural economics and land economics at the Massachusetts Agricultural Experiment Station. Recently he has headed a study of distribution and characteristics of population in his State.

LOUIS F. HERRMANN is Assistant Chief of the Market Organization and Costs Branch, AMS, and Head of the Dairy Section in that Branch. His specialty is dairy marketing, but he reviews, in this issue, two books about the baking industry. The two industries are shaped by a common denominator of considerable power—the distinctive attributes of perishability and bulk relative to value in their products.

EDITORS: Charles E. Rogers
James P. Cavin

ASSISTANT EDITORS: Raymond P. Christensen
Winn Finner

AGRICULTURAL ECONOMICS RESEARCH

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Volume IX

JULY 1957

Number 3

The National Food Survey of the United Kingdom and Comparisons With Other British and American Food Data

By Marguerite C. Burk

The National Food Survey has been a carefully watched gauge for both wartime and postwar British food administration. It has measured the successes and the failures of the policies and programs for maintaining equitable distribution of foods essential to the civilian population of the United Kingdom during the prolonged and grim struggle, first against the enemy, then on the hard road back to some semblance of economic recovery. Because the Survey was conducted only for administrative use, its detailed findings were not published until late 1951. Although such findings were always available to key American food officials, the inner workings of the Survey have been little known on this side of the Atlantic. Accordingly, while in England for independent research at Cambridge University in 1955-56, Miss Burk prepared a report for administrative use in the Agricultural Marketing Service; this was done with the wholehearted cooperation of administrators and technical personnel who were responsible for the Survey and its interpretation. In this article we publish nonconfidential information from the report and some further research notes on these and other comparable data. Although Miss Burk is indebted to a number of civil servants of Her Majesty's Government for extended and frank discussions of problems involved in the Survey, her article represents essentially preliminary research findings. The article is not an official statement of either Her Majesty's Government or the U. S. Department of Agriculture.

THE NATIONAL FOOD SURVEY of the United Kingdom is apparently unique as a survey of food consumption over an extended period of years based on continuous random sampling. Accordingly, it provides an interesting opportunity both for comparisons between survey and disappearance measures of changes in food consumption in the United Kingdom, and for comparison with United States data on per capita food consumption and, for April-June 1955, with the Department of Agriculture's Survey of Household Food Consumption.

For background information, this article traces the development of the National Food Survey from its beginning in July 1940 through 1955. Then current sampling, field work, and processing procedures are described in lay terms; followed by a discussion of the types of data obtained and their uses. Another section presents some of the highlights of the United Kingdom food consumption picture from 1940 to 1955. Finally, changes in British food consumption are compared with concurrent changes in the United States and findings from the United Kingdom's National Food

Survey for April-June 1955 are matched with data for the United States.

Historical Development

According to Dr. Norman C. Wright, Chairman of the National Food Survey Committee and the Scientific Adviser to the Ministry of Food, now Agriculture, Fisheries and Food, the Survey was initiated to provide administrators with early warnings of any dietary inadequacy that might result from wartime shortages and changes in dietary pattern. Food officials were very much aware that certain sections of the British population had had poor diets during the 1930's, as demonstrated by prewar surveys. They believed that the effectiveness of wartime food policies would be most clearly reflected in the food consumption and expenditure of urban working-class households (8, p. 57).¹

The Survey at the outset was designed to measure food consumption of the whole population. But this proved too expensive and staffing difficulties became too great.

Early in 1941, therefore, coverage was reduced to households of urban workers, considered to be representative of 80 percent of the whole population. This coverage was continued substantially until 1950. Likewise, the early attempt at a constant panel to be visited at regular intervals was abandoned completely in 1943 because of poor response, and a system of continuous sampling was substituted. Under wartime conditions this led to overrepresentation of households with young children and those of pensioners in the final sample.

In 1940 and 1941 data were obtained by leaving a logbook with each cooperating housewife for her to enter her food purchases. Experience at that time showed the need for adjustment for change in household stocks to yield more accurate estimates of consumption, which ran about 5 percent higher than purchases. So from 1942 to 1951 fieldworkers began and ended the report week by weighing and counting stocks of food in each household. This procedure was dropped in 1951 because it seemed to call undue attention to household stocks; anyway, by 1952 the supply situation had greatly improved.

¹Numbers in italics in parentheses refer to Literature Cited, p. 87.

During the period 1940-49 information concerning incomes of families surveyed was not regularly obtained. Accordingly, fluctuations in social classes² from which families were drawn at different times were difficult to detect. The basic sample was drawn from households residing in urban districts judged to be predominately working class in character. The sample of working class households was supplemented in 1944-47 and 1947-48 by a small sample of middle class households and by special inquiries into the position of special groups. Because of postwar difficulties with food supplies and problems of de-rationing and decontrol, the Survey was continued in its wartime form until 1950. Data from the Survey for 1940-49 were published in November 1951 by the Ministry of Food under the title, *The Urban Working-Class Household Diet, 1940 to 1949* (12).

In the words of Dr. Wright, "With the termination of the war and the end of the immediate postwar shortages it became clear that, if the survey was to provide a basis for guidance on food policy that would take into account the changing circumstances of different groups of the population, its scope would need to be widened. Accordingly, in 1950 the coverage was increased in such a way as to furnish records for a complete cross section of the population, and thus to facilitate the pinpointing of any groups whose diet appeared to need attention" (8, p. 57).

The broadening of the scope of the National Food Survey to meet British administrators' needs for information about food consumption of the whole population since the easing of postwar shortages is traceable in the series of reports issued for each year since 1949. The 1950 report (13) contained expenditure data along with consumption and nutrient content, also sections on seasonal changes, on the household diet of several social classes (see footnote ²), on diets of house-

²The reports on the National Food Survey use the term "social classes" to represent households grouped by gross income. For example, this statement (10, p. 32), "The definition of social class was based on the gross income of the head of the household, the income ranges employed being those introduced in 1953 with the points of subdivision at £6, £9, and £15 per week. . . ." In dollars, these points were about \$17, \$25, and \$42.

The 1950 report defined a working class household as a household whose head earned less than £8 per week (\$22.40) or whose head was a manual worker earning less than £13 a week (\$36.60) (13, p. 92).

holds of different family composition, and comparisons of National Food Survey data for 1950 with prewar survey data collected by the staff of the Rowett Institute in cooperation with the Market Supply Committee, reported by E. M. H. Lloyd (6) and by Orr (7), and by Crawford and Broadley (2). American agricultural economists will place the names Orr and Broadley as Lord Boyd Orr and Sir Herbert Broadley, prominent in the leadership of the Food and Agriculture Organization of the United Nations.

The reports for 1951, 1952, and 1953 carry useful summaries of changes in food supplies and controls, as well as reviews of quantities of major foods and expenditures reported by the 10,000 to 12,000 households completing logbooks each year for the Survey.

In response to the growing interest in regional and urbanization patterns of food consumption, in 1953 the Ministry made separate tabulations of the Scottish part of the sample and of urban and rural households. The published report aroused much interest, especially in the Scottish press. In contrast with United States food expenditure patterns, the Survey showed only about a 10 per cent differential between urban and rural households in money outlay for food.

The 1954 report went a step further in separating households in the conurbations³ from those in other urban areas. The conurbations accounted for almost one-half of the urban households. The 1954 report also introduced data in the percentages of households purchasing each food during the survey week. The report for 1955 (11), to be issued this summer, carries a considerable amount of data on (1) income elasticities of food expenditures by reporting households, (2) food expenditures by households differing in composition, and (3) geographical differences in the household diet. These developments in the Survey apparently mark a gradual shift in emphasis from obtaining data for strictly administrative use toward obtaining some marketing information.

³ "The conurbations, as defined by the Registrars-General, are the largest areas of continuous urban development; their centres are London, Birmingham, Liverpool, Manchester, Newcastle-on-Tyne, Leeds, and Glasgow" (10, p. 21).

Current Operation of the Survey

The Survey now purports to cover the entire population, but it actually omits the small fraction of the population living in the island areas and the highlands of Scotland and remote parts of Wales. There still seems to be a problem of underreporting by the upper "social classes," as the Survey refers to income groups.

The Survey is so conducted as to space reporting to be representative of food consumption within each month and each quarter, but the annual averages are simple averages of the four quarters. Data are currently summarized by quarters, some being made available for administrative use within a few months, but published reports still lag considerably. The report for 1953 was published in September 1955. Such a time lag probably has reduced the use of the data for marketing purposes.

Reporting on food purchases and use has never included purchases of sweets and chocolate, ice cream, alcoholic beverages, and most soft drinks, on the assumption that the housewife would probably not know the amounts of these items. It included use of home-produced and home-supplied (home grown and gifts) foods, and use of foods in meals carried out, but not the food content of purchased meals and snacks. But the housewife recorded which meals were eaten in (with menus) and out, as well as who was present at each meal. There has been no measurement of wastage of food in households although conversion factors for nutrient content allowed for inedible portions normally contained in food as purchased. In assessing the adequacy of the diet an arbitrary deduction of 10 per cent is made for plate and other wastage.

Sampling Procedure

The technicians in charge of the Survey describe the sample design as "stratified random in three stages."

First stage.—The 613 parliamentary constituencies (after postwar reorganization) have been organized by region and degree of urbanization into 60 groups having approximately equal populations. Attention is given to assuring correct representation of areas of different residential characteristics. The juror index, which contains information on ratable (taxable) value of houses,

is used to stratify by social (income) class for England and Wales, but less adequate data are available for Scotland. From each of 60 groups a parliamentary constituency is selected randomly with probability proportional to the electorate.

Second stage.—Within the selected 60 constituencies, four polling districts are selected on a stratified, random basis for the quarter. Effort is made to obtain the correct proportion of urban and rural households and to design the best possible sample for the 3-month period by spacing the polling districts out over the quarter.

Third stage.—Addresses are selected from the electoral register for each selected polling district at constant intervals from the randomly chosen starting point. The quarterly sample consists of 2,500 to 3,000 households. Sampled addresses are removed permanently from the registers and polling districts are not resampled for several years. Accordingly, it is possible for a family to reappear in the sample only if it has moved.

Handling of substitutions has been revised since the Social Survey Division of the Central Office of Information took over the task from an outside firm. Formerly, secondary choices were permitted; now a much greater effort is made to get response from the primary sample—this includes night interviewing. These procedures apparently are reducing the overrepresentation of households with young children and of those of elderly retired people in the final sample.

In 1954, 20,400 addresses were visited and 11,570 completed logbooks were obtained, an effective response rate of 57 percent.⁴ The proportion of children under 14 was about 25 percent in the 1954 sample, compared with 28 percent in 1950; the 1951 Census figure was about 21 percent.

Fieldwork and Processing

Until 1952 the fieldwork of the Survey was carried on by women investigators employed by an independent firm, the London Press Exchange. Since 1952 it has been the responsibility of the Social Survey Division.

⁴The response rate in the U. S. Survey of Household Food Consumption in the spring of 1955 was 89 percent. However, the U. S. survey relied on recall by the respondents during 2-hour interviews. How buying habits affect survey techniques is discussed in the last section of this article.

Interviewing is systematically organized to have the sample represent food consumption throughout a given quarter. Each interviewer is allocated 20 addresses for placing logbooks during the first 3 days of a 10-day period. An introductory letter is sent to each address. The investigator calls, obtains preliminary information, and introduces and explains the logbook. (The contact rate is up to 95 percent.) She revisits the house at least twice during the survey week, more often if necessary. At the end of the week, the investigator reviews the logbook with the housewife, checking food purchases and other acquisitions against menus reported. About 60 percent of housewives actually interviewed complete logbooks.

Statisticians in charge of the field work believe that they reduce interviewer errors and bias by systematically shifting investigators to work on other surveys. The present sampling and response rates yield 11,000 to 12,000 completed logbooks a year. Logbooks are edited and processed by the Social Survey Division in London.

Calculations of nutrient content are made from quantity data, using conversion factors, a few of which are varied in the course of a year. In the process of making comparisons of the level of consumption per person per day of major nutrients with requirements, there is special weighting of meals (breakfast—4; dinner—5; tea—3; supper—2). British weighting differs from ours—under United States Institute of Home Economics procedure, equal weighting of the 3 meals is used.

Types of Data Obtained and Their Uses

In each household surveyed, the housewife records in the logbook the purchases, for one week, of all food—certain categories excepted—and all food entering the household without payment, from home production, allotments, and gifts. She also records a brief description of each meal served (breakfast, dinner, tea, supper, or other variation) and lists the meals taken outside by any member of the family.

She reports age, sex, and occupation of each member of the household, and notes the approximate age of visitors who take meals during the week indicating whether they are male or female. The household includes all persons for whom the housewife catered. Each person is counted as a

member of the household if he eats at least 16 meals at home during a survey week—tea is counted as a meal. Persons who eat less than 16 meals are recorded as visitors.

The interviewer records (1) net incomes of all members of households (since 1952); (2) information on tenancy of dwelling; (3) participation in special milk and Welfare food programs; (4) usage from household food stocks of selected home-produced items; and (5) home food production. In addition, occasionally, other data are included.

In somewhat more detail, the following types of data are available from the Survey:

1. Average food use per head per week in each quarter is derived by summing quantities of (a) foods purchased; (b) home production in period for current use; (c) usage of home-produced stocks of a few items, such as jams, potatoes, eggs, and home-canned fruit; and (d) gifts from employers or from sources outside the United Kingdom (thus excluding interhousehold gifts). These data cover home consumption only, but they do include food carried from home. They exclude all sweets, mineral waters, and alcoholic beverages, as well as meals and snacks purchased away from home.

The nutrient content of the diet per person per day is calculated from these food use data and tabulated each quarter by social class, household type, and, occasionally, according to other special classifications.

2. Food expenditure per head per week is tabulated and the total value of food consumed calculated by adding to the reported costs of food purchased the computed values of home-produced and gift food.

3. Food prices for more than 100 food groups are derived from expenditure and quantity data, thus reflecting shifts among price lines as well as price changes per se. An index of food prices is computed from these data, using the Fisher Ideal Formula.

4. Number of meals eaten outside the home, which meals, and by whom are reported. The normal pattern is assumed to be 4 meals a day—breakfast, dinner, tea, and supper.

5. Income data. Before 1952 the only income data obtained (and not even those regularly during the war) pertained to gross income of the head of the family. These data were used principally to divide households into four broad "social classes." From 1952 to the present time the Survey has included questions on the total net family income from all sources after payment of income taxes. The Ministry analysts have found considerable underreporting of income, as have U. S. analysts. Former reliance on gross income of head of family apparently stemmed from the belief that the chief earner's level of income controls the food pattern of the family.

6. Information on household composition is obtained in detail and used for grouping households into homogeneous categories for analytical purposes, particularly for nutrition studies.

7. Supplementary information is usually reported on use of Welfare foods and of milk which was obtained under special milk programs sponsored by the Government.

Uses of Data

Data from the National Food Survey have been used principally for administrative and parliamentary purposes. The Survey has provided information on the net effects at the consumer level of changes in total supplies, distribution patterns, rationing procedures, and price changes. When the food situation was particularly stringent, changes in monthly consumption rates were watched and compared with public reactions in the press and in Parliamentary Questions to determine critical levels. The Survey data thus provided an indication of needed changes in administrative regulations to even out the distribution of short supplies. Another use of data on nutrient content of the average diet and of the diet of vulnerable groups in the population was to indicate the need for certain policies relating to nutrition—for example, the enrichment or fortification of foods with synthetic nutrients.

The operation of the Survey during World War II has been criticized by R. J. Hammond, historian of British wartime food policies and administration, on the ground that its principal emphasis was on arithmetical averages of consumption by the reporting households, such averages being the least sensitive index of food welfare or the success of food control measures (4, p. 226). Hammond regretted the failure to make available to administrative officials a picture of deviations, for one reason or another, from such averages, and thereby to throw a real light on inequalities of distribution and differences in food habits.

During the period of decontrol and derationing, housewives were asked in connection with the Survey how much more of particular foods they would buy if available. Their replies proved to be much more reliable indicators of what consumers would buy if they had the opportunity than any other type of guide or demand estimate, according to members of the Ministry staff.

Analytical uses of the data include studies of the effects of income differences on food expenditures and on consumption—the usual income-expenditure and income-consumption elasticities—and on the intake of major nutrients. The objective was to provide the basis for judging whether supplementary family allowances would

increase the takings of nutrients considered to be relatively short in diets of certain groups. J. A. C. Brown, formerly in charge of the analysis of the Survey—now on the staff of the Department of Applied Economics at Cambridge University—used the Survey data in two econometric studies, "Economics, Nutrition and Family Budgets" (8, pp. 63-70), and "The Consumption of Food in Relation to Household Composition and Income" (3).

Two articles by current members of the staff of the Ministry illustrate other uses of the data. A. H. J. Baines and Dorothy F. Hollingsworth wrote "The Diets of Elderly People Living Alone" (8, pp. 77-80) and Evelyn H. Gibson, W. L. Readman, and Grace M. Warnock prepared the article "Food and Family Size" (8, pp. 80-92).

Until late 1955 there appears to have been only limited use of the Survey data for marketing research within the Ministry, in other Government agencies, or by commercial agencies. Some of this difference in emphasis compared with the widespread use of the Department of Agriculture's household food surveys and time series data on food consumption for marketing research was doubtless due to the continuation of Government controls over food distribution and prices up to 1954.

Even in 1955 the United Kingdom was still faced with balance of payments problems in supplying demand for higher quality foods, although food supplies in terms of food energy content were as high as in the United States. In contrast, as shown by tables 2, 3, and 4, the United States has abundant food supplies, largely from domestic output, as well as great purchasing power. Utilizing our food supplies is our problem. Food consumption analysts in Britain are preoccupied with family size and composition and differential allowances, whereas our analysts are absorbed in marketing research, seeking means of disposing of all we produce.

Comparability of Survey Data With Other Types of Data

Without extensive research it would be impossible to reach an independent judgment of the comparability and accuracy of the Survey data. Instead, opinions of a number of informed people were obtained—statisticians responsible for making the Survey, for reviewing and analyzing the

Survey data, for developing food disappearance data; information specialists; and some economists outside the Government. The opinions given may be summarized as follows:

1. Market research firms have made independent checks of the Survey data and found them generally accurate.
2. Any close matching of Survey and disappearance data was impossible, but year-to-year movements usually were broadly reconcilable. This was to be expected during the period of strict rationing and distribution control.
3. Since decontrol and derationing, comparison of Survey and disappearance data has become more difficult. New bases for estimating disappearance of several major foods have had to be developed. As in the United States, there is no way of estimating the quantities of foods consumed outside households, as in eating places.
4. In recent years, the biases in the Survey data have been materially reduced, such as overrepresentation of households with young children and of households with elderly people and underrepresentation of younger 2-person households and of households of the upper social classes. But the free market situation now makes possible wide variations in consumption rates.

Notes on U. K. Food Consumption, 1940-55

Adequate appraisal of data on food consumption in the United Kingdom, 1940-55 (tables 1 and 2), calls for extended research and for far greater knowledge than I possess. But the story back of the data is so dramatic, and so little of it is known in the United States, that I venture a brief description of the changes and a summary of the discussion of the factors back of them contained in the official reports on the National Food Survey. For additional and more precise information, readers are referred to the reports, which may be obtained from the British Information Services in New York, or to the fascinating volumes by R. J. Hammond, *Food: The Growth of Policy* and *Food: Studies in Administration and Control* (4, 5).⁵

The Food Situation, 1940-49

Before World War II the United Kingdom imported more than half of its food supplies—the United States imported less than 10 percent. Early in the war the British Government began a drive to expand domestic production of food with emphasis on the production and consumption of milk, grain products, potatoes, and vegetables. The food supply figures for prewar years and 1941 (table 2) show how sharply the war emergency

⁵ Volume I was reviewed by Gladys Baker in this journal, July 1952.

