
CHAPTER III. USES OF AGRICULTURE
CENSUS STATISTICS IN BUSINESS
AND RESEARCH

CONTENTS

	Page
Introduction-----	201
Uses of Census data by marketmen-----	201
Uses by trade associations-----	201
Uses by farm cooperatives-----	202
Service to individuals-----	202
Tabulations for small geographic units-----	202
Special tabulations-----	202
Some sampling uses of data from the Census of Agriculture-----	203
Sample design and type of sampling unit-----	203
Scope of tabulations-----	204
Methods of expanding the sample-----	204
Precision of data-----	204
Other illustrations-----	204

SAMPLES OF GRAPHIC USES MADE OF CENSUS DATA

	Page
Percent reporting major source of income from livestock, livestock products, 1939 (Successful Farming)-----	206
Tractors per 1,000 farms (Successful Farming)-----	207
Fertilizer consumption by counties—Alabama (The National Fertilizer Association)-----	208
Article taken from "Sales Management," May 1, 1943-----	210
Farmers selling cooperatively, 1919, 1924, 1929, 1939 (Selling and Buying Cooperatively by Farmers—Farm Credit Administration, U. S. Department of Agriculture)-----	211
Farmers transacting business with cooperatives, 1939 (Selling and Buying Cooperatively by Farmers—Farm Credit Administration, U. S. Department of Agriculture)-----	212
Vegetable Belts—South Carolina (South Carolina State Planning Board)-----	213
Beef, hogs, sheep, 1940—South Carolina (South Carolina State Planning Board)-----	214
Morrow County, Ohio:	
Map showing farm location, Census of Agriculture, 1940, including distribution of farms in 2-percent sample-----	215
Map Cardington Township (enlargement of selected area of Morrow County)-----	216
Map showing buying areas of farm operators (cooperative survey—U. S. Bureau of the Census with Magazine Marketing Service):	
Usual place of buying farm machinery (Magazine Marketing Service)-----	217
Usual place of buying groceries (Magazine Marketing Service)-----	218
Usual place of buying men's work clothing (Magazine Marketing Service)-----	219
Farm electrification data by States, 1942 compared with 1940 (Edison Electric Institute)-----	220
30% of passenger cars on farms are 10 years old or over (Automobile Facts and Figures—Automobile Manufacturers Association)-----	221
A reduced facsimile of the 2-color cover of "The Farm Market," a farm market data book, prepared by "Country Gentlemen"-----	222
Sample of the 385 pages of Farm Market Data prepared by "Country Gentlemen"-----	223
County rank tables—showing the leading counties in acreage, production, or value, etc.-----	224

USES OF AGRICULTURE CENSUS STATISTICS IN BUSINESS AND RESEARCH

Introduction.—In the preceding chapters of the Handbook of the Census of Agriculture are described the Census tabulations and publications and the uses made of the data in the educational field. In this chapter the uses of the Census statistics in business and research are discussed. Believing, with a Chinese philosopher, that a picture is worth a thousand words, the present chapter is largely devoted to illustrations of uses which have been made of Census data from the regular tabulations and from special analyses made for advertising and business concerns and farmer cooperatives. Until recently, the principal uses made of Census material in business were applications, to problems of marketing, of the information already published.

Uses of Census data by marketmen.—The marketmen use Farm Census information for market analysis; the determination of sales areas, sales quotas, farm income, consumers' activities, interstate shipment, supply and demand; in calculating sales potentials for farm machinery, fertilizer, livestock, hardware, household and electrical appliances, and the equipment required for various types of farms, such as milking machines for dairies, spraying machinery for orchards, drinking fountains for hogs and poultry, planting machinery for potatoes, dusting machinery for cotton to combat the boll weevil; and other uses too numerous to mention.

To indicate the range of agricultural information which is covered, it may be well to reiterate that the 1940 Census Farm and Ranch Schedule contained 232 major questions in which provisions were made for reports on every kind of crop and each class of livestock. For example, there were approximately 100 different vegetables reported at the 1940 Census of Agriculture, many of which require special machinery for planting and harvesting, different types of fertilizers, and different types of containers, each of which provides a sales outlet for special equipment.

