In this country there are two major sources of data about Agriculture - The Bureau of the Census which takes an agriculture census every five years and the United States Department of Agriculture which forecasts and estimates the current production in agriculture. These data complement each other and it is, therefore, necessary that both of them be considered in discussing the question of "Meeting Present Day Needs for Census Data in Agriculture."

The statistical program of the Department of Agriculture is based largely upon mailed inquiries. This program which has been in operation nearly a century was designed to provide accurate and timely forecasts and estimates of agriculture production to be used primarily in trading operations. To the production figures have been added, data such as taxes, prices paid and received by farmers, cost of living and production expenses, mortgage debt, grain in storage, etc. These descriptive data have come to be used extensively in government, in legislative deliberations, in business and in analytical work of the Department of Agriculture and in educational institutions. To meet the demand of the users of these data. the number of items covered, the frequency of release, and the geographical detail has increased greatly in the past three decades.

Although some kinds of information is obtained more accurately in a self-administered questionnaire, the kinds of information that can be obtained by mailed questionnaires are limited in scope and depth and the sample indications are subject to bias due to selectivity of the mailed responses. To minimize the effect of biases, the samples are expanded by correlating sample ratios of the production items and land in farms with periodic production figures shown by the census. Although this method reduces the selectivity it does not remove all the selectivity, and it introduces another error because it is assumed in the expansion factor that there is no change in land in farm between the censuses. This means that under the present system the Department of Agriculture's statistical program is dependent upon having a census of agriculture production and the accuracy of the estimates depends, in part, upon the frequency of the censuses.

The Department of Agriculture has decentralized the sampling and much of the data processing to the state level. This program is supported financially and politically by the states. This administrative set-up and the development of an information system, based upon mailed inquiries, has placed the statistical program in a methodological and an administrative strait-jacket. This strait-jacket is not likely to be broken because of self interest and political pressure at the state level. Unless an alternative system materializes it will be necessary that the agriculture census be taken at least every five years and that much of the information collected should be devoted largely to the items covered by the Department of Agriculture's statistical program.

When I try to take a broad look at the census and the United States Department of Agriculture data and, if I assume that descriptive data of production will satisfy present day needs, I would agree the information, as now being obtained, is timely, efficiently and, in its present form, essential. But, consider these data in light of the fast moving world we are now living in, the advancements made in sample design, advances in data processing through the introduction of computers, devices developed by the psychologists for pulling information from respondents in a survey interview, and analytical concepts that are now available for solving agricultural problems. It seems clear to me that the informational system developed by the United States Department of Agriculture which has not undergone a basic change in methods during the past thirty years and a census taken every five years which is confined largely to items of production, just does not meet present day needs.

Let me get more specific. There are tremendous changes taking place in agriculture. I am convinced that the five year period between census is too long a period to wait, in order to have reasonably reliable figures in agriculture. For example, the increase in the per farm man hours from 1940 through 1957 is as great as the increase in the 120 years from 1820 to 1940. In the past 10 years, farm tractors have increased almost 90 per cent. There are twice as many grain combines and milking machines, four times as many mechanical corn pickers and eleven times as many pick-up balers and forage harvesters now on farms as 10 years ago. Fertilizer consumption is about  $2-\frac{1}{2}$  times that of 1940. Changes in one year now may equal those of 5 years during a period 30 years ago.

More than  $1-\frac{1}{2}$  million farms, or about 1/4 of all farms, have disappeared since 1930. More than 1/3 of these changes occurred between 1950 and 1954 and 2/3 since 1945. Practically all decline in farm numbers has been in commercial farms. Since there has been little change in the acreage of land in farms and in total cropland, the acreage of the disappearing farms has been absorbed into existing farms. The change in the average size of farms has affected the size of commercial farms, as noncommercial farms have not changed greatly in average size. From 1950 to 1954, the average size of the commercial farm increased from 220 to 336 acres -- a 50 per cent increase.