TABLE 1.—*Domestic (at home) food consumption by households in the United Kingdom*¹

[In ounces per person per week (except where noted)]

Commodity group	Urban working-class households							
	1941 ²	1942	1943	1944	1945	1946	1947 ³	1948 ⁴
	Total dairy products (equiv. pt.)-----	3.9	4.4	4.8	4.8	4.8	4.7	4.7
Milk and cream (equiv. pt.)-----	3.5	3.8	4.3	4.4	4.4	4.4	4.4	4.4
Cheese-----	1.9	3.6	3.1	2.6	2.5	2.5	2.3	1.9
Meat, game, poultry, fish-----	33.2	32.9	32.8	36.1	35.5	37.2	35.1	32.8
Meat, game, poultry-----	27.5	26.3	26.2	28.4	26.3	26.7	25.5	23.0
Fish-----	5.7	6.6	6.6	7.7	9.2	10.5	9.6	9.8
Eggs (No.)-----	1.4	1.4	2.2	2.9	3.0	2.5	2.3	2.3
Fats-----	8.5	8.7	8.8	9.3	8.7	8.3	7.8	8.9
Sugar and preserves ⁵ -----	12.6	13.3	13.9	15.2	14.6	15.0	15.7	15.5
Tomatoes and fruit ⁶ -----	7.7	12.2	12.7	13.9	15.9	15.7	21.7	22.8
Potatoes-----	69.4	68.5	71.2	71.4	68.5	73.8	70.9	66.0
Vegetables-----	29.9	31.4	34.6	37.3	36.4	34.6	30.8	32.7
Grain products ⁷ -----	86.6	81.5	81.3	83.3	85.5	82.5	83.9	89.8
	Urban working-class households		All households					
	1949	1950	1950	1951	1952	1953	1954	1955
Total dairy products (equiv. pt.)-----	5.1	5.4	5.6	5.7	5.5	5.5	5.6	5.6
Milk and cream (equiv. pt.)-----	4.8	5.0	5.2	5.2	5.1	5.1	5.1	5.1
Cheese-----	2.2	2.4	2.5	2.8	2.2	2.5	2.9	2.8
Meat, game, poultry, fish-----	31.1	33.9	36.4	34.4	36.5	38.6	39.4	40.4
Meat, game, poultry-----	22.7	27.2	29.8	26.7	29.0	32.3	33.8	34.4
Fish-----	8.4	6.7	6.6	7.7	7.5	6.3	5.7	6.0
Eggs (No.)-----	2.9	3.4	3.5	2.8	3.0	4.0	4.3	4.2
Fats-----	10.7	11.5	11.6	10.9	9.8	10.5	11.7	11.9
Sugar and preserves ⁵ -----	17.1	15.9	16.4	17.4	17.0	18.7	21.1	21.7
Tomatoes and fruit ⁶ -----	22.4	20.8	22.9	27.0	25.4	26.5	25.5	27.1
Potatoes-----	68.9	65.8	64.2	64.2	65.9	64.2	63.2	61.2
Vegetables-----	31.0	28.7	29.7	32.5	32.6	32.7	30.4	30.7
Grain products ⁷ -----	85.4	80.5	81.7	83.9	85.9	82.8	80.7	80.0

¹ From National Food Survey of the United Kingdom. For 1942-1949 includes purchased foods, supplies obtained free for home consumption and withdrawals from larger stocks. Excludes sweets, ices, alcoholic and some soft drinks and meals purchased away from home, also Welfare foods distributed by the Government except Welfare and School milk. Data for 1941-49 from First Report, (12, pp. 20, 58); 1950, working class from 1950 Report (13, p. 109); 1950-51, all households, 1951 Report (14, p. 13); 1952, from 1953 Report (9, p. 16); 1953-54,

from 1954 Report (10, p. 15); and 1955, from table 49 of 1955 Report (11). Minor revisions have been made with the assistance of the Survey statisticians.

² Purchases.

³ Averaged over 9 months.

⁴ Averaged over 10 months.

⁵ Excludes sweets and soft drinks.

⁶ Includes nuts.

⁷ Includes bakery products.

cut into civilian supplies of imported foods—fruit, meat, sugar, pulses (dry beans and peas) and nuts, eggs, and fats. “. . . by the end of 1941, the pattern of rationing, price control, and food supplies was set in the lines which it was to retain, with comparatively unimportant changes, for the remainder of the war. . . .” (12, p. 10.) In the latter part of 1941, substantial lend-lease shipments of food from the United States were reaching Britain.

“During 1942,” the First Report continues, “supplies of food increased both in quantity and quality. The most critical period of the war, so far as the diet was concerned, was over.” With lend-lease and wartime domestic production programs in operation, note the general increase in consumption of most foods from 1941 to 1944, then the fall in meats, fats and potatoes from 1944 to 1945. (A glance at table 3 reveals concurrent movements in U. S. supplies from 1944 to 1945.)

TABLE 2.—*Food supplies moving into consumption in the United Kingdom*¹

[Pounds per capita per year]

Commodity	Prewar (1934- 38)	1941	1942	1943	1944	1945	1946	1947
Dairy products (milk solids) ² -----	38.3	40.7	48.6	50.0	49.0	49.8	49.4	49.0
Meat, fish, game, poultry-----	142.7	105.6	110.1	108.0	119.5	114.4	124.7	120.3
Meat (edible wt.)-----	110.0	85.6	89.6	86.4	96.1	86.6	90.2	83.2
Fish, game, poultry (edible wt.)-----	32.7	20.0	20.5	21.6	23.5	27.8	34.5	37.1
Eggs and egg products (shell egg equiv.)-----	28.3	25.4	25.1	25.6	26.8	30.4	26.1	24.9
Oils and fats (fat content)-----	46.9	41.7	41.1	39.1	40.5	38.4	36.8	36.0
Sugar and syrup (sugar content) ³ -----	104.6	69.2	69.4	69.1	73.7	69.9	79.3	84.1
Tomatoes and fruit ⁴ -----	137.4	59.7	94.2	77.9	93.6	90.9	108.5	131.1
Potatoes ⁵ -----	181.9	188.2	224.9	248.8	274.6	260.2	281.2	285.9
Vegetables ⁶ -----	107.0	109.0	119.7	117.0	124.8	127.0	123.5	118.0
Grain products-----	210.1	257.2	245.7	248.9	252.8	258.0	237.2	241.7
Pulses and nuts-----	9.5	7.5	6.1	6.0	6.8	6.3	6.5	8.0
Tea-----	9.3	8.1	8.2	7.0	7.4	8.2	8.8	8.5
Coffee-----	.7	1.2	1.2	1.0	1.2	1.2	1.4	1.6
	1948	1949	1950	1951	1952	1953	1954	1955
Dairy products (milk solids) ² -----	49.2	52.7	54.3	54.8	51.5	52.3	52.5	52.2
Meat, fish, game, poultry-----	112.1	109.8	122.9	106.6	112.8	119.0	129.8	136.3
Meat (edible wt.)-----	75.4	75.4	95.8	76.5	84.6	93.4	104.3	110.4
Fish, game, poultry (edible wt.)-----	36.7	34.4	27.1	30.1	28.2	25.6	25.5	25.9
Eggs and egg products (shell egg equiv.)-----	25.7	28.3	31.4	27.6	27.6	28.1	29.4	29.5
Oils and fats (fat content)-----	40.9	47.3	47.7	49.5	45.1	45.6	48.7	48.2
Sugar and syrup (sugar content) ³ -----	85.6	94.9	86.5	95.5	90.7	100.4	108.6	111.2
Tomatoes and fruit ⁴ -----	136.9	132.9	126.5	131.5	123.3	133.4	145.9	140.8
Potatoes ⁵ -----	238.9	258.3	246.4	239.6	237.8	222.4	221.9	223.3
Vegetables ⁶ -----	125.2	108.9	105.7	109.6	100.7	107.0	104.8	101.2
Grain products-----	250.2	240.5	222.8	221.1	219.5	208.4	202.1	196.4
Pulses and nuts-----	6.1	9.3	11.2	10.3	9.4	10.6	12.2	11.5
Tea-----	8.0	8.3	8.5	8.1	8.5	9.5	9.7	9.4
Coffee-----	1.7	1.8	1.5	1.7	1.5	1.3	1.3	1.3

¹ Civilian consumption for the years 1941-47, for other years figures relate to consumption of the total population. Data for prewar from p. 6 of 1952 Report (15); for 1941-45, 1946-49 from pp. 16 and 55 of First Report of the National Food Survey Committee (12); for 1950-52 from p. 6 of 1952 Report (15); 1953 from p. 6 of 1953 Report (9); and 1954 from p. 3 of 1954 Report (10). Figures have been amended in detail by the Ministry of Agriculture, Fish-

eries and Food in the light of later information and to conform to later published data.

² Excludes butter.

³ Excludes sugar for brewing and distilling.

⁴ Fresh equivalent.

⁵ 1954 Report notes that prewar potato estimate may be on the low side.

⁶ Includes home garden production. Fresh equivalent basis.

The supply situation for fish and for foods imported from countries other than the United States changed completely from 1945 to 1946.

In 1947 came first a crisis in food supplies because of balance of payments difficulties, which were eased by Marshall aid, then a domestic production crisis. The short potato crop particularly aggravated the situation; distribution of that commodity was put under controls in November, 1947. This meant that for a short period all major food items were subject to some form of rationing control, a situation which had been avoided even in the worst war years.

Fortunately, signs of a return to prewar food patterns began to appear in 1948. Increasing supplies of fish, eggs, fats, preserves, bacon and tea, as well as milk were available to British consumers. Short supplies of meat and sugar continued, reflecting world shortages.

Although food supplies continued to expand in 1949, except for meat and fish, increases in world food prices were creating serious difficulties for the British Government. Rather than increase food subsidies still further, retail prices of cheese, meat, butter and margarine were permitted to rise.

TABLE 3.—*Food supplies moving into civilian consumption in the United States*

[Pounds per capita per year]

Commodity group	Prewar (1935- 39)	1941	1942	1943	1944	1945	1946	1947
Dairy products (milk solids) ¹ -----	57.4	60.1	64.2	66.0	66.8	71.4	72.7	69.0
Meat, game, poultry, fish-----	142.2	161.2	159.4	171.1	176.5	170.4	175.5	173.4
Meat (edible wt.)-----	112.4	128.1	126.3	133.8	141.0	131.7	138.2	138.2
Fish, game, poultry (edible wt.)-----	29.8	33.1	33.1	37.3	35.5	38.7	37.3	35.2
Eggs (shell eq.)-----	36.4	37.7	38.1	41.6	42.5	48.3	45.5	46.8
Oils and fats (fat content)-----	45.4	47.6	44.9	42.0	40.9	39.1	40.0	42.0
Sugar and syrup (sugar content) ² -----	108.1	116.3	98.0	95.8	104.2	88.9	90.3	110.9
Tomatoes and fruit ³ -----	285.1	310.9	289.3	270.1	312.5	324.6	346.1	325.0
Potatoes and sweetpotatoes ⁴ -----	147.0	142.8	142.4	142.4	152.5	136.4	136.9	137.1
Vegetables ⁴ -----	191.1	196.7	204.7	202.5	207.1	218.5	213.6	200.4
Grain products-----	203.9	199.2	200.7	208.2	190.6	201.0	192.1	173.0
Pulses and nuts ⁵ -----	18.6	18.8	22.3	20.3	20.0	19.3	19.0	16.5
Tea-----	.7	.8	.5	.5	.5	.5	.6	.6
Coffee-----	11.8	13.4	11.4	10.8	13.3	13.8	16.9	14.6
	1948	1949	1950	1951	1952	1953	1954	1955
Dairy products (milk solids) ¹ -----	66.3	66.2	66.6	66.3	67.3	66.3	67.3	67.9
Meat, game, poultry, fish-----	165.0	166.0	168.8	164.4	171.8	178.4	179.2	183.7
Meat (edible wt.)-----	129.5	128.7	128.8	123.4	130.2	137.1	136.3	143.4
Fish, game, poultry (edible wt.)-----	35.5	37.3	40.0	41.0	41.6	41.3	42.9	40.3
Eggs (shell eq.)-----	47.8	47.4	48.5	49.2	49.2	47.8	47.4	46.8
Oils and fats (fat content)-----	42.6	42.6	45.9	42.1	44.1	44.1	45.4	45.5
Sugar and syrup (sugar content) ² -----	105.5	107.1	112.7	105.3	109.0	108.6	106.6	107.9
Tomatoes and fruit ³ -----	312.3	303.5	286.0	298.6	294.6	297.7	290.9	295.4
Potatoes and sweetpotatoes ⁴ -----	114.0	119.1	114.9	117.8	107.1	112.2	112.2	113.9
Vegetables ⁴ -----	195.3	186.2	186.1	182.7	181.5	178.9	176.0	175.2
Grain products-----	170.2	169.3	167.3	165.1	161.8	157.9	155.2	152.1
Pulses and nuts ⁵ -----	17.2	16.3	18.5	17.1	16.9	16.2	16.3	15.6
Tea-----	.6	.6	.6	.7	.6	.7	.7	.6
Coffee-----	15.5	15.7	13.6	13.9	14.2	14.2	12.4	12.9

¹ Excludes butter.

² Includes sugar used for processed food products.

³ Fresh equivalent, including home-produced tomatoes and melons.

⁴ Fresh equivalent, including home-produced.

⁵ Includes home-produced dry beans and peas.

Some Commodity Highlights, 1940-49

The published reports on the Survey contain much commodity detail and quarterly figures which show the swings in the British food supply position more clearly than annual data. Following are some commodity highlights that may interest agricultural economists in this country.

Look first at milk products. The figures in both table 1 and table 2 show the results of the domestic milk production program, controls over manufacturing and distribution, subsidy programs, and the contribution of lend-lease evaporated and dry milk. In 1941 we shipped 490 million pounds of evaporated milk to the United Kingdom for civilians and the British Services, and more than 200 million each year from 1942 to 1944, excluding shipments to the British Services stationed outside the United Kingdom. The cheese consumption

figure for 1942 in table 1 shows the impact of the 282 million pound shipment from the United States under lend-lease that year. Cheese supplies were cut back at the end of lend-lease, then recovered some under the postwar programs of imports from the United States and other countries, and after 1949 with increased domestic output.

Domestic production of meats was reduced early in the war, as emphasis was put on milk production. The extent of dependence on lend-lease supplies and on those imported from Argentina is indicated by the fall in the consumption rate under the dollar shortage of 1947-49, and then again in 1951.

Although the United States shipped large quantities of canned fish under lend-lease to the United Kingdom and British Services Overseas,

most of the improvement in civilian fish consumption after 1941 came from fish supplied with the determined efforts of British fisherman despite the war demands on their personnel and equipment and the intensive war activity all around the Islands. The annual figures in table 1 for 1944 to 1946 conceal much of the dramatic upsurge in supplies after V-E in 1945.

Shell egg supplies were cut to less than half the prewar rate in 1943 and 1944. Nonpriority consumers got one per month in the winter and one or two per week during the spring flush season. Dried eggs from the United States were the rather unappetizing but saving grace. By 1944 two-thirds of the total consumption of eggs by households in the Survey was in dried form. The reductions in egg consumption in 1947 and 1948 reflect the reduction in imports of dried eggs although by 1948 domestic production was increasing and shell eggs were coming in from the Continent. (In the retail stores, eggs are featured as English or Danish.)

Imports of fats for civilian use were reduced during the war even though substantial quantities moved under lend-lease. Note the reflection of the world fat shortage in 1946 and 1947.

Importation of fresh and canned fruit for civilian consumers ceased after 1940, except for occasional supplies of oranges which went to children and expectant mothers. Imports of dried fruit, much from the U. S., were maintained at the prewar level because they were economical of shipping space in comparison to their food value. Domestic fruit production was difficult to step up although tomato output went up some. (The Survey handling of tomatoes with fruit reflects the nutritionists' point of view.) After the end of the war, supplies of fresh fruit and tomatoes were among the first to expand.

Commercial output of vegetables, including potatoes, was increased. By 1944 potato acreage was double that of 1939. Potatoes made a substantial contribution to the diet, providing 40 to 50 percent of the vitamin C (ascorbic acid). Supplies of fruits and vegetables from home gardens and allotments were an important part of the total consumption of these commodities by the households reporting in the Survey. In 1943 19 percent of the households' fresh fruits and fresh vegetables, other than potatoes, came from so-called "free supplies."

"It was a fundamental part of the wartime food policy to ensure that sufficient bread was available to compensate for shortages in the diet and to achieve this without recourse to rationing . . ." (12, p. 35.) To fulfill this policy, wheat acreage was increased, the extraction rate was raised to over 80 percent, and large quantities of flour were brought in from the United States and Canada. Bread consumption did go up, but there were somewhat greater decreases in flour, according to the National Food Survey Committee, because of the outside employment of housewives and the shortage of fats and sugar. Also, bread was subsidized more than flour. Purchases of cakes (not sweet ones like ours), buns, and scones increased. The impact of the worldwide grain shortage in 1946 dealt a severe blow to the British food administration people. They had to raise the flour extraction rate to 85 percent and institute bread and flour rationing in July 1946. It continued until mid-1948.

The fall in sugar imports with the advent of the war cut supplies for British consumers back to 65 or 70 percent of prewar. Then when shipping became available, United Kingdom supplies were held down first by the world supply shortages, then by dollar shortages.

Major Developments, 1950-54

Let us move on to a brief survey of the United Kingdom's food picture in the more recent postwar years. In 1950 came marked improvement in the variety and palatability of food supplies and trend away from the bulkier foods, the relatively high wartime level of vegetable consumption, and the heavy fish consumption of early postwar years. Dairy products, eggs, and fats became more plentiful. The meat outlook looked much brighter as domestic output increased 20 percent, but darkened later in the year with the cessation of Argentine shipments. Relaxation of many controls began but was stopped in midyear by the Korean crisis.

The Korean crisis brought some reduction in ration levels and higher prices in 1951. Balance of payment difficulties and unfavorable terms of trade reduced the imports of meats and shell eggs. Fish consumption rose fairly sharply in 1951 when meats were particularly short.

The following year the trend toward decontrol of food distribution was resumed. Supplies of

TABLE 4.—United Kingdom civilian supplies of food energy, protein, and fat in selected years, per head per day

Nutrient	Unit	Average 1934-38 ¹	1941 ¹	1944 ¹	1947 ¹	1950 ¹	1954 ²	1955 ³
Total calories ⁴	No.....	3,000	2,820	3,010	2,880	3,050	3,130	3,120
Protein:								
Animal.....	Gm.....	43.5	35.7	41.4	44.6	46.6	46.3	47.4
Vegetable.....	Gm.....	36.8	46.7	45.7	46.2	42.2	35.9	35.0
Fat.....	Gm.....	130.0	113.4	124.0	106.3	131.2	136.0	137.3

¹ Ministry of Food Bulletin No. 720, 19th September 1953.

² Board of Trade Journal, 11th August 1956.

³ Economic Survey 1957. (H. M. S. O. Cmnd. 113.)

⁴ British system of calculating food energy seems to yield totals about 100 calories below U. S. system. U. S. calorie figures ran 3,300 to 3,400 during the war and 3,200-3,300 since 1946.

meat, especially bacon, increased, and tea was de-rated. Butter and cheese supplies were still unsatisfactory because of deterioration in the balance of payments position. This close tie-in of the food economy with Britain's international financial position is so very different from the U. S. food situation that it seems like an academic exercise in international economics to an American agricultural economist, but it is all too real to the British housewife.

As the balance of payments situation improved in 1953, and world prices declined, imports of meat, sugar, fresh fruit, and vegetables rose. Note in table 1 how fish consumption went down when meats went up after 1951, also the reduction in cereal products and potatoes. The trend toward prewar food patterns continued, except for the higher level of milk consumption, less fish, and the retention of the butter-margarine shift. During the year 1953 came relaxation of rationing control over the distribution of eggs, sugar, fresh meat and bacon—in part of the year—and cheese. Restrictions on flour milling were removed.

Consumption of all main food groups except cereals, potatoes, and other vegetables increased further in 1954. Demand for cereals and potatoes was falling and vegetable supplies were reduced by unfavorable weather. At last rationing was stopped—with the termination of controls over distribution of meat, cheese, and fats. But nutritionists were not as pleased with record fat consumption as consumers were.

The year 1955 was the first full year without food rationing. Bread and milk were still subsidized and subject to price control. Demand for all other major foods operated in a free market

situation for the first time since 1939. For most foods, the changes in consumption rates from 1954 to 1955 were small. Notable exceptions were the 6 percent increase in meat, a slight further rise for sugar and sirups and decline for grain products.

Nutrient Supplies

The reports on the Survey contain evaluations of the situation for each major nutrient year by year. Nutrient supply data calculated from average per capita consumption of all foods are given in table 4.

Supplies of food energy, measured in calories per head per day, were down to 93 percent of the prewar level in 1940 and 1941, stayed at 5 percent below prewar in the next 2 years, rose to prewar level in 1944, then fell slightly in 1945. Flour, bread, and potatoes were important in maintaining the energy value of the food supply.

The per capita supply of animal protein in 1940 fell to 90 percent of the prewar level, and dropped to 82 percent in 1941, followed by a recovery after the arrival of lend-lease supplies. Increased consumption of bread and potatoes kept the total supply of protein above prewar, as shown in table 4.

Fat consumption ran 89 percent of prewar in 1942-45, fell off during the postwar years of world shortage of fats, then rose to new highs.