In addition to the tabulations usually made by the Census Bureau, frequency tabulations showing the magnitude of operations are often made which enable marketmen to determine, with greater precision, the areas where advertising would be most profitable. Two such tabulations of the 1940 Farm Census offer excellent examples: (1) The special report, "Cows Milked and Dairy Products," shows by number of cows milked the number of farms reporting; the number of cows milked; dairy products produced; the sales of milk, butterfat, and butter; and the number of cows kept for milk. (2) Similar tabulations are contained in a special poultry report which gives statistics, by geographic divisions and States, for poultry of all kinds on hand and raised; and, by counties, statistics for chickens on hand, chicken eggs produced, chickens raised, and chickens sold, by number of chickens on hand, and the number of farms reporting chickens and turkeys raised by numbers raised.

Tabulations of this kind are put to many uses. A striking example of the use of the poultry data was that of a retail merchant, selling anthracite coal, who needed to know the production of broilers within a certain area in order to determine whether he would be warranted in purchasing or processing the size and quality of coal to use in brooders in his territory. From the number of chickens raised and the brooder capacity he could check back to the coal required.

Lest this be thought trifling, the rationing board had need of very similar information to find out whether two counties in the Del-Mar-Va area should be allowed several times the usual fuel quota because of the extensive use of coal for brooders.

Similar examples of the uses of size-group material, in the cows milked and dairy products reports, are illustrated by manufacturers at the extremes of dairy equipment—one firm manufacturing a churn which was suitable for farms having a cow or two and another firm manufacturing mechanical milking equipment suitable for the largest scale commercial enterprises.

The Rank Releases, showing the 50 or 100 leading counties in acreage and production of major crops and in inventory and production for various classes of livestock, are of great importance to marketmen as indicators of sales potentials and in indicating the cream of the market.

By far the widest commercial uses made of Agricultural Census statistics, however, are those which relate to farm income. It is believed that the rough gross-income figures derived from these reports on farms reporting and value of farm products sold, traded, or used by farm households form the best basis for calculating the amount of money which will be available for sales in farm territory.

While there are other methods of calculating this amount, such as bank clearings, amount of sales, credit reports, etc., very few have the universal basis furnished by the Agriculture Census. It is often said that the Census material, after a few years, is out of date. It should be pointed out that, by the use of crop condition figures and price indexes, these county figures can be carried forward by researchers so that an approximate figure can be furnished without a great deal of difficulty.

While the Census does not calculate the basic index figures, the Department of Agriculture does. At this point it might be well to mention the demarcation between the two fields of endeavor. The Bureau of the Census, through its Division of Agriculture, Department of Commerce, is responsible for the basic figures on crops, livestock, and general farm information every five years. The Department of Agriculture is responsible for estimating the changes on a percentage basis from year to year and converting them into absolute figures by the application of percentages and indexes. Estimates on farm income and other items for a geographic unit smaller than a State are not available, so that it is usually necessary to go back to the Census of Agriculture county figures and work from that source to calculate county income.

One of the most interesting examples of calculating sales quotas which has come to the attention of the Bureau was that of a feed salesman who computed from the minor civil division and county figures the theoretical requirements of feed for the animal units within his territory. He worked out the production of the various grains in that area, calculated the deficiency, and set up the sales quota for his dairy and poultry feed accordingly, with great success.

Uses by trade associations.—Trade associations perform a very useful function in bringing to their members essential statistics published by the Census Bureau with descriptions of the uses which can be made of the statistics—making business forecasts from Census figures relating to trade, conditions, credit, etc.; indicating trade opportunities; and furnishing other similar information. Examples of such uses are presented on succeeding pages. These illustrations include statistical tables, maps, graphs, and calculations of important averages and percentages, all designed to make the material more readily assimilable by members and clients of the associations.

Uses by farm cooperatives.—Farm cooperatives make use of Census statistics in much the same way as trade associations. They make the United States, State, and county farm statistics available to their members and sometimes even the statistics for small areas, such as minor civil divisions.

