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General Overview of the NASS Objective Yield and Objective Measurement Programs

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EXECUTIVE SUMMARY

The purpose of this document is to provide a summarized history of the objective yield and objective measurement programs conducted by the National Agricultural Statistics Service (NASS) since the early 1950s. The document presents historical data on state participation and sample sizes for all crops included in the national program and relevant information on state specific programs. The national program, directed from the NASS headquarters in Washington D.C., and funded under the Federal budget, includes (or has included) the following crops: corn, cotton, potatoes, rice, sorghum, soybeans, sunflower, tobacco, and wheat. The state specific programs are only conducted in specific states and are funded by local state governments or specific industries.

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Abstract

This document provides an overview of the objective yield and objective measurement programs conducted by the National Agricultural Statistics Service (NASS) since the early 1950s. The document presents historical data on state participation and sample sizes for all crops included in the national program and relevant information on state specific programs. The national program, directed from the NASS headquarters in Washington D.C., and funded under the Federal budget, includes (or has included) the following crops: corn, cotton, potatoes, rice, sorghum, soybeans, sunflower, tobacco, and wheat. The state specific programs are only conducted in specific states and are funded by local state governments or specific industries.

Key Words: Objective Yield Surveys, Objective Yield Program, Objective Measurement Program

1. INTRODUCTION AND BACKGROUND

This document provides a summarized history of the objective yield (OY) and objective measurement (OM) programs conducted by the National Agricultural Statistics Service (NASS) since the early 1950s. It presents historical data on state participation and sample sizes for all crops included in the national program and relevant information on state specific programs. The national program, directed from the NASS headquarters in Washington D.C., and funded under the Federal budget, includes (or has included) the following crops: corn, cotton, potatoes, rice, sorghum, soybeans, sunflower, tobacco, and wheat. The state specific programs are only conducted in specific states and are funded by local state governments or specific industries.

2. HISTORY

The main goal of the objective yield and objective measurement programs is to forecast/estimate crop yield by direct measurement of plant characteristics. The sampling for the objective yield surveys has been on a probability basis from the inception.

The National Agricultural Statistics Service (NASS) is a recognized world leader in the use of objective yield technology. Objective yield surveys produce the primary indications for yield forecasts and estimates for the major feed and food grains in the United States. Additionally, NASS has made long term commitments to make this technology available internationally.

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Through cooperative agreements, NASS has demonstrated or helped implement objective yield programs in many countries of Asia, Africa, and Central and South America.

Yield and production of major field crops in the United States have been forecasted and estimated by the United States Department of Agriculture (USDA) since President Abraham Lincoln's administration in the 1860s. Crop condition surveys were prepared monthly by the USDA as early as 1863, the year following the creation of the Department. Until 1884 pre-harvest reports were in terms of condition as compared to an "average" crop. In 1884 the reporting concept changed. Condition began being asked as a percent of a "normal" crop, given no adverse effect of weather, disease or pests.

Although crop acreage changes from year to year, some of the largest variations in crop production are caused by fluctuations in yield per unit area. For more than a century, yield forecasts were based on voluntary producer appraisals of expected yield. It was recognized early on that actual changes in yield were not fully reflected in subjective grower appraisals. By 1898, traveling agents started to supplement farmer-crop reporters' information with on site observations of crop conditions. By 1903, more than 100,000 agriculture related business operators, including cotton ginners, millers, elevator operators, and transportation agents were paneled to gain insight into the agricultural situation.

In 1910, a shift began from the practice of reporting crop condition to forecasting actual production during the growing season. By 1915, cotton production forecasts became available during the growing season. Making the transition from condition to yield forecasts required regression modeling. This was almost entirely done by visual interpretation of charts prior to the use of computers in the late 1960s.

Objective measurements for forecasting yield started with cotton in 1928. These early efforts involved statisticians driving along the perimeter of cotton fields, making boll counts at predetermined locations in fields. There appears to have been no effort made to directly relate the field counts to yield. Thus, it may be more appropriate to think of these early efforts as "Objective Condition" surveys. Later, corn and wheat were added to this program, but this early work in objective methods was discontinued at the start of the World War II. Research into objective measurements of wheat, corn, and cotton was resumed in 1954.