According to Hammond, "There were dramatically sharp rises, after 1942, in the supplies of minerals, particularly calcium and iron, and vitamins of the B group . . . ; calculated rises in vitamin A and ascorbic acid (vitamin C) should perhaps be regarded with greater caution on account of the uncertainties of vegetable supply statis-

TABLE 5.—Per person use of selected foods in United Kingdom and United States households at home, in a week, spring 1955¹

[In ounces except where noted]

Commodity	United Kingdom		United States	
	All	Urban	All	Urban
Fresh fluid milk, pint.....	2 5.8	2 5.8	6.6	6.5
Whole milk only, pint.....	2 (5.8)	2 (5.8)	6.0	5.9
Cheese, all.....	2.7	2.6	5.1	5.4
All meat, poultry, game.....	35.3	35.2	59.8	63.4
Poultry.....	.5	.4	11.3	12.5
All fish.....	5.9	6.2	6.3	6.6
Eggs, number.....	4.6	4.5	7.4	7.0
Fats and oils ³	11.7	11.6	11.8	10.7
Butter.....	4.4	4.4	3.2	3.2
Margarine.....	4.6	4.6	3.2	3.2
Sugars.....	17.1	17.1	13.2	11.3
Sirups and preserves.....	4.3	4.1	4.9	3.9
Tomatoes and fruit:				
Fresh tomatoes.....	} 21.0	} 21.5	{ 5.7	{ 5.9
Fresh fruit.....				
Processed (product weight).....				
Total.....	6.5	6.3	23.0	26.4
Total.....	27.5	27.8	74.4	79.0
Potatoes and sweetpotatoes, including processed.....	58.3	59.3	29.9	27.2
Fresh green vegetables.....	13.4	13.2	23.5	23.4
Other vegetables (product weight).....	13.9	14.4	28.2	29.7
Total.....	27.3	27.6	51.7	53.1
Grain products:				
Bread, rolls, etc.....	55.4	54.1	25.8	27.3
Flour (including mixes).....	8.7	8.1	15.7	10.1
Cakes and other sweet goods except cookies.....	5.9	6.2	4.3	5.2
Cookies (English biscuits).....	5.0	5.2	2.1	2.1
Other.....	5.4	5.5	12.5	10.4
Beverages:				
Tea.....	2.8	2.9	.4	.4
Coffee.....	.3	.3	3.8	4.1
Cocoa and chocolate.....	.2	.2	.3	.3

¹ United Kingdom data actually purchases (plus home-produced supplies) but approximate use—from tables 9 and 49 of the 1955 Report (11). United States data from Household Food Consumption Survey Report No. 1.

² Converted to American pints. Includes about ½ pint of school milk. Includes very little nonwhole milk.

³ Including butter but not salad dressings.

tics. Generally speaking, and on an average, that is to say, the diet theoretically available to the British civilian was not only maintained but actually improved during the war" (4, p. 369).

Comparison of Survey and Disappearance Data

As noted in the section on comparability of Survey data, though direct and precise comparisons are impossible, the two sets of data are broadly reconcilable.

Besides the complication that the disappearance or per capita consumption figures include the total flow of food supplies into households, into all kinds of eating places, and into processing of prepared foods, the Survey data for 1942-49 covered only urban working class households.

Moreover, the National Food Survey Committee in its first report noted some upward movement in social class in the samples for 1944 and 1945. Study of the two sets of data indicates that the Survey probably did reflect the changes in food consumption of 80 percent of the population, as its technicians claim. The degree to which the data from two completely different sources matched during the years of food control reflects (a) the leveling-down effect of food restrictions on food consumption by higher income classes, and (b) the leveling-up effect of wartime expansion in purchasing power of workers on their food consumption.

Even though the average consumption rates for urban working class and all households came

quite close in 1950, there is a real possibility that with decontrol the Survey data are diverging from the disappearance data. The higher rate of refusals to cooperate in the Survey among households in the upper income groups and greater freedom of choice in eating out contribute to such divergence.

A few findings from comparisons of the trends in the two sets of United Kingdom data follow.

For dairy products and eggs from 1941 to 1943, greater increases are found in consumption rates by Survey households than the disappearance data show, but the two series moved closely together in later years. These were rationed commodities which working class households could afford to buy as their purchasing power rose. The two series of data for the meat and fish groups combined, and for fats, moved closely together during the war, but they have swung unevenly since. Data for the sugar and sirup group stayed quite close throughout the period 1941 to 1954.

Working-class households reporting under the Survey maintained their higher level of potato consumption through 1950. When other classes were brought into the Survey sample, the level of potato use apparently shaded downward. The heavy buildup in annual disappearance figures from 1941 to 1944 apparently reflected some increased use in higher income groups and probably in eating places. These areas of consumption would be likely to vary their potato use more closely with the supply situation for other foods. Also, it is likely that the proportion of the retail supply of potatoes actually eaten varied with the quality of the potatoes available and with the needs of the chickens in the backyards.

The consumption of tomatoes and fruit by urban workers' families varied much less from year to year than did total consumption per capita in the country. I conjecture that the cause of this difference was variations in harvests of fruit and tomatoes in rural areas for home use.

Both sets of data on vegetable consumption reflect home-produced supplies from gardens and allotments. These were much more important during and immediately after the war than they were before the war or than they are at the present time.

Compared with the level of 1952-54, annual consumption per capita of grain products by the entire civilian population was at a much higher level during the war years. With the exception of the 7 percent drop from 1945 to 1946 at the time of the cereal emergency, it has declined gradually since the end of the war. Household use has been much steadier.

Some Comparisons of United Kingdom and United States Data

Though the primary purpose of this article is to review the National Food Survey of the United Kingdom, some matching United States data are included, for comparisons. Table 3 shows United States per capita consumption data, some of which have been converted to approximate the level at which United Kingdom disappearance is measured. The second lot of data (table 5) is from the nationwide surveys of households in the two countries during April-June 1955.⁶

Food Supply or Disappearance Data

First, the levels of the per capita disappearance data, usually termed consumption data, call for comment. In the prewar years, rates for dairy products were far apart. They were much higher in the United States for all fluid milk, cream, and evaporated milk. There were also wide differences in consumption rates for the tomato and fruit group, vegetables, eggs, and pulses and nuts. These wide differences were in commodities where heavy consumption in rural areas brought up the United States average. The rates for the whole meat, fish, game, and poultry group, and for fats, sugars, and grain products were relatively close.

The war years and those immediately following present a complicated picture. We see in these differences the net effect of the facts that the United States is a great agricultural producer, of livestock products as well as vegetable products, and that the American people benefited during the war and in postwar years from rapidly expanding supplies. During these years, the United Kingdom was an embattled country, first against the

⁶Fieldwork on the Survey in the United Kingdom was suspended during the period of the General Election (May 10-31). Adjustments were made in the handling of data for other parts of the quarter to take some account of the seasonal changes (11, appendix A).

enemy, then against postwar financial problems. Its agricultural resources were far more limited than those of the United States in relation to emergency needs for food. To meet its requirements, Britain stepped up its production of vegetable products, which are more economical of farm inputs in relation to nutrients produced.

Looking now at the data for 1954, we find that the United States and United Kingdom consumption rates for dairy products and for pulses and nuts are closer together, because of increased consumption in the United Kingdom, but that rates for the meat, fish, poultry group, for vegetables, eggs, potatoes and sweetpotatoes, and for grain products are farther apart. United States consumption for the first two groups has risen, and for the latter two it has fallen markedly. There is little change in relative position for sugars and syrups, for fats, and for the tomato and fruit group.

What conclusion can we draw from these shifts? Just these: The rates are farther apart (1) on the items for which the impact of too small imports is still felt in Britain, and (2) on the items used to fill out the wartime food needs of the British people but for which the downtrend in consumption is apparently coming.

The 1954 and 1955 sugar figures for the United Kingdom deserve special notice. These were the first 2 years after some 14 years of sweets rationing, and the upsurge in consumption may reflect a kind of a "binge," as well as some buildup in stocks in homes and in unreported positions throughout the distribution system.

Some details of the changes in United Kingdom food consumption patterns have already been discussed, and this is not the place to comment on trends in the United States. But it may be illuminating to consider the movements of the rates of consumption in the United Kingdom to see if they may be expected to follow those in the United States. The following comments on the situation in the United Kingdom, though admittedly of limited value, have been discussed with informed people in Britain.

The dairy products picture is rather confused because subsidized milk consumption looms so large in the total and the outlook for cheese is affected by imports. But the increasing popularity of ice cream and the coming of age of a generation of milk drinkers will probably increase per capita

use. In this country, some people complain about the relatively high price of milk in eating places, yet in many British restaurants milk is not even available as a separate beverage.

The balance of payments position is still restricting meat imports and may well continue to do so. The English broiler industry is in its infancy so an uptrend in consumption probably lies ahead. The egg consumption rate is also heavily dependent on what happens to imports and, back of them, to that ogre, balance of payments.

Substantial switches from butter to margarine occurred during and after the war in both the United Kingdom and the United States. The present relatively high use of table fats in the United Kingdom is likely to fall off as bread consumption declines.

The downtrend in potatoes and grain products is already underway in the United Kingdom, as in the United States, after wartime and postwar emergency upswings.

For fruits and vegetables, the United States trend is complicated by internal shifts and by the reduction in production for home use. The shift to processed forms is also underway in Britain, but the domestic industry is not large and consumer purchasing power is smaller.

Household Survey Data for April-June 1955

Happily, we now have nationwide household survey data for a week in the same period for both countries. Both were designed to cover all households, but the United Kingdom had a greater response problem in terms of people refusing to cooperate by completing logbooks or schedules, whereas the problem of response in the United States was not in refusal to participate but in the unknown degree of memory bias in recalling use of food in the preceding week. National Food Survey technicians were especially curious about our reliance on recall for U. S. Department of Agriculture household food surveys. Whereas American housewives rely more and more on one big food shopping trip each week with a few extras now and then, British housewives tend to shop every day and in several different stores. Without doubt it is much easier to recall purchases made on one organized shopping trip than in a series of small purchases.

We have matched the United Kingdom items as closely as possible, but certain differences must be

noted. For one, the United Kingdom fluid milk figure includes milk consumed at school by children in the household. The United States cheese figures include a little over 2 ounces of cottage cheese per person, an item of which little is probably consumed in Britain. The still lower levels of United Kingdom household consumption than United States rates, compared with the ratios of per capita disappearance data, for the meat group and for fruits and vegetables point to some downward bias in the United Kingdom figures. This is not news to members of the National Food Survey Committee, for they have reported lower response rates in higher income groups.

The relative positions of the consumption rates in the two countries shown by per capita disappearance figures are further demonstrated in these data. For such comparisons, one regrets the lack of United Kingdom information on household use of ice cream and soft drinks—it would in all probability be far below United States rates—even though these items are major away-from-home snack items for both countries.

Visitors from the United States to Britain and British visitors to the United States frequently remark on the differences in tea and coffee consumption patterns of the two countries. Just as I cannot recall ever having seen an American manual worker drink hot tea, I have not seen a British worker drink coffee. The universal popularity of tea in England represents a very great change from the British attitude 200 years ago. A recent book on English housekeeping in the 18th century pointed out, "No drink has caused more controversy than tea; doctors, political economists, moralists, and the clergy joined with wine merchants and publicans in condemning it roundly." (1, p. 95.) But Johnson and Boswell joined in its defense.

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"Extreme-Value" Methods Simplified

By Ralph R. Botts

New methods have been devised for fitting skewed statistical distributions that conform to a double exponential model. Such distributions characterize a large class of phenomena of interest to agricultural economists. Distributions of data involving rainfall, temperature, crop yields, crop-hail losses, and others follow this pattern. The new technique, under the name of the theory of extreme values, makes use of graphics and is much less complex and time-consuming than older methods. But most of the available literature is highly mathematical and not easily understood. This paper presents a nonmathematical explanation for the working agricultural economist.

THE THEORY of the statistical distribution of extreme values was developed by E. J. Gumbel.¹ Several others had previously explored the problem.² It is particularly appropriate for measuring flood probabilities. For example, a gage height or mean streamflow is available for each day. The highest such reading for the year is an extreme value. So over a period of, say, 36 years, there are 36 such extreme values. Stated another way, the theory applies to a distribution of independent observations, each of which is an extreme value.³ The control curves (discussed later) are helpful in determining whether or not the theory applies to a particular case.

Such distributions of extreme values tend to be skewed, with the mode or most common value at the left of the mean or average. Probably for that reason, the theory has been applied also to distributions such as those involving rainfall, crop yields, and costs of crop-hail insurance loss, even though the figure for a particular year is a single

observation or an average, and not an extreme value.⁴

Most statistical theory applies to normal distributions. Heretofore, it has been necessary to fit Pearsonian curves (particularly type III) to small samples in order to derive the probabilities associated with skewed distributions. The fitting procedure is complex and time-consuming and is not generally understood by economists. But extreme-value methods present a much simpler tool for economists, and they will do well to investigate it.

The purpose of this article is not to review the mathematics involved in the theory of extreme-value distributions; but rather to present this relatively new tool in such a way that it can be applied by those not versed in mathematics. Only a few symbols are used, and no formulas are derived. For illustrative purposes, the method is applied to a distribution of annual "loss costs" of a mutual crop-hail insurance company. Then the necessary steps are summarized and the column headings for a spread sheet are given, so that the calculations may be standardized for mass processing of data by clerks.

Application of the method is simplified immensely by the use of double exponential paper (figs. 1 and 2). On this paper, the vertical scale (y) is evenly spaced. It is used for the observed values. The horizontal scale is used as the probability ($m/n+1$) scale. It never reaches zero on the left nor 1 on the right. Unfortunately, the

¹ GUMBEL, E. J. STATISTICAL THEORY OF EXTREME VALUES AND SOME PRACTICAL APPLICATIONS. National Bureau of Standards, Applied Mathematical Series 33, 1954. For sale by Superintendent of Documents, 40 cents. Also PROBABILITY TABLES FOR THE ANALYSIS OF EXTREME-VALUE DATA. National Bureau of Standards, Applied Mathematical Series 22, 1953. For sale by Superintendent of Documents, 25 cents.

² For example, DE FINETTI, FISHER, AND TIPPETT. See bibliographies in publications listed in footnote 1.

³ A chief difficulty in applying the theory has been a lack of independence of data. For tests of randomness in time series, see F. G. FOSTER AND A. STUART. DISTRIBUTION-FREE TESTS IN TIME SERIES BASED ON THE BREAKING OF RECORDS. JOUR. ROY. STATIS. SOC. Series B, Vol. 16, No. 1 (1954). Pp. 1-22.

⁴ BRAKENSIEK, D. L., AND ZINGG, A. W. APPLICATION OF THE EXTREME-VALUE STATISTICAL DISTRIBUTION TO ANNUAL PRECIPITATION AND CROP YIELDS. ARS 41-13, in cooperation with 5 State experiment stations.

probability paper is not for sale.⁵ Until it is placed on the market, each person interested in applying the method will have to construct his own paper (a time-consuming job) or obtain it from others.

As an example of application of the method, suppose the cash cost of producing wheat in a Great Plains county is \$10 per acre. Using a support price of, say, \$2 per bushel, the cash cost represents 5 bushels of wheat. In arid regions, crop yields tend to be skewed, and not normally distributed, over time. Applying extreme-value methods to a distribution of appropriate annual yields, one could determine the probability associated with getting a yield equal to or less than cash costs. He might do this for both continuously cropped and fallowed wheat, from which probability comparisons would be possible. The method therefore has application in the fields of risk reduction and crop-insurance ratemaking.

Or, to take another example, suppose you want to evaluate the chances of having annual rainfall of less than 15 inches (or any minimum level deemed necessary for wheat production) at 2 weather stations. From station records, you could get rainfall data, by years, for each station, prepare probability charts, and read the respective probabilities from them.

The method has special value in the field of crop-hail and windstorm insurance. Using this method, the probabilities associated with various loss levels can be ascertained. But in this field of work, one is usually interested in the other end of the distribution—the higher values of y (loss costs) and their associated values of $m/n+1$ (probabilities of occurrence).

In the example used, there is an 8-percent, or 1 in 12, chance of having an annual loss cost (aggregate annual losses divided by insurance) that exceeds twice the company's average loss cost (of 56.2 cents per \$100). And there is a 3.3 percent, or 1 in 30, chance that annual losses will exceed 250 percent of average. If the company's safety fund or reserve also amounts to 2½ years of average losses, it may want to get aggregate-excess

⁵ The author has obtained a limited supply from the Weather Bureau and from the Climatology Unit, Environmental Protection Section, Research and Development Branch, Military Planning Division, Office of Quartermaster General, U. S. Army.

reinsurance, which goes into effect at \$1.40 per \$100—250 percent of 56.2 cents.

From its own experience, the company can therefore evaluate the chances of having a year of unusually high losses. And, taking the size of its safety fund into consideration, it can arrive at a decision, with respect to the reinsurance protection it needs, that is better than it could otherwise reach.

The basic data for the example used here are shown in table 1. The annual loss costs (losses paid divided by insurance in force) of a crop-hail mutual insurance company are arrayed from lowest to highest, and are ranked in that order. Then, in column 4, the rank for each year is divided by 37, or $(n+1)$ years.

TABLE 1.—Calculations necessary for plotting data on extreme-value probability paper, based on experience of mutual crop-hail insurance company, 1920-55¹

Year (1)	Annual loss cost ² y (2)	Rank m (3)	$\frac{m}{n+1}$ (4)	Z^3 (5)
<i>Cents</i>				
1926-----	8	1	0. 027	- 1. 28424
1938-----	20	2	. 054	
1932-----	23	3	. 081	
1942-----	26	4	. 108	
1927-----	27	5	. 135	
1933-----	27	6	. 162	
1941-----	28	7	. 189	- . 51043
1931-----	29	8	. 216	
1949-----	31	9	. 243	
1923-----	33	10	. 270	
1935-----	37	11	. 297	
1929-----	39	12	. 324	
1951-----	40	13	. 351	- . 04590
1954-----	40	14	. 378	+ . 02751
1924-----	40	15	. 405	
1936-----	44	16	. 432	
1945-----	46	17	. 459	
1955-----	55	18	. 486	
1930-----	55	19	. 514	. 40717
1925-----	56	20	. 541	
1939-----	57	21	. 568	
1920-----	58	22	. 595	
1948-----	58	23	. 622	
1943-----	61	24	. 649	
1922-----	67	25	. 676	. 93761
1952-----	67	26	. 703	
1928-----	68	27	. 730	
1921-----	69	28	. 757	
1950-----	74	29	. 784	
1940-----	75	30	. 811	

See footnotes at end of table.

TABLE 1.—Calculations necessary for plotting data on extreme-value probability paper, based on experience of mutual crop-hail insurance company, 1920-55¹—Continued

Year	Annual loss cost ² y	Rank m	$\frac{m}{n+1}$	Z ³
(1)	(2)	(3)	(4)	(5)
	<i>Cents</i>			
1946.....	78	31	0.838	1.73309
1947.....	84	32	.865	
1944.....	93	33	.892	
1934.....	100	34	.919	
1937.....	128	35	.946	
1953.....	182	36	.973	
Total.....	2,023			19.47600
Average.....	56.2			.5410
Standard deviation.....	33.2			1.1313

¹ A few values of Z for selected values of m/n+1 are given in column 5 merely to show that the average and standard deviation of the figures in this column depend only on sample size. For a given sample size (36 in example), the average and standard deviation of the reduced (Z) values always remain the same. The value of these constants for various sample sizes is given in table 2.

² Aggregate loss payments divided by amount of insurance in force.

³ $Z = -\ln[-\ln(m/n+1)]$. . . where ln stands for natural logarithm.

⁴ Square root of [sum of squared deviations from average (0.5410) divided by 36 (not 35)].

The average and standard deviation of the Z-values (see table 1, footnote 3) for a sample consisting of 36 years are shown in table 2. Column 5 of table 1 shows how these values were derived for n=36. The average of 0.5410 and the standard deviation of 1.1313, which appear at the bottom of column 5 of table 1, therefore could have been obtained from table 2 opposite n=36.

The next step is to determine the slope of a regression line through the data and the mode of the distribution.

$$\text{Slope of regression line} = 33.2 / 1.1313 = 29.35$$

(See standard deviations shown in table 1.)

$$\text{Mode} = 56.2 - 29.35 (0.5410) = 56.2 - 15.9 = 40.3$$

(See averages shown in table 1.)

Therefore

$$y = \text{point on regression line} = \text{mode} + (\text{slope} \times Z)$$

and in our problem

$$(1) \dots y = 40.3 + 29.35Z$$

Three points on the regression line are calculated in table 3, and the coordinates of these points are shown in the first and last columns.

These 3 values or paired observations are then plotted on the extreme-value probability paper (fig. 1). They are joined to form a straight line. Next, the observed values of y and m/n+1 (Cols. 2 and 4 of table 1) are plotted on the probability paper. The 3 coordinates used to fit the line appear as X's while the other coordinates appear as dots on the chart. The latter fall rather close to the line, indicating that the theory applies.

The calculations necessary to fit control curves are shown in table 4.