At the request of the cooperatives, questions relating to cooperative activities were included on the 1940 Farm and Ranch Schedule. These questions cover farmer sales, purchases, and service through cooperatives. Sample charts which were furnished cooperatives by their statistical service accompany this chapter.

Service to individuals.—The question is often asked as to what service the Census of Agriculture renders individual farmers. A large part of statistical service is rendered by the Census through the county agents, each one of whom is furnished the State bulletins, special reports, and releases covering his territory. Many farmers take advantage of this service, while others write direct to the Bureau of the Census regarding such problems as relative yields in various territories, farm income with county averages, new crops, localities producing seed supplies, data needed in selecting new farm locations—i.e. information relating to soil, climate, yields, and markets—livestock or poultry basic developments, tax statistics, land values, etc.

Still other individuals make similar use of Agriculture Census statistics, particularly in the selection and sales of land in new farming territory, as of the new irrigation projects of the West, and the reclamation projects of the South. The statistics of the Agriculture Census, in such cases, are supplemented by the detailed data of the Census of Irrigation and the Census of Drainage, both of which are handled by the Division of Agriculture. These Census Reports also furnish a large amount of technical data needed by governmental agencies, machinery and equipment firms, planning authorities, and engineers and other individuals.

Tabulations for small geographic units.—The county is the smallest unit for which the data of the 1940 Census of Agriculture were published (see a description of the publications in chapter II of this Handbook). A few years ago the county statistics were sufficient to fill the needs of almost everyone, but today all agencies interested in intensive planning, land purchase, and emergency relief demand exact knowledge of smaller geographic units. To meet this need, most of the Census statistics for 1940 were tabulated on the basis of the small geographic unit, which, for convenience, is termed minor civil division or basic tabulation unit of the Agriculture Census. These units vary widely in the different States, both in size and general characteristics, as may be seen from the various designations, as townships, precincts, beats, militia districts, school districts, etc. There are, on the average, about 17 minor civil divisions per county.

The published county totals are the summation of the totals for each of the constituent minor civil divisions. The cost of preparing and printing these data for approximately 50,000 minor civil divisions for the hundreds of items is prohibitive, but, with the cooperation of the Department of Agriculture and the Work Projects Administration, the most important have been transcribed from the machine tabulation sheets. These tables can be obtained by the general public at the cost of the photostats, 35 cents per sheet.

Special tabulations.—If the Census publications do not disclose the data needed for special purposes, the desired information may often be secured by having the Census Bureau make special tabulations of the data which are recorded on the agriculture schedules and on the punch cards. The punch cards may be retabulated or cross tabulated to bring out the desired relationships.

Anyone desiring special tabulations should write the Bureau of the Census stating exactly what is needed. The procedure will be worked out by the statisticians of the Division of Agriculture, and an estimate will be furnished by the Director of the Census specifying the cost of the work and the method of payment. Because of legal requirements it is necessary that such payments be made in advance and in the manner specified by the Bureau of the Census.

Examples of important special jobs of this kind are as follows:

- I. A study of the characteristics of farms by income groups, by geographic divisions (based on a 2-percent sample of individual reports and made in cooperation with U. S. Department of Agriculture). This shows the interrelationship of such factors as age of operator, size of farm, farm equipment, farm facilities, work off farm, and major source of income with the amount of income.
- II. Study of where farmers buy consumer goods—Morrow County, Ohio—Influence of roads, type of farm, income, farm value, distance to markets, income by soil types, and numerous other market, sociological, and agricultural data. Special tabulations tying in data from five different sources.
- III. Index of County Buying Power—Morrow County, Ohio.
- IV. A study of the application of farm location to commercial research problems—Morrow County, Ohio.
- V. Measurement of characteristics of different groups of farmers, showing relationship of subscribers of a farm magazine to farmers on adjoining farms, for selected counties.
- VI. A market analysis based on Agriculture Census and other data, by States and counties.
- VII. Farm income, by source of income, by major-source groups, and by income groups, for farms by tenure groups, by geographic divisions and States.
- VIII. Virginia study of farm family income.
- IX. Cotton harvested.—Number of farms reporting, acreage, and production; and value of farm products; by number of bales harvested, by counties.
- X. Farms, farm acreage, and farm values, work off farm, cooperative marketing, and income groups, by color and tenure of operator, by size of farm, for selected counties.
- XI. Farms, farm acreage, and farm values, by income groups, for selected counties in Kentucky.
- XII. Selected characteristics of farms, by major source of income.—Number and value of farms, specified farm expenditures, autos, trucks, and tractors, electricity, and telephones.
- XIII. Potatoes by acreage groups (under 3 acres and 3 acres and over), 1939, and by production groups, 1934; by counties.—Farms reporting, acres, and quantity harvested.
- XIV. Value of farms of 30 acres and over, by minor civil divisions, for selected counties.—Number of farms and value of land and buildings.
- XV. Abandoned or idle farms.—Number and acreage, with classifications by cause of nonoperation and year of abandonment, by counties.
- XVI. Number, acreage, and value of farms, 1940, and cropland harvested, 1939, classified by tenure of operator, by minor civil divisions, for Wisconsin.
- XVII. Cross-line acreage.—Farms reporting and acreage by place of enumeration and by location of acreage, with relationship to all farms, by counties.
- XVIII. Japanese farm operations.—Number of farms, by tenure of operator, by minor civil divisions, for Arizona, California, Oregon, and Washington.
- XIX. Mortgage study made cooperatively with U. S. Department of Agriculture to obtain on a sample basis, by means of special questionnaires, mortgage data for tenant-operated farms.
- XX. Plantation study.—Statistics for plantations and for cropper and tenant farms of plantations.
- XXI. Farm characteristics by dollar-value groups (value of land and buildings) for selected counties.—Number, acreage, and value of farms; value of farm products; farm mortgages and farm taxes; and cash rent paid or payable; classified by size of farm, for selected counties.
- XXII. A comparison of agriculture within and outside of drainage enterprises in the alluvial lands of the Lower Mississippi Valley.

The preceding list illustrates a wide range in the types of service tabulations which can be summarized as follows:

- I. The simple or straight compilation of data available on machine tabulation sheets but not published.
- II. Special tabulations of statistics on punch cards, not included in the regular tabulation plan.
- III. Frequency or group tabulations.
- IV. Frequency tabulations by other characteristics, such as income groups by age groups.
- V. Simple sample tabulations with various methods of sampling.
- VI. Sample tabulations from matched schedules.
- VII. Sample tabulations with data from several sources, such as the agricultural, population, and housing schedules, etc.
- VIII. Sample tabulations with farm location from matched schedules, by soil types, distance from town, places of purchase of different types of goods, etc.—An extension of the previous method.

A description follows of one of our most interesting special tabulations, made on a cooperative basis with the U. S. Department of Agriculture. This tabulation showing numerous characteristics of farms by income groups was from a 2-percent sample drawn from Agriculture Census punch cards. For this study, the items listed below were tabulated by the following income or total value-of-products groups:

\$1 to	\$99	\$1,500 to \$1,999
\$100 to	\$249	\$2,000 to \$2,499
\$250 to	\$399	\$2,500 to \$3,999
\$400 to	\$599	\$4,000 to \$5,999
\$600 to	\$749	\$6,000 to \$9,999
\$750 to	\$999	\$10,000 and over
\$1,000 to	\$1,499	

1. Number of farms.
2. Land in farms.
3. Cropland harvested.
4. Value of land and buildings.
5. Number of farms by size (under 10 acres, 10 to 29 acres, 30 to 49 acres, 50 to 99 acres, 100 to 179 acres, 180 to 499 acres, 500 to 999 acres, 1,000 acres and over).
6. Farms classified by major source of income (live-stock, dairy products, poultry and poultry products, wool, mohair, and other livestock products, field crops, vegetables, fruits and nuts, horticultural specialties, farm products used by farm households, and forest products).
7. Farm operators by age (under 25 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 years and over).
8. Color of farm operators (white and nonwhite).
9. Tenure of farm operators (full owners, part owners, managers, tenants, and croppers).
10. Residence of farm operators.
11. Year of occupancy beginning in 1939 or 1940.
12. Farm labor on farms during weeks of Sept. 24-30, 1939, and March 24-30, 1940.
 - Family labor.
 - Hired labor.
 - Hired by month.
 - Hired by day or week.
 - Other hired labor (including piece work and contract labor).
13. Cash wages paid for hired labor.
 - Hired by month.
 - Hired by day or week.
 - Other hired labor (including piece work and contract labor).
14. Expenditures for feed.
15. Expenditures for implements and machinery.
16. Expenditures for gasoline, distillate, kerosene, and oil.
17. Expenditures for building materials.
18. Expenditures for commercial fertilizer.