The "birth" of probability sampling for agricultural statistics and objective yield methods came in 1957 when the Agricultural Marketing Service, a NASS predecessor, proposed to Congress a long term initiative titled "A Program for the Development of the Agricultural Estimating Service." The significance of the project was that it provided a basis for a fundamental change in agricultural estimation methods. The project provided for annual enumeration of a large probability sample of agricultural segments throughout the country, as well as annual measurements in sample fields for improving yield forecasts and estimates. This did not eliminate the use of mailed voluntary crop reports, but it did make available valuable new indications based on probability samples.

The cotton and corn objective yield programs became operational in 1961. Wheat came on line a year later. Soybeans joined the national program in 1967 and potatoes in the early 1970s. Grain

sorghum, sunflowers, and rice were added to the objective yield survey program in the 1980s. However, due to budgetary constraints, grain sorghum and sunflowers were dropped from the operational program in 1988, and rice was eliminated in 1993. Over the years, state participation and sample sizes for all program crops were affected by budget constraints.

Objective yield work for other crops is also done, generally through state funding to assist marketing and industry groups. A partial list of these crops include citrus in Florida and California, grapes in California, tart cherries in Michigan, nut crops in California, Oregon, and Washington, and onions in New York. Background research for developing estimation methods for apples, peaches, and pecans have been conducted periodically.

3. RESEARCH ON PLOT SIZE AND LOCATION

Plot Size

The corn, cotton, and soybean objective yield programs plot sizes have remained unchanged since their inception in the mid-1950s. Although variations in plot sizes have been investigated through the years, none have been found to outperform the plot sizes currently being used. The plot sizes have remained 2 rows by 15 feet for corn; 2 rows by 10 feet for cotton; and 2 rows by 3 feet for soybeans. To arrive at these optimum plot sizes an assortment of variables have been evaluated with respect to variance and cost. Some of these variables are: number of ears for corn, pods with beans for soybeans, and large bolls for cotton.

Plot sizes for wheat were derived differently than for corn, cotton, and soybeans. More than an assessment of various variables, the original plot size was selected based on the ability to expand to a per acre basis. In the 1950s, the original plot size used for wheat was 3 rows by 26.14 inches for drilled fields and 24 inches by 26.14 inches for broadcast fields. Optimum plot size research conducted in 1973 in Kansas and Washington compared rigid steel frames of 14.4 inches and 21.6 inches in length against the 26.14 inches frame. The results of this research showed that it took 40 percent less time to make counts with the 14.4 inch and 20 percent less time with the 21.6 inch frame. Additionally, for variables used in forecasting wheat yield (number of stalks and emerged heads), the 14.4 inch frame was considered optimum. Since there were concerns over the inclusion of borderline plants within the frame, the 21.6 inch frame was selected over the 14.4 inch one. The 21.6 inch frame is the one currently being used.

Plot Location

Objective yield samples are selected from acreage reported on the March and June surveys. These surveys were developed to obtain information on crops, livestock, and other agricultural items with a known probability and use a multiple frame sample design consisting of an area frame and a list frame. Information on sampling procedures for specific crops is provided on Section 5, Sampling. All identifiable land units in the area frame are called a segment. Each segment consists of tracts or farms. Once the tract and segments are identified, the next step becomes selecting the sample acre (plot) within the field.

The procedures for locating the plot within the field have been the same for corn, cotton, and soybeans since the mid 1950s. Initially, plots were randomly located within the field. The first unit was randomly selected from one of the following four locations: 1) 1st row, 20 paces into row; 2) 10th row, 1 pace into row; 3) 20th row, 1 pace into row; or 4) 20th row, 10 paces into row. The second unit was then located an additional 20 rows and 20 paces into the field. These non-random plot locations forced too many plots to be situated in border areas and end rows. Border plots tended to underestimate yield, while non-border plots tended to overestimate yield.