The vertical distances shown in col. (3) are marked off above and below the respective points on the regression line that are shown in col. (1). Then the points above the line are joined to form the upper boundary or control curve. The points below the regression line are likewise joined to form the lower boundary. Two-thirds of the dots or observations (col. 2 vs. col. 4 in table 1) should fall within the control curves in order for the theory to apply.

Summary of Steps

1. Construct a table like table 1. Only columns 2, 3, and 4 are necessary.

a. Compute the simple average and the standard deviation of your figures in column 2.

In the example, the simple average is 56.2 cents and the standard deviation is 33.2 cents.

2. From table 2, find the theoretical average and standard deviation of the "reduced" (Z) values for a sample of the size you have.

In the example, n=36. For a sample of that size, the corresponding average and standard deviation of the Z values (see column 5, table 1) are, respectively, 0.5410 and 1.1313.

3. Compute the slope of your regression line by dividing the actual by the theoretical standard deviation.

In the example, the slope is $33.2 \div 1.1313$ or 29.35.

4. Multiply the theoretical average (step 2) by the slope (step 3). Then subtract this product from the sample average. The result is the mode of your sample.

In the example, the mode is 40.3 as $0.5410 \times 29.35 = 15.9$ and $56.2 - 15.9 = 40.3$

5. Express your regression line as a straight-line equation which has the mode as a constant

EXTREME VALUE DISTRIBUTION

Applied to Crop-hail Insurance Experience, 1920-55

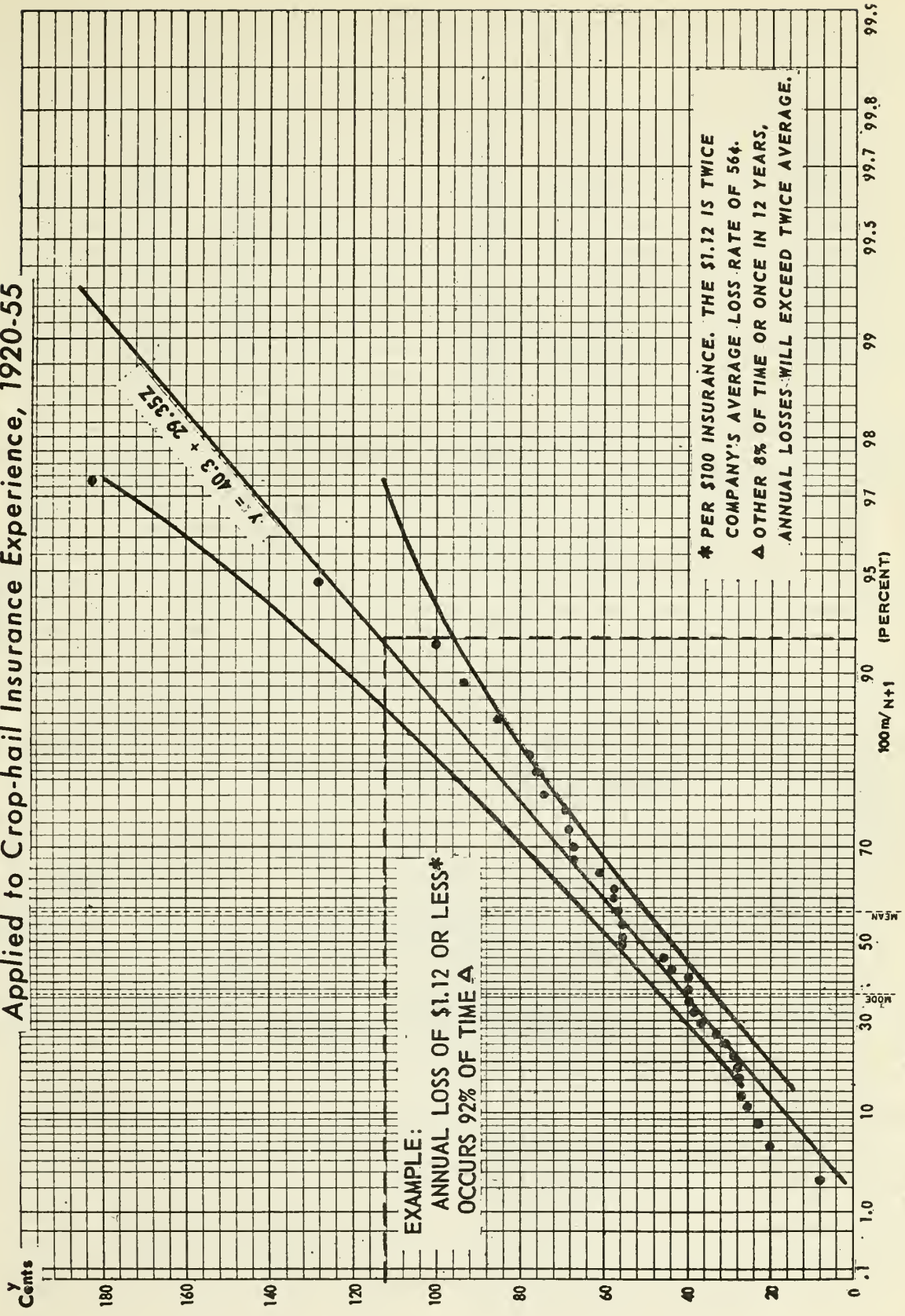
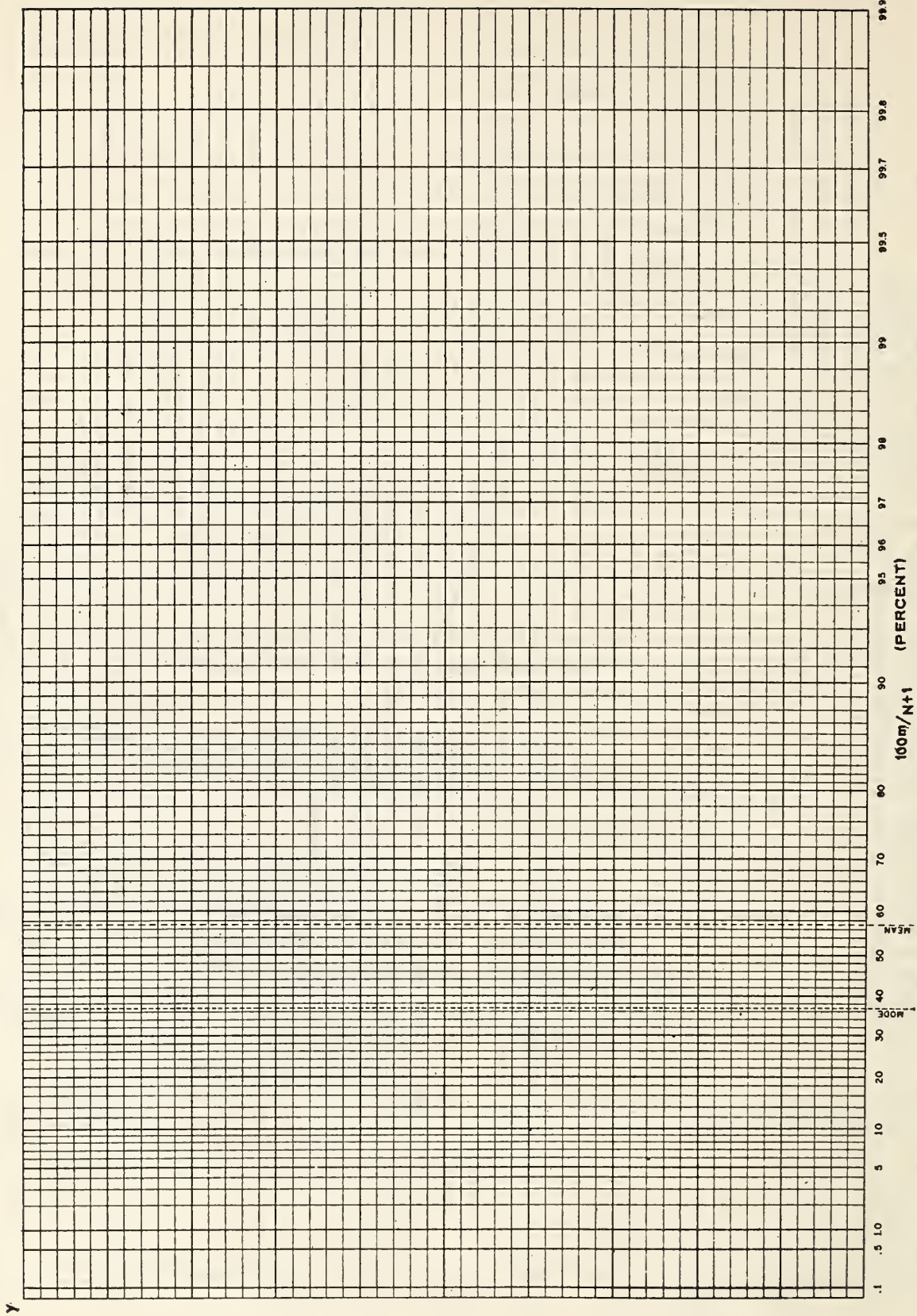


Figure 1.

EXTREME PROBABILITY PAPER



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NEG. 57 (2) - 2281

AGRICULTURAL RESEARCH SERVICE

Figure 2.

TABLE 2.—Averages and standard deviations of reduced (Z) values, by sample size¹

Sample size	Average	Standard deviation	Sample size	Average	Standard deviation	Sample size	Average	Standard deviation
15	0. 5128	1. 0206	40	0. 5436	1. 1413	65	. 5535	1. 1803
16	. 5153	1. 0301	41	. 5442	1. 1436	66	. 5538	1. 1814
17	. 5174	1. 0384	42	. 5448	1. 1458	67	. 5540	1. 1824
18	. 5196	1. 0471	43	. 5453	1. 1480	68	. 5543	1. 1834
19	. 5217	1. 0558	44	. 5458	1. 1499	69	. 5545	1. 1844
			45	. 5463	1. 1519			
20	. 5236	1. 0628	46	. 5468	1. 1538	70	. 5548	1. 1854
21	. 5252	1. 0696	47	. 5473	1. 1557	71	. 5550	1. 1863
22	. 5268	1. 0754	48	. 5477	1. 1574	72	. 5552	1. 1873
23	. 5283	1. 0811	49	. 5481	1. 1590	73	. 5555	1. 1881
24	. 5296	1. 0864				74	. 5557	1. 1890
25	. 5309	1. 0915	50	. 5485	1. 1607	75	. 5559	1. 1898
26	. 5320	1. 0961	51	. 5489	1. 1623	76	. 5561	1. 1906
27	. 5332	1. 1004	52	. 5493	1. 1638	77	. 5565	1. 1915
28	. 5343	1. 1047	53	. 5497	1. 1658	78	. 5565	1. 1923
29	. 5353	1. 1086	54	. 5501	1. 1667	79	. 5567	1. 1930
			55	. 5504	1. 1681			
30	. 5362	1. 1124	56	. 5508	1. 1696	80	. 5569	1. 1938
31	. 5371	1. 1159	57	. 5511	1. 1708	90	. 5586	1. 2007
32	. 5380	1. 1193	58	. 5515	1. 1721	100	. 5600	1. 20649
33	. 5388	1. 1226	59	. 5518	1. 1734	150	. 5646	1. 22534
34	. 5396	1. 1255				200	. 5672	1. 23598
35	. 5403	1. 1285	60	. 5521	1. 1747	Infinity	. 5772	1. 28255
36	. 5410	1. 1313	61	. 5524	1. 1759			
37	. 5418	1. 1339	62	. 5527	1. 1770			
38	. 5424	1. 1363	63	. 5530	1. 1782			
39	. 5430	1. 1388	64	. 5533	1. 1793			

¹ Furnished by Environmental Protection Section, Research and Development Branch, Office of Quartermaster General, U. S. Army (except values for samples of size 16-19).

TABLE 3.—Determination of 3 points on regression line

Let $m/n+1$ equal ¹	Then Z equals ¹	And y equals ²
0.20	-0. 47588	26. 3
.50	+ . 36651	51. 1
.95	+2. 97020	127. 5

¹ These same values of $m/n+1$ and Z can be used for all problems, thus eliminating the necessity for computing or looking up values of Z corresponding to various values of $m/n+1$. Z is defined in footnote 3 of table 1.

² By substitution in formula (1) above.

and Z as the variable (with a coefficient equal to the slope of the line).

In the example . . . $y=40.3+29.35Z$.

6. Determine 3 points on the regression line. By always using $m/n+1$ as 0.20, 0.50, and 0.95, respectively, the corresponding values of Z shown in column 2 of table 3 can be used for any example.

a. Fit these values of Z into your equation and solve for corresponding values of y. (See table 3.) Of course, the equation for each problem will include a different mode and slope; but the 3 values of Z need not change.

TABLE 4.—Computation of control curves

When $m/n+1$ equals ¹	Constant for $\frac{m}{n+1}$ equals ¹	Vertical distance from point on line to control curve (4.892×column 2) ²
(1)	(2)	(3)
0.15	1. 255	6. 1
.30	1. 268	6. 2
.50	1. 443	7. 1
.70	1. 835	9. 0
.80	2. 241	11. 0
.85	2. 585	12. 6
Point on line corresponding to:		
Second-highest dot on chart		³ 22. 3
Highest dot on chart		⁴ 33. 5

¹ These values do not need to change from problem to problem.

² $(1 \div \text{square root of } n) \times \text{slope of regression line}$. In the illustrative problem, $n=36$ years, so the square of $n=6$. The slope of the regression line is 29.35. One-sixth of $29.35=4.892$.

³ $0.7594 \times \text{slope of regression line}$. For illustrative problem, $0.7594 \times 29.35=22.3$ The figure 0.7594 does not change from problem to problem.

⁴ $1.1407 \times \text{slope of regression line}$. For illustrative problem, $1.1407 \times 29.35=33.5$. The figure 1.1407 does not change from problem to problem.

TABLE 6.—*Spread sheet for extreme-value calculations*¹

Column number	Column heading	Explanation	Example
1	Identification.....		
2	n.....	Number of years.....	Crop-hail mutual 36
3	Sum.....	From data sheet (table 1).....	2, 023
4	Average.....	(3) ÷ (2).....	56. 2
5	Sum of squared items.....	From data sheet (table 1).....	152, 189
6	Sum squared.....	Square of (3).....	4, 092, 529
7	Correction.....	(6) ÷ (2).....	113, 681
8	Sum of squares.....	(5) - (7).....	38, 508
9	Variance.....	(8) ÷ (figure in column 2 minus 1).....	1, 100. 23
10	Standard deviation.....	Square root of (9).....	33. 2
11	Theoretical average.....	From table 2.....	0. 5410
12	Theoretical standard deviation.....	From table 2.....	1. 1313
13	Slope.....	(10) ÷ (22).....	29. 35
14	(11) × (13).....		15. 9
15	Mode.....	(4) - (14).....	40. 3
First point on regression line			
16	m/n + 1.....	It can always be 0.20.....	0. 20
17	Z.....	If m/n + 1 is 0.20, Z does not change.....	-0. 47588
18	Slope × Z.....	(13) × (17).....	-14. 0
19	y.....	(15) + (18).....	26. 3
Second point on regression line			
20	m/n + 1.....	It can always be 0.50.....	0. 50
21	Z.....	If m/n + 1 is 0.50, Z does not change.....	0. 36651
22	Slope × Z.....	(13) × (21).....	10. 8
23	y.....	(15) + (22).....	51. 1
Third point on regression line			
24	m/n + 1.....	It can always be 0.95.....	0. 95
25	Z.....	If m/n + 1 is 0.95, Z does not change.....	2. 97020
26	Slope × Z.....	(13) × (25).....	87. 2
27	y.....	(15) + (26).....	127. 5
Control curves			
28	Square root of n.....	Square root of (2).....	6
29	1 ÷ (28).....	Reciprocal of (28).....	0. 166667
30	(13) × (29).....		4. 892
31	(30) × 1.255.....	Vertical distances for m/n + 1 = 0.15.....	6. 1
32	(30) × 1.268.....	Vertical distances for m/n + 1 = 0.30.....	6. 2
33	(30) × 1.443.....	Vertical distances for m/n + 1 = 0.50.....	7. 1
34	(30) × 1.835.....	Vertical distances for m/n + 1 = 0.70.....	9. 0
35	(30) × 2.241.....	Vertical distances for m/n + 1 = 0.80.....	11. 0
36	(30) × 2.585.....	Vertical distances for m/n + 1 = 0.85.....	12. 6
37	0.7594 × (13).....	Vertical distances for second-highest dot.....	22. 3
38	1.407 × (13).....	Vertical distances for highest dot.....	33. 5

¹ In addition to a spread sheet, for mass production of data, a separate data sheet (like table 1) is needed for each set of annual data.

In the example,

$\frac{m}{n+1}$	Mode	Calculations slope	Z	Y
0.20	40.3	$29.35 \times -.47588$		26. 3
.50	40.3	$29.35 \times +.36651$		51. 1
.95	40.3	29.35×2.97020		127. 5

7. Plot the 3 coordinates (of m/n + 1 versus y) on extreme-value probability paper.

a. Find the value for m/n + 1 on horizontal scale and, from this point, go up to a point

opposite y on vertical scale, where an x or dot is placed. Locate 3 such coordinate points.

In the example,

Horizontal scale $\frac{m}{n+1}$:	Vertical scale y
0.20-----	26.2
.50-----	51.1
.95-----	127.5

8. Join these 3 points in a straight line. If they do not fall in a straight line, an error has occurred.

9. Now plot your data from table 1 (columns 2 and 4) on the probability paper. The dots should fall quite closely about the line in order for the extreme-value theory to apply.

In the example (from table 1),

Horizontal scale $\frac{m}{n+1}$ (Col. 2):	Vertical scale y (Col. 4)
0.027-----	8
.054-----	20
.081-----	23
etc.-----	etc.

If control curves are desired,

10. Compute vertical distances (above and below) from points on the regression line, as explained in table 4.

11. Join these points to form control curves. (See fig. 1.)

a. If two-thirds of the dots fall within the control curves, the theory applies.

In the example, 30 of 36 dots, or 83 percent, fall within the control curves.

TABLE 5.—Probabilities that may be read from regression line in figure 1

Annual loss cost (y)		Cumulative probability of occurrence $\frac{m}{n+1}$	
Cost per \$100 of insurance	Percentage of average ¹	Equal to or less than y	More than y
<i>Cents</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
40.3-----	72	37	63
56.2-----	100	57	43
112.4-----	200	92	8
140.5-----	250	96.7	3.3
168.6-----	300	98.7	1.3

¹ Average loss cost 56.2 cents per \$100 of insurance.

Interpretation of Data

The annual loss costs in the example are distributed fairly well about the regression line.⁶ More than two-thirds of the dots fall within the control curves. The probabilities in table 5 may be read from the regression line in fig. 1:

An extra sheet of the probability paper is included (as fig. 2) in this article for use by those who wish to experiment with the method.

The column headings for a spread sheet, and their explanation, including the data for the example used here, are shown in table 6.

⁶ Equation: $y=40.3+29.35Z$.

Land Clearing and Drainage Data From Airphoto Interpretation

By Henry W. Dill, Jr.

The obtaining of quantitative data for economic analysis of changes in the agricultural use of land has been a problem in recent years. Field study is a slow and expensive method of providing information. Usually, it requires several experienced persons to collect the data needed. The airphoto interpretation method described in this article supplies suitable data for economic studies with considerable savings in time and cost. With this method, a minimum of personnel is needed.

LAND IMPROVEMENT has been an important economic activity in the Southeastern Coastal Plain of the United States in recent years. In many instances, land clearing was accompanied by drainage. At the same time, land was reverting from crop and pasture use to forest, particularly in some of the more rolling sections. The magnitude of land development by clearing and drainage is indicated by reports of the U. S. Soil Conservation Service. They show that technical assistance for establishing or improving drainage has been furnished for more than 2 million acres in the Coastal Plain and that about 200,000 acres have been cleared annually in recent years for cropland and pasture.¹

The Agricultural Research Service is making economic studies to provide more complete information about land development, including the extent of land clearing and drainage, changes in land use, and costs and returns from different land-improvement measures. Land clearing and drainage work is distributed widely throughout the Coastal Plain. These activities range from clearing of scattered brush and trees to clearing and drainage of forest. The task of obtaining information about land development and reversion is a formidable one. To obtain it through field surveys would involve much expense and the time of trained personnel. Therefore, the possibilities of obtaining data on land clearing, drainage, and use from interpretation of air photographs has been explored. Preliminary findings

indicate that much detailed information can be obtained at relatively low cost by this method.

The Areas Studied

The North Carolina Coastal Plain is representative of an area in which much land clearing and drainage has been in progress. A check of scattered sample areas suggested the use of aerial photo interpretation to obtain data on land clearing as well as any reversion of the cropland to woodland. The requirements for economic data presented an opportunity for use of the "best estimate" approach in photo interpretation.² In using this procedure, an entire area can be studied on aerial photographs and classes of land use can be established by identifying features. Satisfactory data can be obtained for most classes of land, with error generally confined to the area occupied by categories with the least distinct identification characteristics.