The pressing need to balance supplies of farm production and demand, a need for a more uniform and efficient flow of agriculture produce through the marketing system, the inroads of man made products into the markets for natural products are illustrations of a whole complex of agriculture problems in which data is needed in their solution. Agriculture is going through a technicological revolution, not only in production but in marketing. New concepts of problem analyses are being developed for agriculture production, processing and distribution of foods and fiber and in the supplying of goods and services to farmers. New and powerful analytical concepts are being devised for solving business problems, such as operations research, statistical, economic sociological models. These models will be used in solving basic agriculture problems in the future. Therefore, descriptive data of production are no longer sufficient. Whole new systems of information are needed.

A major step in developing a new system would be an annual farm visitation sample conducted by the Bureau of the Census. They have the trained field staff to conduct interviews, they have the experienced technical staff to design the samples efficiently and they have the computers and the technical staff to process the data using modern methods of analysis. However, I feel that the over-all responsibility of the agriculture statistical program should remain in the United States Department of Agriculture. They should have the responsibility for making the forecasts and estimates of production, the setting of survey objectives, and the analyses in terms of charting courses of action.

Such a sample census could be made up of three parts, each utilizing about one half of the interviewing time: - one part to provide annual estimates in such items as land use, acreage and production of crops, number of livestock, etc. (this type of information could be designed primarily to strengthen the United States Department of Agriculture's production statistical program); a second part to provide new information but on a repeat basis; and a third part to obtain new information as needed only once, which in the parlance of survey people are the "one-shot surveys." The national sample could be designed so that parts of the questionnaire could be constructed to provide regional information. If the data are needed only for the United States as a whole, it could be obtained on a sub-sample, say 1/10 of the segments and the specific questions be rotated among the questionnaires so that 10 times as many items of this kind could be obtained. Because of the smaller number of interviews and the larger and more thorough training, it would be possible to obtain accurate information from the respondent on many kinds of items which could not be obtained in a national census involving 30,000 enumerators.

An area probability sample of 180,000 farms consisting of about 1,000 segments per

state (except for New England and Nevada) using revised Master Sample materials containing an average of about 4 farms per segment, supplemented by a sample of 10,000 to 20,000 large farms would provide an enormous amount of new and powerful information. A sample of this size would permit, for example, accurate estimates of the total number of farms, land in farms, land under cultivation and <u>major</u> livestock numbers by states. Generally, data for cross-tabulations, frequencies of occurrence could be estimated for nine types of farming areas, and for three geographic regions -North, South and West.

The sample census as indicated could, for example, provide accurate information on such important items as insurance, medical care, tenure practices, family employment, sickness, accident, farm construction, fire damage, marketing channels, transportation methods, stocks, utilization of crops, production methods, production practices, inventory of farm machines and equipment, days of use of machinery and equipment, rental agreements, debts, use of chemicals for weed control, insecticides, feeding practices, purchasing habits, cooperative marketing, use of insecticides, use of fertilizers, soil management practices, use of new and improved varieties of crops, farm population, hours of work, wage rates, etc.

In my opinion, there are many advantages of having the sample census taken in the fall rather than in the spring. If taken in the fall, October would be the ideal time for the interviewing in the rocky mountain and hard wheat areas and the first part of November for the remaining areas. If the interviewing workload averaged about 120 hours, the interviewing could be completed by the end of November. The size of the field staff would be small enough that they could be sufficiently trained to prevent the response errors from getting out of hand. If the interviewing was first completed on a sub-sample of the segments and of the large farm operators during the first week and the data processed on the computers, it would be possible that estimates for the United States could be released before January 1. States estimates from January 1 through February and cross-tabulations during March to June.

Existing or new Master Sample materials could be used to designate the sample segments. Materials prepared for the 1954 sample census of Agriculture should be satisfactory for 26 northern and eastern states. For the southern states for which census county divisions have been established, a new set of segments would be needed. Since the Ed's to be used for the last census will comprise areas larger than an MCD, the segment boundaries could be drawn so that they have distinct, identifiable boundaries and not influenced by MCD boundaries with Ed's or census divisions. A small supplementary sample of urban areas could be used to provide data for the area sample. The supplementary sample of large farms could be taken from the last census.