In 1955, two methods were evaluated to select plot location for cotton in North Carolina. The first method involved selecting two coordinates for Unit 1. The first coordinate for Unit 1 was selected between 1 and the maximum number of rows for a field. The second coordinate was selected between 1 and the maximum number of paces for the field. The second method required that 12.5 percent of the sample units fall in border areas. Unit 1 was selected using random numbers between 1 and 20 for 25 percent of the fields and between 21 and 40 for the remaining 75 percent. Unit 2 was located 30 rows and 30 paces further into the field from Unit 1, regardless of the method used to select Unit 1. The results of this analysis showed that non-randomly located plots were more homogeneous in the interior of the field than those plots randomly located. Also, the proportions of non-random plots in border and end row areas should be the same as proportions of plots in those areas if they had been randomly selected. As a result of this research, plot locations were randomly selected starting in 1956.

A 1965 study in Indiana, Iowa, Nebraska, and Kentucky found that there were too many plots located in the interior instead of border areas of corn objective yield fields. As a result of this analysis, the table of random locations was re-designed to reflect the field's proportion of border and interior areas. The re-designed table was built for fields of 8, 16, 32, and 80 acres. It assumed that fields were rectangular, had widths of 5/8 of an acre and the maximum number of rows (or paces) was ½ the length of the field. It was also recommended that Unit 2 be located independently of Unit 1. This method of locating Units 1 and 2 for corn, cotton, and soybeans, is the one currently being used.

Most of the research on wheat plot locations was documented after 1965. This surge in plot location research most likely occurred as a result of the 1965 corn study in Indiana, Iowa, Nebraska, and Kentucky. Wheat related research looked at potential biases from a disproportionate number of plots in turn row areas and the location from which the enumerators accessed the field, among other things. In 1977, a newly re-designed table of plot locations was introduced to select plots in border, turn-row, and interior portions of the field in the same proportions as the field's acreage in these areas. To select Unit 1, the table included plot locations for 7, 15, 29, 47, and 128 acres. Plot locations for strip farmed fields were based on a 30 acre field, ¾ mile long and 1/16 mile wide. To minimize damage and to limit the time required to locate the plot, the area in which a plot could fall was limited to ¼ of a field for less than 60 acre fields, to 1/9 of a field for fields over 60 acres, and to 1/8 of a strip farmed field. To simplify procedures and to minimize crop damage, Unit 2 is located 30 paces further into the field and 30 paces further along the edge from Unit 1. In an effort to minimize the enumerator's decision as to where the edge of the field lies, no chance of selection is given to 0 paces (i.e., no plot located on the extreme border). This method of locating Units 1 and 2 is the one currently being used.

4. GENERAL METHODOLOGY

The concepts and methodology used in objective yield surveys for forecasting and estimating yields are similar for all field crops. Forecasts and estimates are based on actual counts and measurements made in sample fields by trained enumerators, and on data obtained by laboratory analyses of fruit from the crops. Two components of yield — number of fruit (heads, bolls, ears, etc.) and weight per fruit — are used to forecast yield levels. Various plant characteristics are used to predict these components during the growing season. Harvest losses, estimated by gleaning small plots in the sample fields after harvest, are deducted to obtain a net yield.

During the early growing season, crop maturity varies considerably by region. As the season and plant maturity progresses, the plant characteristics and measurements made to forecast yield change. The enumerator determines the maturity stage of the crop in the sample field during each visit and makes appropriate counts and measurements for the growth stage.

Observations for each sample are made on two randomly selected plots (units) in each of the selected fields. Each plot consists of a specified number of parallel rows of predetermined length, or a rectangular unit drawn to specification if crop rows are indistinguishable at the unit location. Forecasts are made from plant and fruit counts obtained each month during the growing season. A small portion of mature fruit is sent to a regional laboratory to make moisture and weight measurements.

States are selected for the objective yield program with the intent of covering over 80 percent of the production of the crop. This is done as long as there are no budgetary constraints.

5. SAMPLING

Objective yield samples are selected from acreage reported on the March and June Agricultural Surveys and the June Area Survey. Winter wheat samples are selected from the March Agricultural Survey. Spring wheat, durum wheat, corn, cotton, and soybean samples are selected from acreage reported on the June Area Survey. Potato samples are selected from the June Agricultural Survey.

Winter wheat samples are unique, as they are selected from the March Agricultural Survey using a multiple frame (combined list and area survey) design. Also, winter wheat varies in that samples are drawn from ‘fields to be harvested for grain’, while other crops are sampled from fields ‘planted and to be planted’ on the parent survey.