Three townships in North Carolina were chosen for study using aerial photo interpretation. Choice of these townships was based on local reports of agencies concerned with land development, as well as some field reconnaissance. The areas selected were Long Acre Township, Beaufort County, Belvoir Township, Pitt County, and Alfordsville Township, Robeson County. Complete townships were selected for study since use of a minor civil division as a base provides a known

¹ Land Use and Development, Southeastern Coastal Plain, Agr. Inf. Bul. 154, May 1956.

² Dill, H. W., Jr., "A Classification of General Problem Types in Photo Interpretation," Photogrammetric Engineering, Vol. XXI, No. 4, September 1955.

area figure to which percentage data from photo interpretation can be applied to furnish acreage data.

The primary objective of the study at the outset was to identify, locate, and measure the extent of land clearing. But as the interpretation work progressed, it became evident that the amount of drainage ditch installed since the date of the early photo coverage could be identified and measured. This was done and the location, amount, and type of drainage installation was determined. As the study continued, it became apparent that information on the distribution of major land use types would be useful. Comparison of the area cleared with the acreage of cropland would show the trend in land development more clearly than providing only the acreage of land cleared or expressing this figure as a percentage of the township area. The procedure used in obtaining the data on land clearing, drainage, and use is discussed in detail in the section that follows.

Photo Interpretation Procedure

Aerial photographs were available for all three townships for 1938-40 and 1954 from the Commodity Stabilization Service, U. S. Department of Agriculture. The 1:20,000 scale contact prints were used. Because of their higher resolution contact prints were selected in preference to photographs with a larger scale, particularly as the higher resolution affected tone and texture in the identification of grassland and brush. To aid further in interpretation and annotation, positype paper prints were used. Stereoscopic photo coverage was obtained for all three townships for both periods.

Before beginning the interpretation study, it was necessary to establish the township boundary lines on the photographs as carefully as possible in order to obtain the actual acreages in the various categories of clearing and land use. The boundary was transferred from U. S. Geological Survey topographic sheets or highway planning maps of the U. S. Bureau of Public Roads. The next step was to put match lines on the latest set of photographs to avoid duplication or omission of any area and to locate the photographs within the township. When these two steps were completed, actual interpretation began. This is described for each of the three parts of the study, with Long

Acre Township, Beaufort County, N. C., used as an example of the procedure and results.

Land Clearing

The land-clearing study was essentially a field-by-field comparison of the early and later photo coverage with stereoscopic study of the comparable areas for each set of photographs. To assure complete coverage of the township, a clear acetate line grid was placed over each of the latest photographs and the entire photograph was checked with the early coverage by block. When areas of clearing and reversion were identified, they were outlined to scale on the recent photographs and marked with appropriate symbols. It was decided that the following classes of land clearing and reversion would be most appropriate for conditions in the area and also suitable for use in the economic studies to be carried out at a later date.

Land clearing:	<i>Symbol</i>
From brush and grass.....	b
From scattered trees and brush.....	t
From forest (over 50% crown cover).....	T
Reversion to forest:	
From cropland.....	c
From grass.....	g

After interpretation and annotation of the data, the area of the township on each photograph and the acreages of each type of land clearing and reversion were measured by using a dot grid. A transparent small circle-type grid with 40 dots per square inch was used. The accuracy of the dot grid compares favorably with that of the planimeter and the time saved is appreciable. Studies conducted in the measurement of forest and non-forest uses have indicated that the dot grid gives accurate results even with grids having only 16 to 25 dots per square inch.³ The data for each photograph were recorded separately for later possible use in other studies. After the dot count was completed for the entire township, the percentage of each type of land clearing or reversion was computed, based on the total dot count. Acreage figures for each type of activity were obtained by applying the percentage figures to the total acreage for the township, as given by the Bureau of the Census in the report, "Land Area of the U. S.—1940."

³ Tryon, T. C., Hale, G. A., and Young, H. A., "Dot Gridding Air Photos and Maps," Photogrammetric Engineering, Vol. XXIV, No. 5, December 1955.

Drainage Ditch Installation

As mentioned previously, during the clearing study it was decided to estimate the amount of new drainage ditch installation from a photo comparison study. Areas of new installations of main and secondary ditches were identified and annotated on the recent photographs and were measured by using a magnifier scale. The area affected by these new installations could not be estimated accurately, but it was believed that the linear data might aid in economic studies of land drainage.

Land Use Classification

Land use for the entire township was determined by photo interpretation and the area of each use was computed. The following land use types were established and identified:

- Rotation cropland (1938)
- Cropland cleared (1938-54)
- Cropland clearing in process
- Idle cropland
- Permanent pasture
- Forest
- Forest from reversion (1938-54)
- Residences and farmsteads
- Urban areas (Washington Park and Pinetown)
- Roads and railroads
- Drainage ditches
- Tidal marsh
- Water

Rotation cropland includes land plowed and in row crops, small grains, and grass. In the study reported here, it was not possible to identify specific crops because of the date of the photography.

Idle cropland presented a problem, as there was a possibility of confusing it with hayland or pasture. In general, however, the idle cropland had a lighter tone and rougher texture than the hayland and ordinarily no trees were present, as was the case with most of the areas classified as pasture. Only a small acreage was in this category.

Permanent pasture.—This class of land use was distinguished from idle cropland by the darker tone, rough texture, and presence of large trees in most units. In some instances permanent pasture was adjacent to and apparently merged into woodland that was pastured. Many of the units were small fenced areas adjacent to the farm buildings. Paths and tracks were not too apparent, perhaps because of the season of the year. As in the case of idle cropland, only a relatively small acreage was observed.



PLATE I.—Air photo of a part of Long Acre Township, Beaufort County, N. C., taken in April 1938. Areas outlined with white dashed lines and marked "x" have been cleared. Compare with 1954 conditions on the same area shown in plate 2. (Photograph from Commodity Stabilization Service, USDA.)

Forest.—Forest was classified into two categories: Forest present on the early photo coverage, and those areas that reverted from cropland and grassland.

Area measurement of land use.—After interpretation and annotation of the photographs was completed, the area of each type of land use was measured by using a transparent grid as described above. It should be noted that this procedure involved a very detailed type of interpretation for several items, particularly residences, farmsteads, roads, drainage ditches, and streams. In using the dot grid, as opposed to the planimeter, a certain portion of the dots fall squarely on roads, ditches, houses, and so on. It is believed that this system gives due weight to the area occupied by each of these items. For example, ditches are a rather prominent feature in this area, and careful count using the dot grid indicated that they occupied as much area as roads and railroads. In



PLATE II.—Airphoto of the area shown in plat 1 taken in December 1954. Arrows point out new drainage ditches. (Photograph from Commodity Stabilization Service, USDA.)

the same way, it appears that small areas of clearing, farmsteads, and so on are given due consideration in area measurement by this procedure.

Results of the Study

Land Clearing

Data on acreage of land clearing are shown in table 1, with Long Acre Township used as an example of the detailed data obtained. It should be noted that one assumption is involved concerning clearing in process for cropland. It was assumed that this clearing was for rotation cropland or intensive cultivation. This was based on the fact that clearing would involve considerable expense and in many instances, land drainage was being installed. Based on these facts, it was believed that these areas would be used for intensive cultivation.

Granting the above assumption, the total amount of clearing is 3.2 percent of the township,

TABLE 1.—Land clearing, by type, Long Acre Township, Beaufort County, North Carolina, 1938-54

Type of clearing	Dot count	Percentage of total dot count	Area
Clearing for cropland:			
Completed:	<i>Number</i>	<i>Percent</i>	<i>Acres</i>
Light brush.....	179	0.3	297
Brush and scattered trees.....	335	.6	594
Forest.....	1,025	1.7	1,699
Total.....	1,539	2.6	2,590
In process:			
Brush and scattered trees.....	108	.2	199
Forest.....	233	.4	399
Total.....	341	.6	598
Grand total.....	1,880	3.2	3,188
Clearing for urban use:			
Completed:			
Brush and scattered trees.....	13	.03	30
Forest.....	33	.07	69
Total.....	46	.10	99

or 3,188 acres (table 2). Expressed as a percentage of the township area, it is relatively small. However, land cleared in the previous 16 years amounted to 21 percent of the 1954 cropland.

Another point concerning land clearing is the kind of clearing that is being done. In general, two kinds were noted: Clearing of land in blocks for establishing new fields, and clearing that was associated with extending existing fields, cleaning out corners, wet spots, and so on. (See plates I and II.) No precise study of the kinds of clearing was made, although a percentage estimate of the two kinds mentioned was made for each photograph. The average of these estimates for the township showed that 78 percent of the clearing was in complete blocks, mostly from forest, while the remaining 22 percent was in connection with adjustment of fields. As a matter of interest, the acreage of land clearing, cropland reversion, and cropland are shown in table 3 for the three townships studied.

Drainage ditch installation.—The amount and type of drainage ditch installed from 1938 to 1954 is shown in table 4. The classification of drainage ditches into main and secondary ditches was for

TABLE 2.—*Land use, Long Acre Township, Beaufort County, North Carolina, 1954*

Land use	Dot count	Percentage of total dot count	Area ¹
Cropland:			
Rotation cropland (1938)-----	<i>Number</i> 7, 110	<i>Percent</i> 11. 8	<i>Acres</i> 11, 758
Cropland cleared (1938-54)-----	1, 539	2. 6	2, 590
Cropland clearing in process-----	341	. 6	598
Idle cropland-----	121	. 2	199
Total-----	9, 111	15. 2	15, 147
Permanent pasture-----	146	. 2	199
Woodland:			
Forest-----	45, 274	75. 5	75, 234
Forest from reversion (1938-54)-----	141	. 2	199
Total-----	45, 415	75. 9	75, 434
Residences and farmsteads	931	1. 6	1, 595
Urban concentration (Washington Park and Pinetown)-----	150	. 2	199
Cleared for urban use (recreation)-----	46	. 1	99
Roads and railroads-----	590	1. 0	996
Drainage ditches-----	627	1. 0	996
Tidal marsh-----	135	. 2	199
Water-----	2, 860	4. 8	4, 784
Grand total-----	60, 012	100. 0	¹ 99, 648

¹ 155.7 square miles—Areas of the United States, Bureau of the Census, 1940.

convenience only; it was not related to capacity. The scale of photography was too small to attempt this type of measurement. The main ditches included those that extended over more than one or a small group of farms. In turn, the farm ditches included all those on farms, although differences in width were noted.

Land use.—The land use classes summarized in table 2 were described previously; however, a few items should be mentioned in summary. Included in the urban concentration (towns of Washington Park and Pinetown) is a small industrial area adjacent to Washington Park. Also, the item of residences and farmsteads includes several concentrated residential areas, particularly those along Pamlico Sound east of Washington Park.

Conclusion

Use of the photo interpretation method pro-

TABLE 3.—*Summary of land clearing, cropland reversion, and cropland for sample townships, North Carolina*

Item	Area		
	Beaufort County, Long Acre Township, 1938-54	Pitt County, Belvoir Township, 1940-54	Robeson County, Alfordsville Township, 1938-54
Cropland-base year---	<i>Acres</i> 11, 758	<i>Acres</i> 8, 738	<i>Acres</i> 14, 815
Cropland clearing ¹ ---	² 3, 188	³ 709	⁴ 2, 934
Idle cropland-----	199	71	184
Total cropland 1954-----	15, 147	9, 518	17, 933
Cropland reversion---	199	71	45

¹ Includes clearing in process 1954.

² 21 percent of 1954 cropland.

³ 7 percent of 1954 cropland.

⁴ 27 percent of 1954 cropland.

TABLE 4.—*Drainage ditch installation, Long Acre Township, Beaufort County, North Carolina, 1938-54*

Type of installation	Amount	
	Linear feet	Miles
Main ditch:		
Installed-----	40, 335	7. 6
Under construction-----	5, 640	1. 1
Total-----	45, 975	8. 7
Farm ditch:		
Installed-----	179, 141	33. 1
Under construction-----	16, 110	3. 1
Total-----	195, 251	36. 2

vided suitable estimates for economic analysis of the various classes of data described above. The extent of these classes has been shown on aerial photographs which are available for use in field schedule work. The work was accomplished in a relatively short time with a minimum number of personnel. The method allows for most efficient use of trained and experienced people. The savings in time and expense in efficient use of personnel are the main advantages of the photo interpretation method described, as photographs would be needed both for this procedure and for detailed field studies by direct mapping used in combination with the questioning of farmers.

Opportunities for Research in Marketing

By D. B. DeLoach

Among the established purposes of Agricultural Economics Research is the publication of broad reviews of fields of research within the general area of agricultural economics. This is such an article. The author first presented the subject before the Western Agricultural Economics Research Council. Believing that his remarks deserved a wider audience, the Editors have persuaded him to prepare them for presentation here. They reflect his extensive experience and mature thinking on problems important for a forward-looking program of research in the economics of marketing.

THE PRIMARY PURPOSE of marketing research is to provide information to help farmers, processors, distributors, and consumers to make better decisions regarding their economic operations. Research findings likewise are of value to State and Federal agencies that have the problem of formulating and instituting policies affecting the conditions of trade for food and fiber products.

Most decisions people make in farming, processing, distributing, and even consuming are routine in character, but a few are of major importance. Such decisions frequently result from changes that occur in the conditions under which people live and work. Some are made for the purpose of initiating changes; others to adjust to changes. They range from problems of quality and costs to accounting and personnel procedures. They may come about as a result of changes on the outside of the business firm or of conditions within the firm where changes must be made to remain in a competitive business.

Two types of information are needed in the field of marketing to aid in the decision making process. The first relates to changes that must be made as a result of adjustments that take place in our business environment. These are changes beyond the control of any individual firm or person, but they set certain limitations under which a firm can operate. The second type concerns the operating policies and practices of a firm.

Adjustments to Government Regulations

Management must be aware of and adjust to the multiplicity of Government regulations under which it must operate. In addition to the general run of economic factors influencing our economy, changes in the business environment are generally associated with social and economic

legislation which affects the conditions of employment of labor, including minimum wages, hours, social security, private retirement plans, and the availability of workers; zoning of business locations; waste disposal from processing activities; acreage and market quotas; and sanitary and health measures; and by such institutional factors as unionization of labor and collective bargaining with management on plant operating policies and practices. These types of social and economic measures have material effects on marketing costs and practices, and they are major factors in determining the conditions under which it is feasible to establish new industries.

The structure and organization of industry are assuming greater significance in our general economic environment. The ownership and control of business and the facilities and arrangements for moving products from the farm to the consumer are undergoing major realignments. Of particular importance at the present time is the degree of concentration of ownership and control at the retail level of distribution. Developments in this field are important to all segments of our society. They are doing more to influence the manner in which food products and clothing are distributed than any other one thing on the horizon. For this reason, I think we should give much attention to learn the extent to which ownership and control are factors in deciding the manner in which goods are purchased at the farm level, and the conditions under which they are processed and routed through market channels to the consumer.

Economic Indicators Record Changes

The changes taking place in business environment are reasonably well recorded in the various

economic indicators published by the Federal Reserve Board, the 12 Federal Reserve Banks, the Bureau of Labor Statistics, the U. S. Department of Commerce, the Federal Trade Commission, and the U. S. Department of Agriculture. In addition to the economic information published by the Government and quasi-Government agencies, private banking institutions issue a vast amount of economic information that aids business people in reaching better business decision.

Usually the type of information in these economic indicators and private banking reports is of a general character and relates to the business environment in which an operator must carry on his affairs. It is important that people engaged in business either as consumers, farmers, processors, or distributors should understand the society in which they operate. It seems particularly important now that the conditions under which business institutions must operate, particularly with respect to labor and market conditions, market prices, and production and trade in general, should be available generally for use by people in agriculture and industry.

In spite of the vast amount of general information that is published on the production and marketing of agricultural products and on other economic matters that are relevant to an understanding of the status of our economy, there is a shortage of good information relating to consumer needs and consumer buying practices. I am not sure that this type of information falls under the general heading of changes that take place in our business environment. It seems, however, that information regarding consumers and their buying habits should be available to those who must make decisions with respect to what to produce and what to market.

The external environment in which a business must operate establishes the boundaries of a firm's activities. Conversely, the external environment is partly a result of the composite actions of the community of business firms which evolve policies and practices for mutual accommodation. The business firm is the organizational entity that produces goods and services, and its existence depends on its management's ability to compete with other businesses.

We find, therefore, that the second type of information needed in the decision-making process concerns the changes associated with the internal

organization and operation of the firm. This type of information encompasses facts relating to the choice and location of businesses, and the conditions under which businesses of different types are likely to succeed or fail.

In this area, the Agricultural Marketing Service has underway studies relating to the economics of location of flour milling and meatpacking plant. Regional studies are underway on frozen food production and marketing. We could go much further in this direction and it is likely that our studies in the future will take us into research on the economics of location of many types of agricultural industries.

The selection of the types, qualities, prices, and markets for products can only be made if there is a good understanding of markets, consumer buying practices, and the likelihood of success of business ventures in particular localities. Pricing and price discovery are of outstanding importance to people who are in business. It is through prices, services, and quality that competition is carried on.

Large Investment Capital Required

I think it is worthwhile to recognize the fact that ability to obtain investment capital is becoming of outstanding importance; it determines to a great degree who can and cannot go into business. Present investments in a modern supermarket seldom run less than a half million dollars. This capital requirement is far beyond that considered necessary in former years by people who expected to enter food retailing. These high capital requirements have altered greatly the conditions of entry into retailing.

Another comment or two relating to the importance of large-scale financing and the size of business organizations is important at this point. It has been my observation that large-scale businesses with many outlets are in a position where the failure of one unit does not necessarily mean the failure of the entire business organization. This is not true with a small firm. The independent processing plant, wholesale firm, or retail store cannot afford a failure. On the other hand, a large corporation can have several failures and continue to be a success.

Mass production and marketing practices are both a cause and a result of urbanization. It seems, however, that the rate at which individual

firms strive to adopt mass production and marketing techniques to increase efficiency is related closely to labor versus capital costs, spreading of risks, and promotion costs for mass marketing. Furthermore, the growth in size and power of some businesses is closely associated with the tax loss rights in Federal income tax laws.

Problems of Internal Control

The last item I wish to mention under the changes associated with internal organization and operation is that of internal control. Included under this heading are the problems of (1) physical handling of products at the various stages in the marketing operation, (2) quality maintenance and control, and (3) accounting records.

The problems of types of buildings, plant layout, material and product flow, labor use and product output are common to all types businesses. Nevertheless, scientific management has met with little favor in the food industry until recent years. With the development of larger organizations employing many workers at a time when wage rates, fringe benefits, and capital costs were rising, the food industry began to seek ways to lower costs in order to meet competition.

Quality maintenance and control have grown in importance as mass production and marketing increased. The necessity of standardizing qualities and of identifying qualities by grade labeling or by proprietary brands has increased as food retailing has drifted more toward multiple-unit operations. For a large multiple-unit retail organization to standardize its offerings to consumers, it must develop sources of supply that can provide products of given grades and in sufficient volume to make trading feasible. These practices of large buyers have had material repercussions on growers, processors, and consumers.

The current competitive struggle between suppliers of nationally advertised branded merchandise and users of private labels or Federal grades as a means of identifying product quality is of utmost significance to our marketing system. The spread in the use of Federal grades in the perishable commodity field, especially meats, fruits, and vegetables is of unusual significance.

The magnitude of the adjustments in the production and marketing practices of farmers, processors, distributors, and consumers to cope

with the changes in merchandising techniques such as the use of Federal grades by large, integrated concerns are having a far-reaching effect on our economy. Regardless of how this competitive struggle is resolved, quality identification of some sort will continue to dominate merchandising procedures. The need for and the expansion of an economically feasible system of quality control, identification, and maintenance will continue as major managerial problems.

Accounting controls are traditionally the most familiar, trustworthy, and accepted management tool. Carried to a refined stage of costing, the accounting record is about as useful a device as management can have. The difficulty of accounting controls, like all controls, is that the simple records usually are inadequate and the most useful ones often are too costly.

It is unfortunate that so many of the discussions of marketing in the professional society meetings since 1946 have dwelt on the mechanism for carrying on marketing research rather than the actual problem of doing marketing research. Too frequently, interest has centered on the distribution of Federal grants-in-aid rather than on problems, and the ferreting out of problems, that are really meaningful from the standpoint of assisting business people to make decisions they have to make.

The concern of the State agricultural experiment stations, as well as the U. S. Department of Agriculture, with problems of the physical handling of products, quality maintenance and quality control, and prices to a large extent cover the range of subject matter that have been the concern of research workers during the last 10 years. In addition to research on handling methods, quality, and prices, some efforts have been made to go beyond the immediate measurement of these factors to determine the efficiency of operation of the firm, the industry, or particular facets of the firm's activities.