19. Expenditures for liming materials.
20. Automobiles (farms reporting).
21. Motortrucks (farms reporting).
22. Tractors (farms reporting).
23. Electric distribution line within 1/4 mile (farms reporting).
24. Dwellings lighted by electricity (farms reporting).
25. Telephones (farms reporting).
26. Farm operators reporting business with or through cooperatives.
27. Farms reporting horses, mules, cattle, and/or hogs.
28. Farms reporting horses and/or mules.
29. Farms reporting horses and/or mules with no tractors reported.
30. Farms reporting horses and/or mules with tractors reported.
31. Farms reporting tractors with no horses or mules reported.
32. Farms not reporting horses, mules, or tractors.
33. Farms reporting cattle.
34. Farms reporting cows milked by number milked (1 cow, 2 cows, 3 or 4 cows, 5 to 9 cows, and 10 or more cows).
35. Farms reporting hogs.
36. Farms reporting sows by number on farms (1 sow, 2 sows, and 3 or more sows).
37. Farms reporting hogs but not reporting sows.

In order that a fair idea of the method and usefulness of this special study may be obtained, a paper read by Irvin Holmes, Statistician on Agriculture Census values, at a recent meeting of the Washington Chapter of the American Statistical Association, follows:

SOME SAMPLING USES OF DATA FROM THE CENSUS OF AGRICULTURE
By Irvin Holmes
Bureau of the Census

The 1930 Census of Agriculture classification of farms by type of farm was used for making type-of-farm tabulations by counties and States of many agricultural items, such as acreage of land in farms, numbers of farms by tenure of operator, expenditures for specified items, etc. For the 1940 Census of Agriculture it was decided to use sample data instead of complete tabulations as a basis for presenting statistics on the characteristics of farms classified according to type (major source of income), according to total value of farm products, and according to color-tenure of operator. Four considerations contributed mainly to this decision: The urgent need for the figures in connection with war programs, particularly statistics on marginal (low income) farms and on farm labor; the necessity for holding costs to a minimum; the greater variety of tabulations that could be made on a sample basis than on a complete basis with the funds available; and the possibility of securing experience and information which would be valuable in preparing plans for future censuses, either on a complete or on a sample basis. The purpose of this talk is to review the work that has been done to date on these tabulations of sample data from the 1940 Census of Agriculture.

SAMPLE DESIGN AND TYPE OF SAMPLING UNIT

The primary objective of these tabulations of sample data was to secure national statistics on farm characteristics. The secondary objective was to provide measures of the variation in these statistics by large geographic regions.

All of the data for one farm for a group of related items, such as value of farm products, are on a single punch card. Consequently it was feasible to use the smallest available sampling unit, that is, the individual farm. Most previous studies of sampling techniques for proposed sample censuses of agriculture have centered about the problem of size of sampling unit; i. e., the problem of balancing enumeration difficulties and costs for small sampling units, such as individual farms, against the loss of information for large sampling units, such as clusters of farms. The number of farms, according to the 1940 Agriculture Census, varies from 135,000 for the New England Division to nearly 1,100,000 for the West North Central Division. It was recognized that it would be desirable to vary the sampling ratio of number of farms for each geographic area for which statistics were desired. It was also recognized that for tabulations of farms classified by type of farm the sampling ratio should be varied by type groups; likewise for any tabulations of farms classified by total value of farm products, it would be desirable to vary the sampling ratio of number of farms by value groups. Administrative considerations made such procedures impractical; consequently, the following alternative was substituted:

First, the cards were sorted into two primary strata: Farms with less than \$10,000 and farms with \$10,000 or more total value of products. The farms with \$10,000 and over total value of farm products represented only 1 percent of all farms, but accounted for approximately

17 percent of the gross farm income for the United States in 1939. The cards for all farms with \$10,000 and over total value of farm products were sorted out and tabulated, i. e., a 100-percent sample was used.