The objective yield sample for each crop is allocated to the most important production states such that 80 percent or more of the nation’s crop is included. Allocations are made to minimize production estimates’ coefficients of variation (CV). Until about 1990, allocations were made to maintain minimum harvest level CV’s. As estimation models have improved, an effort has been made to allocate samples to maintain a minimum CV across the growing season within budget constraints.

The June list and area surveys are major annual survey efforts conducted by NASS that serve as the parent surveys for several of the objective yield surveys. Nationally, the area frame component includes approximately 11,000 segments, each about one square mile -- collectively representing about 42,000 farms, which are enumerated in early June to identify land use. The enumerated acreages of planted crops in a given sampled segment are expanded by the associated segment-level expansion factor. Objective yield samples are then selected proportional to the expanded acreage. Proportional sampling ensures that the distribution of the objective yield sample will approximate the distribution of the crop as discovered in the June Area Survey. Sampling procedures are similar for winter wheat except that the March Agricultural Survey is the base survey.

Survey states, sample size, and sample distribution are reviewed annually, but NASS has attempted to maintain consistent state involvement and sample sizes to maintain year-to-year comparability and to meet target coefficients of variation.

6. FIELD PROCEDURES

Enumerators are provided aerial photographs with a segment outlined in red. Operators of land in these segments were interviewed during the June Area Survey. Within the segment there may be more than one tract (farm). The enumerator locates and interviews the operator of the tract for the specific objective yield survey being worked.

Seven reporting forms are used during the course of the growing season to collect information from the farm operator or for recording the counts and measurements in the field. The reporting forms are designated by an alphabetic letter, which, in general, reflects the chronological order in which they are used during the growing season. The data collected on each form are similar for all crops in the objective yield program.

A convenient way to describe the field procedures for the objective yield surveys is to describe each reporting form, and explain its use.

Form A - Also known as the "Initial Interview" form, it is completed on the first visit to the farm operation. It is used to update the crop acreage intended for harvest and to identify the sample field for the survey. It is also used to gain permission from the farmer to enter the field to lay out the objective yield survey sample units and to query the farmer about pesticide usage so the enumerator can take appropriate personal safety precautions.

This form is used to verify or change planted and harvested acreages that were reported earlier with the mid-year survey. It's also the mechanism for selecting the field for making actual field counts and measurements.

Form B – This form is the field observation recording form. It is used to record counts and measurements of the plants and fruiting forms. In addition, Form B reiterates instructions for locating, constructing, and processing the sample units. A separate Form B is completed each survey month until harvest time, when a final Form B is completed.

A Form B is done for each month until very near harvest. Close contact is maintained with the operator so that a sample field is not harvested before a final Form B (just before harvest) can be completed. During this last visit before farmer harvest, a sample of the mature crop is sent to the laboratory. This sample is the basis for 'at harvest yield' estimates.

Forms C-1 and C-2 – These forms are used to record laboratory observations and are not seen by the field enumerator. Form C-1 records data from the early season, pre-harvest field visits, while the C-2 is generated from the last field visit made at, or just before, farmer harvest.

Form D – This form was used to record the actual number of acres harvested at the end of the year and the operator estimated yield of the field. It was discontinued in 2002.

Form E – This is a field observation form used to collect data for determining field harvest loss so that a net yield estimate can be made. The field visit to collect Form E data must be within 3 days after harvest to determine harvest loss accurately, as loose grain deteriorates quickly or is lost when left in the open. From the gleanings recorded on this form, an estimate of harvest loss is obtained that is subtracted from gross yield to arrive at a net yield. Plot location of this post-harvest unit is similar to the location process of the original unit. A measured rectangle is staked out, and fruit remaining in the unit after harvest is collected and sent to the lab. There it is counted, weighed, and moisture tested to estimate the harvest loss. It should be noted that gleaning plots are not located in the same place as the Form B plots, since enumerators hand harvest these plots and bias the harvest loss.

Form H – This is also a farmer interview form, and it is completed at the same time as the Form A. It is used to collect data on seed, fertilizer, and pesticide application rates and tillage practices. These data are used for further economic analysis, and are not part of the yield estimation program.