The emphasis on studies relating to the efficiency of handling food and fiber products and the need for maintaining or controlling quality have had a distinct place, and a useful one, in the field of marketing research. I believe, too, that this type of material has provided the public and industry with much information that will help to increase the efficiency of marketing and in the long run probably to improve returns to pro-

ducers of agricultural commodities. This type of work should be continued and probably expanded in some commodity areas.

Knowledge of Existing Channels and Practices

Generally speaking, we have not answered too well the many questions that need to be answered relating to the conditions under which farm products are being marketed at this time. A thorough understanding of present marketing channels, practices, and organization is essential to any improvement that might be suggested in marketing processes.

While there is a disposition on the part of many research workers and administrators to look with disfavor on the descriptive type of research, I do not think it has been carried too far—in fact, it has not been carried far enough. The difficulty that we have faced is that the research has not been thorough enough and the interested parties have not been able to gain a complete understanding of marketing processes from what has been written.

If we can develop a complete understanding of existing marketing conditions, it will be much easier for us to proceed to a second problem, namely, competition and its magnitude as it relates to quality, prices, and services. I believe that an understanding of our marketing system and how it adjusts to changes in products, production, and processing as well as consumer buying practices, is a key to a more efficient system.

Cost Reducing Actions by Management

The substance of this discussion is that the rapid changes taking place in the processing and distribution of food and fibers have come about largely as a result of the efforts of entrepreneurs to establish a competitive advantage. Such efforts take the form of cost-reducing actions by management.

Operating costs reductions might occur in the form of (1) changes in the services provided by the firm; (2) changes in methods of handling materials and products in the plant; (3) adjustments in inventory policies; (4) adjustments in administrative and supervisory activities; (5) changes in the arrangements for transportation, assembly, and storage; (6) relocation of plants and facilities; (7) alterations of distribution

methods and channels; (8) changes in the allocation of and types of promotional media; (9) alterations of the quality of product offered for sale; and (10) the limitation of number of products sold. There are doubtless many other ways to adjust to competition in addition to those we list here.

I wish to repeat that marketing research and service programs exist to provide information and services to help farmers, marketing agencies, and consumers to make better decisions regarding buying, selling, and handling of food. As our system becomes more complex there will be a growing need and demand for more adequate current statistics on market supplies, product movement, practices, margins, and costs as an aid to producers, marketing agencies, consumers, and policymakers who must respond immediately to price and supply changes. It is evident, however, that a statistical record of change is not an explanation of either the reasons for, or the impact of, change on an industry or a firm. It is important, therefore, that we continue our research and analyses to develop ways and means of using our present marketing resources most effectively, and to find new and improved technologies and products.

Special Problem Areas

Most certainly there are many problems confronting research workers in agricultural marketing on which our research groups can make a real contribution to marketing efficiency. A few broad areas with special types of problems on which economists can be very productive follow.

1. Studies of the economic and social developments associated with the integration of food retailing organizations. Particular attention should be given to underlying factors causing such adjustments and the impact of such changes on producers, processors, distributors, and consumers. Collective bargaining, taxation policy, technology, and mass-marketing techniques deserve special consideration.

2. Economic studies of grading and standardizing food and fibers at each level in the marketing process. Special consideration should be given to the implications of the adoption of uniform quality standards on the operations of the industry, firm, and the consumer.

3. Studies of the adaptability and adequacy of marketing facilities and outlets to serve small-scale farmers are badly needed. This is especially true with perishable products, that is, eggs, poultry, milk, and livestock.

4. Studies of the impact of market controls on the use of processing and marketing resources should be undertaken for the purpose of learning the economic response to each type of regulation at each level in the marketing process.

5. Studies of the effects of States and industry commodity promotional programs on producers of

farm products, stressing particularly those programs that require a deduction from the producer's selling price in order to finance the general promotional activity.

6. Studies of the adaptability of various forms of business organizations to specific functions and activities in the processing and marketing of farm products. In this area, special attention should be given to the adaptability of the cooperative form of business to the various processing and distributing activities.

7. Studies of the pricing system and the extent to which it facilitates or restricts sales.

Farm Population as a Useful Demographic Concept

By Calvin L. Beale

In the development of plans for the 1960 Census of Population, the question has been raised as to whether "farm population" should be retained as a distinctive category of enumeration, or if "open country" residents should be enumerated without distinction as to whether their residences are farms. This article presents certain demographic differences that, in the author's view, argue the continuing usefulness of retaining farm residence as a distinct category for enumeration.

ONCE EVERY DECADE the planning stage arrives for the next national census of population. At such a time, the demographic concepts used in the census are reevaluated together with a host of proposals for changes. We have now come to that point in time with respect to the 1960 census.

From several sources, opinions have been expressed that separate data on farm people should no longer be obtained in the census of population or that the definition of farm population now employed needs radical modification.¹

Residence on rural farms has been a unit of classification in censuses since 1920. But today the farm population is only 13 percent of the total,

¹ For example, see the remarks of Price, Daniel O., and Hodgkinson, William, Jr., discussing the paper, NEW DEVELOPMENTS AND THE 1960 CENSUS, by Conrad Taeuber. Population Index. 22:181-182. 1956. Also, FIRST LIST OF QUESTIONS ON 1960 CENSUS SCHEDULE CONTENT, a statement prepared by the Bureau of the Census for the Council of Population and Housing Census Users. Pp. 1-2. September 1956.

and many farm people are now involved in non-farm industries to a degree not common in the past. Under such conditions, those who seek additional urban data in the census ask, "Is there justification for retaining in the next census the tabulation detail given to farm population in the last?" "Indeed, should the farm residence category be retained at all?"

During the period in which the majority of the people in the United States lived on farms, the censuses of population provided no statistics on the farm population. As an early student of the subject explained it, "the Nation was so largely rural that interest centered in the growth of cities."² The farm population was taken for granted.

But by the turn of the 20th century, the non-farm population was rapidly drawing away from the farm population in number. As the cities

² Foreword by Warren, G. F. to Truesdell, Leon E. FARM POPULATION OF THE UNITED STATES, 1920. Washington, D. C. U. S. Bureau of the Census. 1926. P. xi.

flourished, qualitative differences became evident. President Theodore Roosevelt motivated by concern that “. . . the social and economic institutions of the open country are not keeping pace with the development of the nation as a whole,” appointed a Commission on Country Life.³ This was in 1908. It may be significant that the term “open country” was apparently still equated with “agriculture” at that time, as the work of the Commission on Country Life dealt almost entirely with agricultural questions.

Farm Population Distinguished From Remainder

Roosevelt's plea at this time for “organized permanent effort in investigation” was reflected some years later in the creation of a Division of Farm Population and Rural Life in the United States Department of Agriculture. Dr. Charles Galpin, in charge, felt that by 1920 the census statistics on the rural population had become inadequate as a measure of conditions in the farm population. Primarily at his urging—and for use in tabulations promoted by him—the farm population was distinguished from the rest of the rural population in the 1920 census. In the census monograph in which the new material was published, few words of justification were thought necessary. It was simply stated that material differences between the farm and nonfarm population had developed and that many persons “desired an analysis of the farm population.”⁴ In the population censuses since 1920, the basic threefold classification of urban, rural-nonfarm, and rural-farm has been used extensively. The urban-farm population has been tallied, but as the number is so small, tabulations by characteristics have been confined to the rural-farm population, in order to achieve economy by fitting the farm residence concept into the urban-rural residence concept.

Since 1920, great changes have been wrought in the lives of farm people and in the nature of farming. The physical isolation of farm life and its concomitant social isolation from urban life have been reduced by automobiles, paved roads,

³ U. S. Cong., 60th, 2d sess., Senate Doc. 705, Country Life Commission Report. P. 21.

⁴ Truesdell, Leon E. FARM POPULATION OF THE UNITED STATES, 1920. *op. cit.* P. xi.

and electricity. The subsistence farm is almost a thing of the past; crop specialization has increased. The farmer's cash needs have grown enormously. He needs large amounts of cash to enable him to buy the expensive equipment characteristic of modern farming and the goods and services that make up the modern standard of living. Increasing numbers of farm operators and their wives and children have taken nonfarm jobs to supplement the farm income. These statements are truisms—they have been repeated often in the last generation.

If farm and nonfarm conditions of work and living have tended to converge, are there still major differentials between the two groups of the demographic and quasi-demographic type measured by the decennial census? The answer would appear to be yes. Table 1 shows summary measures and frequency of occurrence for various characteristics of the urban, rural-nonfarm, and rural-farm population. For many of these measures, substantial differences between the farm and the total nonfarm populations are evident. As the key question is whether the farm and rural-nonfarm values of the measures are different, attention here is focused on these values.

Farm population declined by 18 percent from 1940 to 1950 through heavy outmigration, while rural-nonfarm population grew at a rapid but somewhat unmeasurable rate. Through differential migration, the sex ratio in the farm population is much higher than elsewhere. (Without the military and institutional populations, the rural-nonfarm ratio of males to females is below 100.) The prevalence of nonwhite people is higher in the farm population. Educational attainment is somewhat lower in the farm population, especially for men in the prime of life. Retardation in grade reaches its most serious proportions among farm children. Cumulative fertility, both for women now bearing children and those of older age, is considerably higher for farm than for rural-nonfarm women. Differences in natural increase rates are even greater.

The mobility rate, measured by the proportion of people who move from one house to another in a year, is lower for the farm population than for the nonfarm. The average size of farm households is considerably larger than that of

TABLE 1.—Selected characteristics of the population of the United States, by residence groups, 1950

Characteristic	Urban	Rural non-farm	Open-country nonfarm	Rural farm
Total population (millions)-----	96. 2	31. 0	20. 9	23. 0
Percent change in population, 1940 to 1950-----	23. 8		NA	-17. 9
Sex ratio, population 14 years and over-----	92. 2	103. 2	105. 8	112. 2
Percent nonwhite-----	10. 1	8. 7	9. 8	14. 5
Median age—years-----	31. 6	27. 9	26. 5	26. 3
Percent 65 years and over-----	8. 1	8. 6	7. 3	7. 6
Children ever born:				
Per 1,000 women 15-44 years-----	1, 215	1, 927	NA	2, 420
Per 1,000 women 45-49 years-----	1, 957	2, 626	NA	3, 564
Percent movers and migrants in population-----	17. 3	20. 2	23. 5	13. 9
Percent of movers having farm residence in 1949-----	4. 5	18. 1	18. 9	62. 8
Average persons per household-----	3. 24	3. 45	NA	3. 98
Percent of households with female head-----	17. 5	13. 1	NA	6. 3
Median age at first marriage:				
Males-----	23. 1	22. 4	NA	23. 2
Females-----	20. 6	19. 3	NA	19. 7
Percent single—males age 21-----	71. 2	65. 9	NA	72. 6
Percent married—males 65+-----	65. 1	64. 2	61. 1	70. 0
Percent widowed—females 65-69 years-----	44. 1	38. 8	NA	28. 6
Highest percent divorced at any age—female-----	4. 6	2. 6	NA	1. 3
Median years of education:				
Persons 25 years old and over-----	10. 2	8. 8	8. 7	8. 4
Males 30-34 years old-----	12. 1	10. 4	NA	8. 7
Percent high school graduates among males 30-34 years-----	52. 5	38. 7	NA	25. 8
Percent of children 16-17 years old enrolled in school-----	78. 8	70. 2	NA	67. 2
Percent of enrolled 7-year old children in 2nd grade or higher-----	67. 1	54. 7	NA	51. 6
Percent in the labor force:				
Males, 14 years and over-----	79. 3	74. 1	73. 4	82. 7
Females, 14 years and over-----	33. 2	22. 7	21. 1	15. 7
Males, 65 years and over-----	40. 0	31. 3	29. 1	60. 6
Females, 40-44 years-----	40. 9	30. 7	NA	19. 4
Median income, 1949 (dollars):				
Families-----	3, 431	2, 560	NA	1, 729
Persons (males only)-----	2, 602	1, 835	1, 743	1, 246
Percent of civil labor force unemployed-----	5. 3	5. 1	5. 4	1. 7
Percent of births not occurring in hospitals-----	6. 2	16. 0	NA	33. 5
Percent of infants missed by the 1950 Census-----	3. 2	3. 3	NA	5. 3
Percent of population 14 years and over in institutions-----	. 9	3. 4	4. 9	1. 0
Percent of males 14 years and over in the Armed Forces-----	1. 4	4. 0	5. 8	. 1
Percent of employed males with farmer, farm manager, farm laborer or foreman as primary occupation-----	1. 1	9. 6	11. 2	76. 3

NA=Not available.

¹ No institutional population by definition.

Sources: Reports of the 1950 Census of Population and unpublished data of the National Office of Vital Statistics.

nonfarm. Differences in marital status exist, the most notable of which is perhaps the high proportion of married persons and the low proportion of widows among elderly farm residents as compared with nonfarm. A related statistic is the proportion of households having female heads—it is very low among farm people.

Labor-force participation rates are noticeably higher for farm men, particularly for young and elderly men. On the other hand, farm women have lower labor force participation than other

residence groups. The percentage of the labor force enumerated as unemployed is lowest among farm residents. The average money income of farm families is lower than that of the rest of the population, allowing for difficulties in the comparison of income for farm and nonfarm classes. The proportion of births not occurring in hospitals is much higher for farm than rural-nonfarm births, and the proportion of infants missed by census enumerators is likewise greater in the farm population.

Differentials Reveal Special Problems

The significance of many of these differentials between the farm and rural-nonfarm or urban populations is that they reveal conditions of problem nature in the farm population that are not present in so severe a degree in the rest of the population. For example, the high fertility of farm people, coupled with contracting manpower needs in agriculture, necessitates outmigration at extremely heavy rates, with resulting social consequences and loss of investment to the farm population.

The low educational achievement of many farm youth leaves them unprepared either to practice modern farming or to acquire skilled nonfarm jobs. In 1954, farm families made up only 12.5 percent of all families, but they accounted for 38 percent of families receiving less than \$1,000 cash income. A fourth of the farm families fall in this category.

The abnormal occurrence of such social or economic conditions among farm residents is a major factor in creating a continued demand for farm population statistics out of proportion to the relative number of farm people in the total population.

The rural-nonfarm population, as defined in the census, was largely purged of its urban elements in 1950 by the transfer of unincorporated communities of 2,500 persons or more and suburban fringes to the urban category. Despite this transfer, the rural-nonfarm population has remained a somewhat heterogeneous group, as the rural village population differs demographically in many ways from the open-country nonfarm population. Under these conditions, one must consider whether the differentials between rural farm and rural nonfarm that we have cited are also present between rural farm and open-country nonfarm. Some information on this is available from a special report of the last census.⁵

Of the differentials shown in table 1, those for sex ratio, percentage nonwhite, median age, and median income of persons are less between rural farm and open-country nonfarm than between rural farm and total rural nonfarm. Only in the

case of median age is the differential cut substantially. But other differentials, including percentage of movers and migrants, percentage unemployed, percentage in the labor force, percentage married at some age groups, and percentage of population in institutions or Armed Forces are greater between rural-farm residents and other open-country residents than between rural farm and all rural nonfarm. In sum, the open-country nonfarm population remains demographically different from the farm population.

For two of the characteristics mentioned, the fact of farm-nonfarm residence involves conceptual differences that make separation of data by farm residence essential. In a basically nonfarm area, the unemployment rate is a good index of economic conditions. But, in a severe agricultural depression, unemployment rates for farm people do not reach high levels, and they run well below those for nonfarm. The reason is simple. If a man even farms at a mere subsistence level, he will usually remain technically employed under our labor-force concepts.

This fact has great relevance for all geographic analysis of unemployment. One of the major domestic questions before this session of the Congress is a program of aid to areas of prolonged economic distress. A key—and controversial—issue in the question of area assistance legislation is whether Federal aid shall be based solely on unemployment rates or on separate criteria devised to delineate distressed farming areas. It is argued that unemployment does not reflect basic conditions in farming areas as it does in nonfarm areas. Such a situation obtains whether an area is one in which farming is largely full time or one in which it is often supplementary to off-farm work.

Money income is difficult to measure for farm people, and it is therefore difficult to compare that received by farm and nonfarm people. Most farm families have income in kind from consumption of home-grown products, use of a house as part of a tenure agreement, or receipt of room or board as a perquisite of farm wage work. Statistically, this is partly offset by nonmonetary income items of nonfarm workers. However, the ability to subtract income of farm recipients from that of all income recipients in order to get a purified nonfarm series remains a basic reason for classifying income data by farm residence.

⁵ U. S. Bureau of the Census, *Census of Population: 1950. CHARACTERISTICS BY SIZE OF PLACE*. Washington, D. C., 1953.

Another sustaining factor in the demand for farm population data is the particular responsibility that the Federal Government has assumed in the promotion and regulation of agriculture and for the welfare of farm people. In addition to agriculture, commerce and labor are economic groups recognized at the Cabinet level, but only the Department of Agriculture has a clientele that can be readily distinguished demographically. The Congress, the Department of Agriculture, the land-grant colleges, and the Council of Economic Advisers continually demand farm population data in their policymaking and research work.

Agriculture Still Big Business

The declining number of farm people brings no lessening of this interest, for agriculture remains as big a business as ever, and farm people continue to determine the land use of more than 60 percent of the land surface of the country. If anything, the administrative needs for farm population data have increased because of the far-reaching adjustments under way in farming. This is augmented by the increased sophistication in demographic matters of those responsible for agricultural policy. Some of the appropriations for agricultural purposes are allocated to the States on the basis of their share of persons resident on farms as determined in the decennial census of population.⁶

If we accept the continuing need for data on the numbers and characteristics of farm people, the problem of how to define this population remains. In 1930 and 1940, a household was included in the farm population if the enumerator or respondent considered the place of residence to be located physically on a farm. In the 1950 census, the respondent was asked the direct question, "Is this place on a farm or ranch?" Institutional residents or households paying cash rent for house and yard only are excluded.

But the censuses of agriculture, taken simultaneously, used criteria of acreage and value of production or sales to decide what places were farms. In the last census, agricultural schedules were taken for every place that a respondent said was a farm, but some of the places were disqualified in the editing process. There are, then, people

⁶ Bankhead-Jones Act of 1935 and Research and Marketing Act of 1946.

listed as farm residents in the census of population whose places are not treated as farms in the census of agriculture, and a farm operator who lives in town, and not on the farm he operates, is counted as a nonfarm resident.

For analytical and administrative purposes of agencies concerned with agriculture, the lack of complete correspondence between farms and farm population is unfortunate. Nor is the present definitional situation always understood. Since 1950, more than one demographic publication emanating from land grant colleges has erroneously cited the farm definition of the census of agriculture in place of that of the census of population.

Some demographers appear to believe that the census of population definition of farm population is an attitudinal or subjective one, and is thus somehow inferior to objective questions or to definitional standards appropriate for a decennial census. As a respondent is not given a definition of a farm, there is of course a subjective element in the answer he gives. Because concern over the nature of the definition produces doubt in the minds of some regarding the utility of the data, it may be well to comment further on the definition aspect.

The writer believes that the farm question is no more subject to bias or variation through subjectivity than many other items on the census schedule; actually, the attitudinal element in this instance may have a useful discriminatory function. A point to remember is that the overwhelming majority of farms are listed as farm residences in the population census no matter what definition is used. In 1950, data from the collation sample of the censuses of population and agriculture show that 95 percent of the people living in farm-operator households as defined in the census of agriculture were numerated as farm residents in the census of population.⁷ The majority of the remaining 5 percent represents families who operated farms but did not live on them, rather than families whose classification was affected because of the subjective nature of the population census inquiry.

From the same study, we know that only 7.5 percent of the people who were treated as farm residents in the population census lived on places

⁷ U. S. Departments of Agriculture and Commerce. FARMS AND FARM PEOPLE. 1953. P. 48.

that did not qualify as a farm under usages in the census of agriculture. Thus it is only for about a tenth of the total universe in question that the attitudinal element in the definition really comes into play. For certain purposes, it would be desirable to improve further the correspondence between the two censuses. My personal opinion is that from the viewpoint of demographic characteristics, persons with marginal connections to agriculture who term themselves farm residents are likely to be closer to the demographic norms of the core of the farm population than are those with marginal connections who call themselves nonfarm.

When singling out the question of farm residence as subjective, it should not be overlooked that subjective elements are in the rest of the urban-rural residence scheme, especially in the very refinements made in 1950, which it is proposed to extend in 1960. What objective criteria do we have for drawing the boundaries of unincorporated urban communities? The results are indisputably reasonable, but communities string out along the highway or shade off into the countryside, and the boundaries that separate urban from rural in such instances must be based on subjective decisions of the census geographers. The same comment applies to delineation of suburban fringes in metropolitan areas.