For farms with less than \$10,000 total value of products a 2-percent sample was selected by machine by sorting out all punch cards with serial numbers ending in 15 and 65. The same terminal digit "5" was selected to reduce the number of cards handled in the subsequent sort, i. e., 600,000 compared with 1,200,000. The "15" was selected to reduce the number of counties excluded from the sample. There were only 22 counties in the United States, chiefly independent cities in Virginia, which had less than 15 farms at the time of the 1940 Census, and which were, therefore, excluded from this 2-percent sample.

There is no reason to infer any relationship between the characteristics of the farms and their serial numbers. The serial numbers had been placed on the individual farm schedules prior to the time that the data were transferred from the schedules to the punch cards. The selection of the sample farms was on a county basis; that is, the secondary stratification of the 2-percent sample was geographic. Although the machine selection of the sample farms was done by counties, the individual farm schedules had been arranged by minor civil divisions within each county prior to numbering. Consequently, the geographic distribution of the sample farms approaches a stratification by minor civil divisions within each county. (See illustrative map of Morrow County, Ohio, on succeeding pages.) To a considerable extent, the original order of enumeration was preserved in numbering the schedules. Accordingly, the 2-percent sample also approximates a selection along the enumerator's route of every 50th farm in the "Under \$10,000" category.

SCOPE OF TABULATIONS

At the present time, the following tabulations are completed or in progress:

- (1) Analysis of characteristics of small farms.
- (2) Analysis of farm characteristics by type of farm.
- (3) Analysis of value of farm products by color-tenure of operator.

The first tabulations are being made in cooperation with the Bureau of Agricultural Economics and the Farm Security Administration of the Department of Agriculture. Preliminary reports, or press releases, are now being prepared showing figures for those items by geographic regions for which the expected error is small enough to justify publication. Present plans are to publish the results of all three of these series of tabulations in a special monograph.

METHODS OF EXPANDING THE SAMPLE

For the tabulations for the Department of Agriculture, two factors were available for expanding or inflating the sample. Published figures were available for the total number of farms and total value of farm products for each value-of-farm-products group. For these tabulations it was decided to use the total number of farms in each value group for expanding the sample data.

For nearly all of the items sampled, the totals for all value-of-farm-products groups were also known. On such items, the expanded sample figures for each value-of-farm-products group were scaled to equal these previously published totals by simple proportionate adjustments. In some of the tabulations, cross-classification tables were involved, such as numbers of farms cross classified by total value of farm products and by size of farm. In such cases, the expanded sample figures for all cells were adjusted to equal these known totals by a succession of horizontal and vertical proportionate adjustments. These adjustments were made for the convenience of any user who might wish to relate the figures to previously published Census data.

It was recognized that for some of the items, particularly such items as value of land and buildings and expenditures, some increase in precision might have been obtained had the sample data been expanded by using an inflation factor based on the total value of farm products for each value-of-products group. The decision to use total number of farms instead of value of products in expanding the sample was determined partly by administrative reasons and partly by the fact that, since the tabulation sort was by value of farm products, much of the over-all relationship between value of farm products and the sampled items had already been taken into account.

A third expansion factor, which could have been used, was the reciprocal of the sampling ratio based on number of farms for the total sample, that is, for all value groups combined. Obviously this would have given less precision than that obtained by the use of sampling ratios for the individual value groups. This would be particularly true for the terminal value groups where the population numbers of farms are relatively small and the sampling ratios quite variable.

PRECISION OF DATA

Because of cost and operational considerations, it was considered impractical to vary the size of sample by value groups or by geographic areas. For this reason, it is to be expected that the relative sampling errors will be considerably smaller for the central value groups, for which the number of farms is generally large, than for terminal value groups which have few farms. A similar difference

in relative sampling errors is to be expected as between geographic divisions with large numbers of farms and geographic divisions with fewer farms. Likewise, the relative sampling errors differ as between items, depending, in the case of the farm counts, upon differences in the proportion of farms reporting specified characteristics, and, for quantitative items, upon differences in the variability of the items.