The utilization of electronic equipment makes it possible to use more efficient methods of estimation than were possible in the past. For example, regression methods of estimation can be used which utilize information from the previous census in such a way that sampling variation is greatly reduced. The estimate for any item could be made by first obtaining the simple unbiased estimate, multiply the sample total by the reciprocal of the sampling rate and adding to this estimate a quantity which is the difference between the complete census total for that item, and the simple unbiased estimate of that total for the sample in the base year. This method takes into consideration the correlation between years in the identical sampling units. In most agriculture items a correlation of better than .75 can be expected which would result in substantial reduction in sampling variation.

It has been estimated that an annual sample census as outlined above would cost from \$2,200,000 to \$2,500,000 per survey as compared to \$22,000,000 for the 1957 census. If a national sample census was taken every year and a full census every ten years, more useful information would be obtained to meet present day needs at no additional cost to the taxpayer. A vastly greater range of items could be covered and depth of information obtained, and the response error would be at a minimum because of intensive interviewer training.

With the size of the sample indicated, more accurate estimates would be forthcoming than under the present systems for the production of the major crop and livestock on a national and regional basis. Furthermore, the data from the sample would provide a more accurate basis for expanding the mailed surveys. If county figures are needed more frequently than once every ten years, I feel this is the responsibility of the states. In about one fourth of the states there has been sufficient interest in annual county figures that the states are taking annual agriculture census through the assessors. If additional states find a need for county estimates they have two courses of action open to them. They can obtain the data through the assessors or they can, no doubt, contract for this work with the Census Bureau in the same way cities contract with the Bureau for population census. This arrangement would, in my opinion, result in a better coordinated and directed statistical program between the federal and state governments.

The agriculture census, the mailed surveys of the United States Department of Agriculture and the annual sample census as outlined above would provide data that is largely descriptive and of the nose counting variety. There is wholly a different kind of survey information needed that is designed to solve specific problems. The United States Department of Agriculture has in recent years conducted a number of surveys of this type by contracting with commercial firms for the interviewing and the data processing. These surveys have been largely directed at marketing and related problems and from a survey methodological viewpoint are of high quality. Because this research has been handicapped by a lack of funds, they have too often been narrow in concept.

The psychologists have, in recent years, made great strides in developing methods for field interviewing that goes a long way in explaining human behavior by using such devices as scaling or projective methods, word-associations, multiple choice answers, and open end probing types of interviews. After all, many of the problems facing agriculture rests with people and, regardless what the facts are, people will act as they perceive the situations.

For example, the controversy continues over the role of federal agricultural agencies in establishing policies and systems having a direct effect upon levels of production and prices of agricultural commodities. A more intensive use of sample surveys to determine the motivations, perceptions, and attitudes of farmers with respect to these systems and policies is called for. The essential danger is that the directors of the agriculture agencies will attempt to implement their policies and systems while working from assumptions that are faulty estimates of the psychological characteristics of the people who must, in the final analysis, operate within their own framework. This is not to say, necessarily, that the validity of a given policy or system is to be based upon the average farmer's attitudes and opinions. The point is that the intrinsic worthwhileness of a given policy is not guarantee of its success. It can be a success only in terms of its being perceived as something designed to meet the needs and perceptions of those it is meant to effect. All too often, the barriers to success of a program rest almost solely in the attitudes and perceptions of the people who are expected to carry out the practices called for. The attitudinal and perceptual barriers cannot be changed until they are analyzed and understood in the first place. Present day market research has had a great deal of success in adapting techniques from psychological research to the study of problems such as this within the framework of sample surveys.

In keeping with this view, one can ask whether or not agriculture needs the continuing type of psychological research represented in the Federal Research Board's surveys of consumer finances and spending. In these surveys great emphasis is placed upon consumer expectations, consumer feelings of confidence in the economic situation, consumer spending intentions, etc. The years have demonstrated that these surveys provide valuable categories of information which can be integrated into other areas of information for diagnostic appraisal of the current and near-future status of the economy. Surely, more intensive research of this type can be done upon the farmer both as a producer and a consumer.