Locating the Unit

After completing Forms A and H, the units are constructed in the sample fields by the enumerator. Two units are laid out for each sample. Unit 1 and Unit 2 are located independently of each other (except in wheat where unit locations are dependent). The random number of rows and paces for locating Units 1 and 2 are computer generated and preprinted on a label on Form B.

The point of entry into the field, or starting corner, is the first corner reached when approaching the field that allows the units to have a chance of falling in any area of the field – interior, border, or turn-row. Ideally, any area of the field should be available for selection; however, particularly for very large fields, this is not logistically feasible. Therefore, procedures focus on ensuring randomness and that various types of field locations are appropriately represented. As part of the selection process, the shape of the field must be considered. Research has indicated that there are no statistical differences related to starting corners. Therefore, any field corner which does not exclude some part of the field is acceptable.

In locating the sample plots based on a designated number of paces along and into the field, the enumerators are instructed to walk their normal paces. It is very important that they not vary their

pacing based on specific areas they may be seeing in the field, so as not to bias the plot location. The pacing process, if allowed to be truly random, should ultimately result in the inclusion of some barren areas (not delineated on Form A) as well as some especially lush ones.

The steps below are followed when locating and laying out the sample units for corn. There are slight variations in these procedures from crop to crop.

Step 1: The enumerator marks the starting corner with a piece of plastic flagging ribbon so that it will be clearly visible on later visits. He/she usually ties a piece of red plastic flagging ribbon to a fence or some nearby object or drives a large stake in the ground and attaches the ribbon. The enumerator then makes a note of the location and the type of marking used on the kit envelope field sketch.

Step 2: The enumerator then walks along the end of the crop rows until the number of rows (or paces for wheat and broadcast seeded fields) indicated for Unit 1 is reached. A piece of flagging ribbon is tied on the first plant in Row 1. This helps locate the same row on subsequent visits. The next row in the direction of travel will be Row 2 of Unit 1.

Step 3: The enumerator walks the required number of paces into the field between Row 1 and Row 2, starting the first pace 1.5 feet outside the plowed end of Row 1. This makes it possible for a unit to fall anywhere in the field including the very edge.

Step 4: After the last of the required paces is taken, a dowel stick is laid down so that it touches the end of the enumerator's shoe. The dowel is placed across Row 1 and Row 2, at a right angle to the rows. The unit is laid out in the direction of travel of the last pace.

Step 5: The zero end of a 50 ft. tape is anchored at the dowel stick directly beside the plants in Row 1. The sample number is written on a florist stake and inserted at the anchor point.

Florist stakes are color coded pieces of lath about 6 to 8 inches long. They are highly visible markers commonly used in nursery and greenhouse operations to mark seed beds. Florist stakes deteriorate quickly so no hazard will be created if they are lost or abandoned in the field after the survey.

Step 6: In Row 1, a starting florist stake is placed exactly 5 feet from the anchor point. It is marked "U1-R1". This measured 'buffer zone' helps ensure that the unit location is not subjectively biased in its location by the enumerator. The florist stake should be placed beside the row about 2 inches from the base of the plants. The marker is placed outside the plant row to avoid any damage to the developing crop.

Step 7: Working outside the unit, the enumerator carefully measures the unit length and places a florist stake at the designated point. Corn, cotton, and potatoes have larger unit lengths which are measured with a tape. For example, the corn count area is 15 feet long. A rigid metal frame is used for marking wheat and soybeans where the unit size is smaller.

Not all the fields are square or rectangular, and other special situations may arise when locating and laying out a unit. The Interviewers' Manual provides detail instructions on how to handle most of these situations. Some of the problems that more commonly occur include: blank areas in the field that were known or unknown during the mid-year survey; the field is not large enough to accommodate the number of rows or paces specified; row direction changes; odd shaped fields are encountered as circular fields under pivot irrigation; fields planted on contours; or crop rows that are not distinguishable due to sowing practices. All these situations are covered with precise instructions.

The Form B is the recording form for counts and measurements that are made at the units. Visits to these sample units will take place monthly during the growing season except for potatoes, when only one visit is made within 3 days of harvest or when vines are dead.

Because the same sample unit must be revisited monthly, it is important that the enumerator precisely mark the location of the unit. Plastic flagging ribbon is used. This is highly visible, but like florist stakes, quickly disintegrates so that it may be abandoned after the survey.