Advantages and Disadvantages of Definition

What definition should be used? As I see it, the advantages of the present definition are as follows:

1. Operationally, it is by far the simplest and cheapest form, requiring only one yes-or-no question on the schedule.

2. It provides comparability with the last census and other historical series, a property that may be rare in 1960.

3. It defines as farm residents the great majority of people whose residence is clearly agricultural under any definition. Among marginal cases it probably discriminates as meaningfully as any other definition that could be used in a population census.

4. Using this definition, farm residence has been placed on the vital statistics certificates of 33 States in the last 2 years. No one can state yet that the data from this source will prove to be

comparable with that from the census. But this is the intention. The National Office of Vital Statistics has gone to much effort and expense to get farm residence on vital records. It will be unfortunate in more than one respect if it does not get population base data from at least one census for the study of vital events by farm-nonfarm residence. No other definition of farm is deemed to be usable in the vital registration system. It is well to recall that urban-rural residence is no longer obtainable for births and deaths under current urban-rural definitions.

The disadvantages of the definition appear to be these:

1. It does not provide a base population identically relatable to statistics from the census of agriculture.

2. Persons who live under the same physical circumstances, or even under the same roof, may construe differently the farm status of their home.

3. No matter how useful and valid a subjective definition may be, it is not easy to provide a precise meaning for it or to explain it to the public.

4. It does not include as farm people some families who depend solely on farming but who do not reside on farms.

The most frequent alternative proposed is to define farms as in the census of agriculture. But a battery of questions on production or sales is necessary to get accurate answers from this approach, especially for the marginal cases where the reliability of the definition now used is under question.

Other proposals would tabulate a population based on farmwork as a primary occupation or on farm income as the chief source of all income. The definition of a farm used in the census of agriculture is a broad one; it results in a maximum number of places called farms, as only \$150 worth of products produced or sold in a year is required to qualify under it. Obviously, under current economic conditions, most of the people who raise only a few hundred dollars' worth of products must have other sources of income.

The self-defining definitions used in the census of population also must be considered to classify a maximum number of households as farm households. But the policy of the Department of Agriculture, which has been reaffirmed in recent months, is that its responsibility encompasses all

farms, including the small farms or those for which off-farm work provides most of the income. Data on the population primarily dependent on farming, whether revealed by income or occupation, are much needed and widely used, but they do not supplant the need for farm population data more broadly defined.

With the present and prospective high rate of growth in the nonfarm population, it is natural that the demand for more data on metropolitan areas, urbanized areas, tracts, unincorporated communities, and even city blocks should increase—and be met. The crux of the problem is how these legitimate needs can be met without digging an untimely grave for data on the farm population. Segregation of the village population in a separate class would not justify the merger of the rest of the rural population into one heterogeneous group. Maybe Univac will perform the miracles of economy that will allow us to have additional community classes and farm population, too.

Since 1950, rural sociologists have made much use of the State economic area concept in population research, even though it meant doing their

own data consolidation work in the absence of economic area tabulations. This would appear to hold out the promise that certain data for the farm population, such as some of the items based on sample counts, could be published for economic areas only, without fatally compromising the needs of workers in this field. The basic interest, however, is *where* and *how many*. The administrative organization of agricultural work being what it is, this means county data for such subjects as sex, race, and age.

Summary

In sum, we are interested in a group of people whose lives are related to agriculture in greater or lesser degree, whose demographic, social, and economic characteristics still differ significantly from those of their neighbors, and who as a group are the administrative concern of various Government and private agencies. The method now used to identify these people in the census has conceptual imperfections, but for most purposes these imperfections are tolerable and are offset by the economic and operational superiority of the definition over its possible alternatives.



Book Reviews

Mathematical Economics. By R. G. D. Allen. St. Martin's Press. New York. 768 pages. 1956. \$10

MONSIEUR, $(a+b^n)/n=x$, *donc Dieu existe; repondez!*" (Sir (. . .), then God exists; is this not true!) With these words the mathematician Euler is said to have routed the philosopher and atheist Diderot from the court of Catherine the Great, much disconcerted. Allen's clarity of exposition and thought, already amply demonstrated in his earlier *Mathematical Analysis for Economists*, should, however, disconcert no one. Too many nonmathematical economists believe that mathematics is used in economics in much the same way Euler used it to demonstrate the existence of God; Allen's latest work should enlighten them.

According to the introduction, "The object of the text is to give a summary, and to some extent, a synthesis, of what mathematical economists have written on certain economic theories." In this aim the book succeeds amazingly well. The contents may be grouped roughly in accordance with the mathematical tools which are used. They are (1) differential and difference equations, and (2) the algebra of vectors and matrices.

The first nine chapters, slightly less than half the book, represent the results of applying the mathematical theories of differential and difference equations to economic problems, that is, they are concerned with economic dynamics. The elements of micro- and macro-dynamic economic theory are introduced via discussions of the cobweb model, the multiplier, and the acceleration principle. These discussions point up the need for using differential and difference equations, in general, and complex variables for the description of oscillatory movements.

The chapter on difference equations is perhaps the only reasonably complete elementary treatment of the subject in existence. Distributed lags are also treated, and several interesting improvements and modifications of earlier work are introduced. The latter is discussed more fully in an appendix using the algebra of operators.

With these tools, Allen proceeds to develop the fairly elaborate trade-cycle theories of Samuelson, Hicks, Goodwin, Kalecki, and Phillips. In a final chapter on dynamics, based on Tustin's *The Mechanism of Economic Systems*, he presents an extremely interesting account of the economic application of electrical engineering concepts. Of special interest are the use of electrical engineering diagrams to represent dynamic models and the engineer's concept of a transfer function to provide solutions to those models.

The remaining 11 chapters represent primarily the application of the algebra of vectors and matrices to economic problems. General equilibrium analysis, both of the Walrasian and of the Leontief (input-output) types, is taken up. The final sections of the chapter on Walrasian general equilibrium analysis show clearly the relation between general equilibrium theory and linear programming. It is interesting to note that the mathematics of both linear programming and the theory of games developed historically as a result of criticisms of the Walrasian system.

Since a good deal of vector and matrix algebra is needed, an excellent treatment of these subjects is then provided. The discussion is both brief and clear, and it covers almost all topics in the area which are of interest to economists. The concept of a convex set is introduced, and this leads to a discussion of the theory of games and linear programming.

The theory of games is treated for its mathematical rather than its economic content; as Allen himself points out, "The more general economic problems known as linear programming, or activity analysis, provide one of the main fields of economic application of the theory of games." Consequently, only 2-person zero-sum games are discussed, and the interesting subjects of many-person games and games in extensive form are left to one side. The mathematics of the simplex method is discussed in some detail in the chapter on linear programming.

The main thread of the economic development is resumed in chapters on the allocation of resources and the theory of the firm. The theory of the firm is discussed both in marginal terms, following the "classical" pattern, and in terms of moderately large finite changes employing linear programming and activity analysis, with emphasis on the latter. The theory of consumer behavior is presented in "classical" terms, but an interesting approach through linear programming is briefly introduced. The book concludes with a chapter on problems of aggregation, based almost entirely on Theil's *Linear Aggregation of Economic Relations*.

Allen's book should be useful not only for dispelling the doubts many have about the use of mathematics in economics, but also for stimulating further developments. Though couched primarily in macroeconomic terms, the chapters on dynamics should be read by those seriously interested in price analysis: Static theory has played a useful role in the econometrics of demand, but full understanding of supply response will come only when

Agricultural Price Analysis. Fourth Edition. By Geoffrey S. Shepherd. The Iowa State College Press, Ames, Iowa. 293 pages. 1957. \$5

TO EXPECT any one author to be free of the shortcomings of his profession is to ask too much. Admitting that any economist who undertakes to write a text thereby presumes a certain authority for himself, he nevertheless cannot be free of all the limitations imposed by the contemporary state of knowledge. The weakness of this edition of Professor Shepherd's text is chiefly a reflection of certain general inadequacies of price analysis. Its points of strength reflect not only the author's own competence but also the recent considerable advance in the field to which he too has contributed.

For all our piecemeal wisdom on how the price system works, it is extremely difficult to put together a unified, systematized "agricultural price analysis." In all their 34 years of activity, neither the former BAE nor the present AMS ever produced a comprehensive bulletin on the pricemaking mechanism.

In relying on consumers' disposable income and a supply variable as the basic forces by which to explain prices, Shepherd conforms to the orthodox line. Consumer income is a highly significant eco-

we are able to formulate our hypotheses in dynamic form. Those interested in the statistical estimation of simultaneous equations will benefit greatly from the chapters on vector and matrix algebra. Linear programming enthusiasts will find a sympathetic author and a full treatment of the subject.

The book is introductory, but it is not elementary. Although directed to the economist rather than to the mathematician, it requires a knowledge of mathematics through elementary differential and integral calculus (such as may be obtained from chapters I-XV of Allen's, *Mathematical Analysis for Economists*). It is best not to read this book in one's easy chair. It is a hard book, best read sitting in a hard chair, at a table, with paper and pencil close at hand. The text is copiously supplied with exercises. As these frequently present new developments, they form an integral part of the book.

Typographical errors are few and far between and the price per page is reasonable, rare qualities in a book of this sort and size.

Marc Nerlove

conomic value when aggregate employment and income are in transition between prosperity and depression. It is much less meaningful during prolonged high employment, as the postwar decade has demonstrated so emphatically. (The economics of growth is a more appropriate concept then.) Yet in a new edition dated 1957 and intended to include "some substantial changes," the author not only disregards the lessons of recent experience but retains a BAE exhibit relating farm product prices and income to disposable income in 1924-41 that worked fairly well for the data as plotted through 1951, but has been notably inadequate since.

Overtrust in consumer income as an omnibus price explainer appears also in the little distinction given to pricemaking for various farm products. In a brief subsection, Specific Changes in Demand, livestock prices are introduced into an equation explaining prices of corn, but further digressions by commodities are rare. Much more detail is needed to show how prices come to be as they are for products that have partial industrial outlet, such as soybeans, and to measure the impact

of foreign demand on export commodities. And surely in these latter days more is needed on the bearing of Government price-support programs to prices farmers receive.

Another deficiency in the text is a lack of attention to marketing margins as an influence on farmers' prices.

Yet these inadequacies and omissions are not singular, but universal. The regret is that in this new edition Professor Shepherd does not advance a stride farther ahead of his company.

And there are compensations too. Shepherd is meticulous in treating of shifts in supply-and-demand curves, and the problem of identification. His care almost becomes an obsession—and if one, it is justifiable. Laudable also is his emphasis on the effect of time span on curve shifting, and particularly on the various coefficients of elasticity obtained from analyses.

Many of us who employ graphic correlation technique concur in Shepherd's approval and in his claim of X-ray vision for it.

In connection with production response to price, Shepherd makes the sapient comment, seldom seen, that no normal response to price change can be hypothesized until it is known how the price change itself came about. A higher price that results from increased costs is hardly expansionary!

Other comments on the specifics of the text do not bear enumeration—some would be favorable, others unfavorable. In the latter category would fall the author's belaboring of parity prices for failing to do several things they were never intended to do, such as to measure incomes.

Finally, this reviewer, while joining with sympathy any move for calendar reform that would assure completion of all tasks by the winter solstice, nevertheless must regret that Shepherd's current revision of a basically good text is not more comprehensive. It is fine to see a new chapter devoted to simultaneous equations. Old chapters still carrying prewar tables need some simultaneity too. And adding a chapter on modernized parity prices is not the best corrective for the preceding chapter on parity (now "old" parity) that apparently has remained virtually undisturbed from previous editions.

Let's hope Professor Shepherd can soon find time for a fully reworked fifth edition. And on that, may this reviewer get in a cherished bit of advice. Many texts written by professors look as though they were meant as score for a pedagogue's classroom libretto. Any book ought to be independently readable, to stand on its own. This is true of classroom texts no less than any others.

Harold F. Breimyer

Patterns of Farm Financial Structure. By Donald C. Horton. Princeton University Press. 185 pages. 1957. \$4.50

DONALD HORTON'S study of *Patterns of Farm Financial Structure* was undertaken as one of a series of investigations comprising the Agricultural Finance Project of the National Bureau of Economic Research. It will contribute to a basis for the capstone volume of the project, which is now in progress at the National Bureau under the tentative title of *Agricultural Credit Facilities in the United States*.

The purpose of Horton's study is to show how physical and economic features of farms are related to the way in which they are financed. The procedure is to show how various sources of capital and credit are drawn upon to meet the requirements of different sizes and types of farms. Asset and farm product characteristics are related to farm financial organization, and use and sources of credit are related to the economic character-

istics of agriculture. A summary chapter contributes materially in coordinating relationships developed in the book.

Lacking more adequate data, much of the study is based on 1940 United States Census data from a sample of 108 counties selected to give (1) the relative homogeneity of physical and economic characteristics of their component farms, and (2) a wide representation of different kinds of agriculture. Census data are supplemented by materials from lending agencies and special surveys—the latest that were available in the mid-1940's when the study was initiated. Census data such as those used in the study are gathered only in decennial censuses.

The book will be of value in basic research as a historical reference, and for the working hypotheses it suggests for creative thinking and

collection of data. Basic research and analysis such as this are always of value, but it is unfortunate that the findings of the study could not have been published a decade ago. The age of the data will be a deterrent to wide current interest and use.

A comprehensive and well-prepared introduction by R. J. Saulnier, director of the Financial Research Program of the National Bureau, currently the chairman of the President's Council of Economic Advisers, devotes attention to age of the data—and his discussion is pertinent. However, basic structural changes that have occurred in agriculture, and in sources of capital and credit since 1940, may call for modification in some of the findings as related to current conditions.

As indicated, the major source of data is United States census for 108 counties. Al-

though the counties are well distributed over the United States and selected for homogeneity of their farms, averages of this kind have limitations. Even in the most uniform county, farms differ greatly. Deductive analysis based upon data of this type, supplemented when necessary by estimation, has led to reasonable results; but do they provide a firm benchmark from which to orient one's thinking and judgment?

Such a pioneer study as this has usually to start with material that is available. This one provides considerable guidance for intelligent planning of data needed for future work, and it gives information on basic relationships in the 1940's that can be followed up by later research. Work is needed in this field. The National Bureau and Donald Horton deserve to be commended for this initial undertaking.

Aaron G. Nelson

Immigrants and Their Children, 1850-1950. By E. P. Hutchinson. John Wiley & Sons, Inc., New York. 392 pages. 1956. \$6.50

THE 1850 CENSUS was the first to provide information on the number of foreign-born in the United States. Information on native-born children with one or both parents of foreign birth became available beginning with the census of 1870.

As stated by the author, the objective of the monograph is to present an analysis of census data on immigration, and in addition to provide a survey and guide on immigrants and their native-born children in the population and labor force. In both of these directions the study makes a valuable contribution to the basic literature in the field.

In view of the fact that census data on immigrants, up to and including the census of 1920, were the subject of an earlier study, the discussion in the present monograph centers mostly on the period after that date. Of the 11 chapters in the monograph, the first is devoted to an analysis of the historical trend in the number of immigrants and their children from the date the census figures became available.

In this connection the author notes that the number of foreign-born in the United States reached a maximum of more than 14 million in the census of 1930. With the introduction of restrictive immigration laws after 1920 and a busi-

ness depression in the thirties the number of immigrants declined, and in 1950 the total figure of foreign-born in the United States was a little over 10 million. But foreign-born together with the native-born children of foreign or mixed parentage in 1950 represented as much as 25 percent of the total white population in the country. One of the most marked effects of the reduction in immigration is the aging of the foreign-born population. In 1920 the median age was 40 years; in 1950 it advanced to 56 years.

The second and third chapters of the monograph deal with the geographic distribution of foreign-born and native-born of foreign parentage covering the 1920-1950 period. The data of the study indicate that foreign-born, in both 1920 and 1950, were more urban than the total white population. At the end of that period a definite change was registered in the composition of foreign-born by national origin in favor of southern and eastern Europeans.

It is in the analysis of occupational data of immigrants and their children, presented in the remaining chapters of the monograph, that the most important contribution of the study is found. The previous monograph published in 1920 did not go into detailed consideration of this area. Anyone who has had experience in work-

ing with census data in tracing the historical trend for a definite series is well aware of the involved complications. The difficulty is due both to changes in classifications and to the inclusion or exclusion of certain data from one enumeration to another. The author of this monograph, through a painstaking process, succeeds quite well in bringing about a certain continuity in the occupational data. This enables him to produce a picture of occupational distribution of the immigrants and their children for every decade from 1870 to 1900, and a general analysis of changes in this area from 1920 to 1950.

From the occupational series it appears that all along the proportion of foreign-born in agriculture has been considerably lower than the proportion of the entire population. As with the total population of the country, there is found to have been a distinct movement of foreign-born workers, between 1910 and 1950, away from manual and unskilled labor and toward more skilled employment.

The last chapter of the monograph is devoted to a comprehensive summary and a recapitulation of the main findings. In addition, there are copious appendix notes concerned with an explanation and evaluation of census data beginning

with 1850. The appendix includes also detailed census data for foreign-born by country of birth, and occupation by nativity for both males and females.

Although many of the findings and conclusions in this study of immigrants and their children have been brought out previously in some other general or specific study, this monograph stands out by virtue of its systematic historical analysis of primary data. In its treatment of the census data it makes also a distinct contribution to the methodology involved in this kind of analysis. The material in the monograph is well organized and presented, but its clarity is somewhat obscured by the necessity for careful scrutiny in a number of places to determine whether a particular statement in the discussion refers to foreign-born exclusively or to the foreign-born in combination with their native-born children.

Considering the fact that immigration has played such an important part in the development of this country, the subject matter of this study will be of interest to any student in the field of social studies. To researchers dealing with various historical aspects of population growth in the United States, this monograph will be of special significance.

David Rozman

Baking in America. Volume I: Economic Development. By William G. Panschar. Volume II: *Market Organization and Competition.* By Charles C. Slater. Northwestern University Press, Evanston, Ill. 1956. \$15

HOW MUCH COMPETITION is there in the baking industry, and what characteristics of the industry preserve the competitive features it has? What restrains the baker who would maximize his profits by singly or collusively manipulating prices or withholding from consumers some freedom of choice of bakery products and related services? Through two volumes of description and analysis, Panschar and Slater pursue these questions, using a well-diversified kit of methodologies and a wide variety of basic data. Their implicit hypothesis is that history, technology, costs, and institutions separately and through interaction have shaped the present market organization, and point the directions in which further change may be expected.

An economic history of baking constitutes volume I. Ancient and medieval times in the Old

World and the early days of America are reviewed briefly, but with stimulating insight into the economic factors at work. Most of the volume is devoted to the last century in America, during which the baking industry has gone through three economically significant stages. Between 1850 and 1890, it evolved from a handicraft trade to an industry with large-scale production and wholesale distribution. From 1900 to 1930, under the influence of a changing pattern of demand, dynamic technology, and changing corporate patterns, the baking industry became differentiated into several categories of kind and size. After 1930, the dominant economic characteristic of the industry was its adjustment to changing levels of general economic activity through depression, World War II, and the postwar boom.

Volume II considers in greater detail the differ-

entiation of marketing functions among the different types of bakers who make up the industry, and the complex structure of services, costs, and prices through which a balance is achieved. Nearly half of the volume is concerned with the economic organization of the industry. This section of the work appears to draw too little on what had been covered in volume I, and for that reason it is unduly long. The redundancy is most evident in chapters on patterns of consumption, shopping habits, and the distribution of bakery products.

Chapters on the economics of bakery production, wages and labor relations, costs of bakery production and distribution, and the organization of bakery companies create a detailed economic picture of the industry which is subsequently utilized in analyzing the competitive process in the industry. Accounting records for 173 baking plants for a 3½-year period are a substantial basis for this section of the work. They are supplemented with a synthesis of costs for a more precise evaluation of economies of scale.

Competition in the baking industry is analyzed from the standpoint of price-and-profit-structures, the tactics used by bakers in the struggle for market position, reactions to external factors such as shifts in prices of materials or consumer demand, characteristics of entry into the baking business, and the impact of shifts in the organization of food distribution generally.

The treatise is completed with an appraisal of the economic processes of the baking industry. Slater asks whether the industry is in fact competitive, and attempts a judgment based on whether coordination and control are provided primarily by forces of the market, rather than whether particular aspects of the industry's organization and behavior benefit consumers as much as they might do.

Noting that the organization of the industry does not match either of the two polar limits for

which economic theory can provide definite answers, Slater approaches his evaluation as a matter, not of factfinding, but of making judgments based on the evidence accumulated in the preceding chapters. In keeping with the complexity of structure and competitive activities, he expresses a cautious conclusion, "Altogether, the organization of the typical bakery market is favorable to competition."

He believes that hazards for a firm that holds prices out of line with a competitive level are too great. But he notes reservations with regard to small, relatively isolated markets, and to some inflexibility in adjustment of the industry to development of new products.