For example, in estimating average age of operator, the size of sample necessary for a given degree of precision is considerably less than that required for all land in farms, cropland harvested, value of land and buildings, and work off farm. Some evidence is available from California and Illinois: For the upper terminal value groups in Illinois and California the sample size for all land in farms would need to be from 40 to 80 times as large as that for average age of operator to secure the same relative precision. The higher-value groups include not only farms with large acreages but also small-size farms, such as hatcheries, greenhouses, and nurseries which accounts for the high degree of variability.

For work off farm in these high income groups the sample data for California indicate that it would require a sample approximately 250 times as large as that for average age of operator to secure the same relative precision. Most operators of large-income farms report very few days of work off farm, but a few such operators report nearly full-time nonfarm employment, generally at professional or business occupations. To secure statistics on the number of days of work off farm for these value groups with a relative error of 10 percent would require approximately a 33-percent sample, which figure includes a correction for sampling from a finite population. In these comparisons the formula used is for an unstratified sample; therefore, the coefficients of variation may slightly overstate the facts.

In the tables accompanying the reports, the figures have been marked with an asterisk when the expected sampling error is relatively large. However, in evaluating the reliability of the figures, the consistency in the pattern of relationships should be taken into account as well as the indicated precision for individual cells. For practically all items studied to date the relationship patterns have been remarkably consistent between States and geographic divisions.

Other illustrations.—Another tabulation from samples was made for a farm paper,¹ to determine, among other things, how the subscribers and their farms varied from the average, and from their nearest neighbors and their farms. One of the many colored illustrations resulting from this sample is included.

Another example of a somewhat different type of research is represented by a study which correlated data from different sources—schedules—from the censuses of agriculture, housing, and population; information from a private agency; and a special questionnaire—and charted some of the data on a county map. Morrow County, Ohio, had been used at two censuses in a project to show the location of each farm. Recorded on the map are the numbers of the farm schedules for 1940. With farm location as a basis and the returns from farmers on a special questionnaire, the buying habits of the farmers have been charted.

Charts were prepared on the following subjects:

Groceries
Farm machinery
Men's work clothing
Women's best dresses, etc.
Stoves, refrigerators, etc.
Bedding, floor covering, window shades, etc.
Beauty preparations

The first three of these charts are included in the illustrations on succeeding pages.

This farm location technique can also be used in designated areas to obtain any business, agricultural, sociological, or other data from agricultural or other schedules. By matching schedules from the sources mentioned above and assembling the data on one master card, the value of the material can be greatly enhanced. Examples are yields by type of land, values by type of soil, type of farming by type of soil, mapping and outlining of market areas, etc., from reports of places farmers bought various kinds of merchandise, such as groceries, consumers' goods, farm machinery, etc. The possibilities of this method can hardly be exaggerated. Aside from other statistical uses, farm location is needed for enumeration control (to assure complete coverage). It is hoped a detailed description

¹ Successful Farming.

of the Morrow County, Ohio, results may be published in the form of a cooperative monograph.²

The 2-percent sample farms for Morrow County which were included in the cooperative survey, "Specified Farm Characteristics for Farms Classified by Value of Products," have also been identified on the Morrow County maps as examples of the geographic distribution in the selection of the sample farms.

The location represented in this stratification and other phases of sampling can be tested and comparisons can be made with other farms, location, soil types, etc. By using adjoining farms, the advantages and disadvantages of blocks or

groups of farms in sampling material may be determined. The results of all of these studies appear so promising that the Bureau has been requested, many times, to bring them to the attention of marketing, economic, engineering, sociological, and other students and to invite them to participate. A selection of the examples of uses made is attached. By writing the Census or the agency or firms mentioned for further information or by calling at the Bureau of the Census more complete descriptions of the methods may be obtained.

²Magazine Marketing Service and Bureau of the Census cooperating.