At any given moment there is a tremendous amount of research being conducted on some aspect of the demand for agricultural commodities. And, much of this research makes use of the sample survey approach. Further, this research is generally characterized by a high degree of quality with respect to concepts and methods. The most serious criticism of all of this research effort, however, is that it is directed toward analysis of demand - problems associated with single commodities (eggs, poultry, frozen concentrated juice, etc.) or limited categories of commodities (dairy products as a class, citrus products as a class, etc.). The problem here is that the demand for these single commodities or categories of commodities does not exist in isolation. There is interaction between the demand for the specific agricultural commodities, and interaction between the demand for agricultural commodities and non-agricultural commodities. The real understanding of what is happening in terms of the demand for any one commodity must be a function, to some degree, of our understanding of these demand-interactions. As these interactions occur within people (the consumers) we must go to them in order to obtain the needed data. A few years ago we, at National Analysts, made our first real attack on this type of problem in our research on buying-decision behavior which we conducted for the Advertising Research Foundation. I believe that this kind of survey information can make a contribution to agriculture.

We sometimes seem to ignore the fact that the passage of foods and fiber through the distribution system from primary producer to ultimate consumer involves people at each of the traditional steps or stages -- processors, shippers, wholesalers, and retailers. And, whenever we have people, we must be prepared to admit that motivations, perceptions, values, information levels, etc. can be functioning in a way to prevent the operation from being a wholly rational one. Traditionally, market research, especially that using psychological concepts and methods in combination with sampling procedures, has been directed toward the consumer.

In recent years, there has been an increase in interest in applying these to problems arising within the distribution system. Several of our current projects at National Analysts are of this nature. For example, one of our projects has to do with the use of <u>certain information sources by decision-making</u> executives in a certain industry. It soon became apparent that we could not study this problem without going into certain motivations, perceptions and attitudes of these executives as they pertained to their decision-making function. And, of course, we encountered a most challenging problem in terms of sampling this particular universe. The main problem was that we did not want to go by title in locating our sample respondents but on the basis of actual job functioning. The studies we have conducted to date have been mainly on non-agricultural problems. We have done a few studies, of this type, though, on agricultural commodities under the sponsorship of the American Dairy Association.

It is often claimed that many of the problems in agriculture are based upon the fact that there is a drastic change occurring in the role or meaning of "farm living" in our present day society -- the values associated with the farm as a way of life are changing. To what extent do we know, in a definitive manner, just what the nature of these valuechanges is? In what segments of the population are the changes occurring in the most functional sense? What are the sources of the new set of values that are relacing the old? Sociology and social psychology have matured to the extent that concepts and techniques from these fields, in combination with sampling techniques could be utilized for the study of this vitally important problem on a survey basis.

In summary, I feel that as long as the United States Department of Agriculture continue to base its forecasts and estimates of agricultural production on mailed surveys, the agriculture census should be taken every five years and devoted largely to an inventory of production so that this vital information can be continued. However, this information is limited in scope and depth.

A first step that should be taken is to break out of the administrative and methodological strait-jacket that these programs are in is to have the Bureau of Census take an annual sample census. This Bureau has the facilities to conduct the surveys and process the data efficiently. If an agriculture census was taken every ten years and a sample census taken every year, there would be an increase in the accuracy of the production data for the nation and for regions, more useful information obtained in the census, and the sample census would provide a wealth of new and powerful information at no extra cost to the taxpayer.

It should be recognized that this information is largely of the nose counting variety and there would still be a great need for sample surveys designed to solve specific agricultural problems by obtaining from farmers, processors, shippers, wholesalers, retailers and the consumers -- their perceptions, levels of information, attitudes, opinions, values, motivations, etc. -- in other words, obtaining directly from the people in the agricultural producing and marketing system information as to why they do as they do.