Volume I is enthralling reading for anyone with the slightest interest in economic history. It is skillfully written; its contents are of consistent economic significance; it provides a depth and perspective that help the reader to understand the current organization of the industry.

Volume II does not achieve the unusual literary quality of Volume I. Although in many respects well written, parts of volume II are redundant and repetitious. Some of the discussions of methodology appear superfluous for economists and not significant for lay readers. But these are minor faults—the scope and thoroughness of the study amply reward the reader.

The work was written, Slater states, because many leaders of the baking industry were concerned with the fundamental economic processes and the future potentials of their business. The authors also hope that it will acquaint junior executives, suppliers, labor leaders, and Government officials with the economic processes and behavior of the baking business. To such readers should be added any economists with a commodity or industry to analyze. They will find here a stimulating example of such work, a fruitful source of hypotheses, and a skillful utilization of economic data.

Louis F. Herrmann

Selected Recent Research Publications in Agricultural Economics Issued by the United States Department of Agriculture and Cooperatively by the State Colleges¹

ANDERSON, H. O., McNALL, P. E., AND INMAN, BUIS T. PROGRESS IN APPLICATION OF SOIL-CONSERVING PRACTICES, SOUTHWESTERN WISCONSIN. U. S. Agr. Res. Ser., ARS 43-44, 38 pp., illus. April 1957. (In cooperation with Wisconsin Agricultural Experiment Station.)

Based on a study made in 1955 of 127 farms in 5 counties, it appears that after 15 years, 45 percent of the farmers in these counties were cooperating in the soil conservation district program. Around two-thirds of the farmers said they had no difficulty in carrying out the soil conservation programs for their farms. Farmers gave contour strips, terraces, and diversions the highest ratings as conservation measures. Of those who had delayed adoption of soil-conserving practices, 17 percent said that lack of time was mainly responsible, and 35 percent gave lack of credit as the chief reason for delay.

ANDERSON, K. E. THE SPECIAL SCHOOL MILK PROGRAM IN LOS ANGELES, CALIF. U. S. Dept. Agr., AMS-179, 13 pp., illus. March 1957.

Los Angeles children increased their consumption of milk in schools more than 100 percent last year as a result of participation in the Special Milk Program. This preliminary report studying milk consumption in Los Angeles among schoolchildren shows a price reduction and an increase in size of containers for milk. Average daily milk consumption per pupil in schools serving milk more than doubled in the first year after the Special Milk Program began in September 1955.

ASKEW, W. R. SEED MARKETING CHANNELS FOR GRASS AND SMALL-SEEDED LEGUMES IN THE NORTH CENTRAL STATES, 1954-55. U. S. Dept. Agr. Mktg., Res. Rept. 158, 37 pp., illus. March 1957.

Specialization in the production of and increased demand for many grass and small-seeded-legume seeds have made the farmer more dependent on commercial seed dealers. Report shows the changes in demands and purchasers of various seeds, transportation methods, and distribution of sales of seeds.

CLODIUS, R. L., FIENUP, D. F., AND KRISTJANSON, R. L. PROCUREMENT POLICIES AND PRACTICES OF A SELECTED GROUP OF DAIRY PROCESSING FIRMS. Univ. of Wis. Res. Bul. 199, 56 pp. February 1957.

Studies in detail the procurement practices and policies of a selected group of dairy processing firms. Attempts to answer theoretical and practical questions in the procurement of milk.

CLOWES, H. G., ELLIOTT, W. H., AND CROW, W. C. WHOLESALE FOOD MARKET FACILITIES—TYPES OF OWNERSHIP AND METHODS OF FINANCING. U. S. Dept. Agr. Mktg. Res. Rept. 160, 96 pp., illus. April 1957.

¹ Processed reports are indicated as such. All others are printed. State publications may be obtained from the issuing agencies of the respective States.

Report discusses in some detail the merits of different types of ownership of wholesale food markets, sources of loan capital for building new markets, ways of selling securities, governmental regulations to be complied with, methods of financing used by a number of food markets.

FAUGHT, W. A., AND SCHLEGAL, W. A. HUNDRED-WEIGHT OR BUSHEL AS A TRADING UNIT FOR GRAIN. U. S. Dept. Agr. Mktg. Res. Rept. 168, 12 pp. April 1957.

A study of the probable effects of a shift from the bushel to the hundredweight measure in the grain industry indicated that the advantages would vary in degree, depending upon the group concerned. The advantages, however, would be permanent, and the disadvantages, although more numerous, could be surmounted. Report presents views of representatives of farmers, farm organizations, grain trade, banks, insurance companies, and other interested agencies and groups.

FISCHER, CHARLES M. INFLUENCE OF HATCHERIES ON BROILER PRODUCTION IN WESTERN STATES. Western Reg. Res. Pub., Agr. Expt. Sta., Oregon State College, Sta. Bul. 560, 24 pp., illus. May 1957.

Sharp fluctuations in weekly broiler production causes problems in Western States—study recommends more stability in broiler industry by selling broilers strictly on a cash basis. Studies various aspects of broiler industry.

GUILFOY, R. F., JR. TESTS OF A SPRINKLER SYSTEM FOR HOT-WEATHER HAULING OF LIVE HOGS IN TRUCK-TRAILERS. U. S. Dept. Agr. Mktg. Res. Rpt. 172, 20 pp., illus. May 1957.

A water sprinkler cooling system was installed in truck-trailers used to haul live hogs. The U. S. Dept. of Agriculture made 16 tests in 1956 to determine what effect these cooling systems would have on reducing death losses and intransit shrinkage of hogs during hot weather.

HARSTON, CLIVE R. MARKETING HIGH PROTEIN WHEAT IN THE NORTHERN GREAT PLAINS. Montana State College Bul. 527, 138 pp., illus. January 1957.

Marketing high protein wheat adds a number of problems to the already complicated grain marketing structure. Objectives of report are to describe the various marketing channels for high protein wheat, to improve distribution of protein premiums to farmers, to observe problem areas and peculiarities caused by present methods of marketing and pricing high protein wheat.

HESTER, O. C., AND PRITCHARD, N. T. PRICING EGGS IN LOS ANGELES. U. S. Dept. Agr. Mktg. Res. Rept. 161, 20 pp., illus. April 1957.

Egg prices to producers in the Los Angeles market, in contrast to those in many other cities, are based on prices paid by retailers to wholesale dealers. This pricing system is accompanied by a narrower margin between producer and consumer prices and by less fluctuation in prices than prevail in most major U. S. markets.

HOCHSTIM, E. S. **TEENAGE GIRLS DISCUSS THEIR WARDROBES AND THEIR ATTITUDES TOWARD COTTON AND OTHER FIBERS.** U. S. Dept. Agr. Mktg. Res. Rept. 155, 126 pp.

This survey shows cotton to be a favorite fiber among teenage girls: Majorities said they owned cotton summer blouses and skirts, winter blouses, summer everyday and dressup dresses, winter everyday dresses, shorts, slacks, bobbysocks, and sports jackets. Almost all the girls interviewed said they had more experience with cotton than with any other clothing fiber.

HOWELL, L. D. **PRICE RISKS FOR WOOL AND WOOL PRODUCTS AND MEANS OF REDUCING THEM.** U. S. Dept. Agr. Tech. Bul. 1163, 101 pp., illus. January 1957.

Purpose of bulletin is to show the nature and extent of the risks from holding substantial quantities of wool, wool tops, and wool yarns and fabrics from the time they are ready for market until they are needed by consumers, and to indicate means of improving the marketing of wool and wool products by reducing or offsetting these risks.

JACOBS, MILTON. **FABRICS AND FIBERS FOR PASSENGER CARS.** U. S. Dept. Agr. Mktg. Res. Rept. 152, 53 pp. April 1957.

A survey of five major automobile manufacturers showed that automobile manufacturers anticipate increased use of cotton in some parts of car interiors. Report covers major changes that have taken place in the styling of automobile interiors over the 5-year period (1950-55) and discusses future trends.

JACOBS, MILTON, AND LEVINE, DANIEL. **MEN'S OWNERSHIP OF SELECTED CLOTHING ITEMS AND THEIR FIBER PREFERENCES.** U. S. Dept. Agr. Preliminary Summary Rept., AMS-181, 9 pp. April 1957.

Summary report presents selected findings of immediate interest and use to commodity groups, textile processors, manufacturers, and others concerned with men's apparel, particularly since the preliminary information shown is mainly for those items of clothing which are and will be promoted during the next few months.

JOHNSON, H. B., AND NEWSOME, D. W. **TRANSIT REFRIGERATION OF MATURE GREEN TOMATOES SHIPPED BY RAIL FROM THE LOWER RIO GRANDE VALLEY OF TEXAS.** U. S. Dept. Agr. AMS-188, 12 pp., illus. June 1957.

A study was made to develop an icing schedule adapted for South Texas conditions, which will provide transit temperatures within the desired 55° to 65° F. range. Attempts to find the satisfactory refrigerator temperature for mature green tomatoes moving from the Lower Rio Grande Valley.

KAUFMAN, J., BENFIELD, P. L., AND HARDING, P., R., JR. **SHIPPING TESTS WITH MASSACHUSETTS-GROWN CRANBERRIES IN CONVENTIONAL REFRIGERATOR CARS WITH STANDARD VENTILATION AND IN MECHANICALLY REFRIGERATED CARS.** U. S. Dept. Agr., AMS-187, 9 pp., illus.

Cranberries were shipped in mechanically refrigerated cars and in conventional end-bunker railroad refrigerator cars with standard ventilation to determine the effect of the two different methods of shipment. Tests were taken of the temperatures of the cranberries after shipment.

LEVINE, D. B., AND MILLER, H. P. **RESPONSE VARIATION ENCOUNTERED WITH DIFFERENT QUESTIONNAIRE FORMS, AN EXPERIMENTAL STUDY OF SELECTED TECHNIQUES USED IN AGRICULTURAL MARKETING RESEARCH.** U. S. Dept. Agr. Mktg. Res. Rept. 163, 46 pp. April 1957.

Summarization of the results of a study of consumer purchases of seven food items. Study was primarily designed to measure the variations in response when questions about the purchases of selected food items were asked in different ways.

MACPHERSON, D. D., AND SMITH, H. V. **MILK DISTRIBUTORS' SALES AND COSTS.** U. S. Dept. Agr., AMS-180, 7 pp., illus. April 1957.

Report is first of a series on costs and quantities of raw milk and other raw materials; prices and quantities of products sold; and operating costs.

MCDONALD, E. M., PHILLIPS, RICHARD, AND HARRINGTON, D. N. **LOSSES FROM QUALITY DETERIORATION AND SHRINKAGE FOR CORN RESEALED ON IOWA FARMS.** U. S. Dept. Agr., AMS-166, 19 pp. March 1957.

Deterioration in quality and shrinkage from moisture loss of corn stored about 20 months in farm bins means a loss of 1.5 cents a bushel in market value. Report studies the loss in value from these causes, for each year of storage, for corn stored in various physical conditions on 171 farms in Iowa.

MCDONALD, E. M., PHILLIPS, RICHARD, AND HARRINGTON, D. N. **LOSSES FROM SHRINKAGE AND QUALITY DETERIORATION OF CORN STORED IN COUNTRY ELEVATORS AND AT BIN SITES IN IOWA.** U. S. Dept. Agr., AMS-173, 37 pp. April 1957.

Corn storage losses were determined by measuring changes in weights and grade of corn which was stored at country elevators and at bin sites over an extended storage period.

MCELVEEN, JACKSON V. **FAMILY FARMS IN A CHANGING ECONOMY.** U. S. Dept. Agr., Agr. Inform. Bul. 171, 94 pp., illus., March 1957.

Since 1930, farms have become larger and fewer in number. A major premise in the study reported here was that comparable growth in farm size was to be expected during a period in which improved farming methods nearly doubled the work capacity of farm labor. The question of growth in farm size as it relates to the family farm in this approach is whether this growth in volume of business has been more or less consistent with the extent to which new farming techniques have meant greater control by the farm family over other production resources. When viewed in this way, family farms appear to be holding their own. Family farms and large-scale farms made up about the same proportion of commercial farms in 1954 as they had a quarter of a century earlier. Since 1940, operators of family farms have made a slight gain over those of large-scale farms in controlling land resources and market sales, although evidence to this effect is not conclusive. Recent trends indicate that the

number and importance of family farms have been affected largely by the many adjustment problems that are found on the smaller units in commercial agriculture rather than by the encroachment of large-scale farming.

McLURE, J. H., AND ASHBY, W. L. COTTON PRICE QUOTATIONS IN DESIGNATED MARKETS. U. S. Dept. Agr., AMS-167, 31 pp., illus.

Report studies cotton price quotations in eight designated markets to determine their accuracy and reliability and inspect possibilities for their improvement. These quoted prices were compared with prices actually paid for the cotton.

MEHL, PAUL. MAJOR MANUFACTURING INDUSTRIES AS POTENTIAL SOURCES OF EMPLOYMENT IN LOW-INCOME FARM AREAS. U. S. Dept. Agr., AMS-176, 28 pp., illus. April 1957.

Additional employment opportunities for underemployed persons in rural areas in the Southeastern States are most likely to develop in small plants producing apparel and related products, metal products, and wood products. Report deals with industrial development in the United States from 1947 through 1954, with special attention to the Southeast.

MUEHLBEIER, JOHN. ORGANIZING FOR WATERSHED DEVELOPMENT. S. Dak. Agr. Expt. Sta. Cir. 133, 24 pp. January 1957. (Great Plains Agr. Council. Pub. 17.)

This bulletin indicates ways in which local people may work together and assume certain responsibilities in initiating, planning, constructing, and financing a watershed program, or may participate effectively in one undertaken cooperatively with the Federal Government. The responsibilities that local people may need to assume are outlined.

NORTON, H. S. HIGHWAY TRANSPORTATION BARRIERS IN 20 STATES. U. S. Dept. Agr. Mktg. Res. Rept. 157, 40 pp., illus. March 1957.

Discusses problems of diversity among State trucking regulations. Highway taxes, or third-structure taxes, have caused some breakdown in reciprocal arrangements, and may become more serious. Report also examines individual State fees.

OTTE, ROBERT C. LOCAL RESOURCE PROTECTION AND DEVELOPMENT DISTRICTS. STATUTORY FUNCTIONS AND POWERS AS RELATED TO THE WATERSHED PROTECTION AND FLOOD PREVENTION ACT. U. S. Agr. Res. Serv., ARS 43-48, 12 pp. April 1947.

This publication provides an informational overview of the types, functions, and powers of "land and water resource" districts possible under general enabling acts of the States. It is based on a survey conducted during 1955 and 1956 by the Office of the General Counsel of the United States Department of Agriculture.

PRESTON, HOMER J. THE MARKETING AND PRICING STRUCTURE FOR SKIM MILK PRODUCTS IN KANSAS, MISSOURI, AND OKLAHOMA MARKETS. U. S. Dept. Agr. Mktg. Res. Rept. 166, 30 pp., illus. April 1957.

Report analyzes the marketing and pricing structure of plain condensed skim milk and of spray and roller process nonfat dry milk solids. Also provides informa-

tion about the prices received by handlers and non-handlers for the major products manufactured from surplus milk.

REESE, R. B. PRODUCTION OF FROZEN PREPARED FOODS, 1954-55. U. S. Dept. Agr. Mktg. Res. Rept. 170, 20 pp., illus. May 1957.

Study attempts to answer questions about more than 170 different items being produced for the frozen food industry: What is the current production level of frozen prepared foods? Relative importance of the marketing outlets used? Major problems facing the industry?

RUSH, JOHN D. FATAL FARM ACCIDENTS IN THE U. S., 1949-53. U. S. Agr. Res. Serv., ARS 43-50, 18 pp., illus. May 1957.

A little more than a fourth of the fatal accidents among farm people from 1949 to 1953 occurred on the farm, but outside the home. Many accidents were to young people. Farm machinery ranked first as a cause of fatalities. Other major causes were drownings, firearms, and falls. The age group 15 to 19 had the greatest number of fatal accidents, followed in order by the 10 to 14 and the under 5 groups. Males sustained about 91 percent, females 9 percent, of fatalities.

SAINSBURY, G. F., AND SCHOMER, H. A. INFLUENCE OF CARTON STACKING PATTERNS ON PEAR COOLING RATES. U. S. Dept. Agr. Mktg. Res. Rept. 171, 10 pp., illus. April 1957.

Report deals with the cooling and storage characteristics of corrugated-paper pear cartons compared with wooden boxes and the effect of these characteristics on the quality of the stored product.

SNARE, JOHN L. FARM RENTAL ARRANGEMENTS IN ALABAMA'S PIEDMONT. Ala. Agr. Expt. Sta. Bul. 303, 23 pp. December 1956. (Southeast Land Tenure Res. Com. Pub. 23.)

Data for the study reported here were obtained by visiting 370 farm tenants and owners in seven counties of Alabama's Piedmont area. Most common tenancy arrangement was found to be cropper and share, followed by cash, part owners, standing, and miscellaneous arrangements. Most leases were oral, 1-year agreements with no definite renewal arrangements. Most did not provide for compensation to tenants for improvements and none provided for compensation to landlords for abuse of property. Much improvement could be made in leases by having them clear, specific, and definite, and in writing.

U. S. AGRICULTURAL MARKETING SERVICE. LAMB MARKETING COSTS AND MARGINS. U. S. Dept. Agr. Mktg. Res. Rpt. 159, 35 pp., illus. April 1957.

Report analyzes the costs and margins in marketing lamb and gives some examples of the channels through which lamb moves to the consumer and the costs and services involved.

U. S. AGRICULTURAL MARKETING SERVICE. SPECIAL MARGINS AND COSTS STUDIES. U. S. Dept. Agr. Mktg. Res. Rept. 167, 30 pp., illus. April 1957.

The total food marketing bill rose from \$9 billion in 1940 to \$34 billion in 1956. This report studies the margin or spread between prices farmers receive and consumers pay for food.

U. S. AGRICULTURAL MARKETING SERVICE. TRADING STAMPS AND THE CONSUMER'S FOOD BILL. U. S. Dept. Agr. Mktg. Res. Rept. 169, 9 pp. May 1957.

The second of a series of reports on trading stamps, it considers consumers' attitudes toward stamps, returns consumer gets for stamps, money value of stampbooks, implications of the costs of stamps.

WESSON, W. T. POSSIBILITIES FOR FUTURES TRADING IN FLORIDA CITRUS FRUIT AND PRODUCTS. U. S. Dept. Agr. Mktg. Res. Rept. 156, 28 pp. February 1957.

Representatives of the Florida citrus industry have shown interest in the feasibility of organized futures trading in frozen orange concentrate or oranges. Study attempts to evaluate the possibilities for futures trading in these commodities.

WILLIAMS, W. F. WHOLESALE MEAT DISTRIBUTION IN THE SAN FRANCISCO BAY AREA. U. S. Dept. Agr. Mktg. Res. Rept. 165, 87 pp., illus. April 1957.

Study focuses attention on the San Francisco Bay area, a leading slaughtering center and wholesale market for producers and packers throughout the Western States, in an attempt to provide information concerning the organization, structure, and efficiency of wholesale markets for meat.

Statistical Compilations

HAGOOD, M. J., BOWLES, G. K., AND MOUNT, R. R. FARM OPERATOR FAMILY LEVEL-OF-LIVING INDEXES

FOR COUNTIES OF THE UNITED STATES. 1945, 1950, AND 1954. U. S. Dept. Agr. Statis. Bul. 204, illus. March 1957.

U. S. AGRICULTURAL MARKETING SERVICE. ANNUAL REPORT ON TOBACCO STATISTICS, 1956. U. S. Dept. Agr. Statis. Bul. 200, 71 pp., illus. March 1957.

U. S. AGRICULTURAL MARKETING SERVICE. GRAIN AND FEED STATISTICS THROUGH 1956. U. S. Dept. Agr. Statis. Bul. 159, 97 pp. Revised May 1957.

U. S. AGRICULTURAL MARKETING SERVICE. PRICES OF HOGS AND HOG PRODUCTS, 1905-56. U. S. Dept. Agr. Statis. Bul. 205, 44 pp. March 1957.

U. S. AGRICULTURAL MARKETING SERVICE. SEED CROPS BY STATES, 1919-54, ACREAGE, YIELD, PRODUCTION, PRICE, VALUE. U. S. Dept. Agr. Statis. Bul. 206, 82 pp.

U. S. AGRICULTURAL MARKETING SERVICE. STATISTICS ON COTTON AND RELATED DATA, 1920-56. U. S. Dept. Agr. Statis. Bul. 99 (revised February 1957), 256 pp.

U. S. AGRICULTURAL MARKETING SERVICE. VEGETABLES FOR PROCESSING, ACREAGE, PRODUCTION, VALUE, BY STATES, 1949-55 (REVISED ESTIMATES). U. S. Dept. Agr. Statis. Bul. 210, 50 pp. May 1957.

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