Counts and Measurements

The steps below apply specifically to corn. There are slight variations in these procedures from crop to crop.

Step 1: The first field procedure is to measure row spaces. For corn, 1-row and then 4-row space measurements are required. Measurements are made from the plants in row 1 to row 2 and then from row 1 to row 5. These measurements are used to calculate the area of the unit.

Step 2: The enumerator counts the number of plants in each row in the designated unit.

Step 3: The enumerator classifies the unit by maturity category. Descriptive four page handouts with color picture examples are provided to assist in determining maturity.

Step 4: There is typically a small area of the unit in which more specific counts and measurements on fewer plants are made. Different counts are made depending on the maturity level category. The crop and type of counts are as follows:

Soybeans: 1) plants; 2) nodes; 3) lateral branches with blooms, dried flowers, or pods; 4) blooms, dried flowers and pods; and 5) pods with beans.

Corn: 1) plants; 2) average length of kernel rows; 3) diameter of ear; 4) stalks with ears or silked ear shoots; 5) number of ears; 6) ears with kernel formation; and 7) cob length.

Cotton: 1) plants; 2) burrs, open and partially opened bolls; 3) large unopened bolls; 4) small bolls and blooms; and 5) squares.

Wheat: 1) stalks; 2) heads in late boot; 3) emerged heads on all stalks; and 4) detached heads.

Potatoes: 1) hills; 2) tubers; and 3) field weight of tubers in the unit.

After completing Unit 1 counts and measurements, the enumerators have to go back to the beginning of the Row 1, Unit 1 and walk to the designated row, or number of paces, for Unit 2. The enumerators are instructed to continue in the original direction of travel as when locating Unit 1, if the Unit 2 count exceeds the Unit 1 count. After locating Row 1 of Unit 2, they have to walk the required paces into the field to set up Unit 2, and make the counts and measurements required.

Table 1 presents the number of states participating in the national objective yield program by commodity since the start of the program.

Table 1: Number of States in the National Objective Yield Program by Commodity: 1954-2008

CROP	CORN	COTTON	SOYBEANS	WINTER WHEAT	SPRING WHEAT	DURUM WHEAT	POTATOES	RICE	SUNFLOWER	SORGHUM
1954	10	10								
1955	10	10		2						
1956	23	10	11	2						
1957	23	13	11	9						
1958	23	13	11	9						
1959	23	13	11	9						
1960	23	13	12	9						
1961	23	13	12	9						
1962	23	13	11	9						
1963	23	14	na[2]	9						
1964	23	14	11	9						
1965	29	14	11	na						
1966	30	14	11	15	5	3				
1967	30	14	14	15	5	3				
1968	24	14	14	15	5	3				
1969	24	14	14	15	5	3				
1970	24	14	14	15	5	3				
1971	19	14	14	15	5	3	6			
1972	19	14	14	15	5	3	7			
1973	19	14	14	15	5	3	7			
1974	19	14	14	15	5	3	7			
1975	19	14	14	15	5	3	12			
1976	20	14	14	15	5	3	12			
1977	18	12	17	15	5	3	12			
1978	18	12	17	15	5	3	11			
1979	18	6	17	15	5	3	11			
1980	16	6	17	15	5	3	11			
1981	10	6	15	14	5	3	11	1	1	1
1982	10	6	15	14	5	3	11	1	1	1
1983	10	6	15	14	5	3	11	2	1	2
1984	10	6	15	13	5	1	11	5	3	5
1985	10	6	15	15	5	1	11	5	3	5
1986	10	6	15	15	5	1	11	5	3	5
1987	10	6	15	15	5	1	11	5	3	4
1988	10	6	14	15	5	1	11	5		
1989	10	6	14	15	5	1	11	3		
1990	10	6	11	12	4	1	11	2		
1991	10	6	11	15	4	1	11	2		
1992	10	6	11	na	4	1	11	2		
1993	10	6	8	13	4	1	11			
1994	10	6	8	13	4	1	11			
1995	10	6	8	13	4	1	11			
1996	7	5	8	10	3	1	7			
1997	7	5	8	10	3	1	7			

[2] The cells shown with a "na" represents those for which no information was available.

Table 1: Number of States in the National Objective Yield Program by Commodity: 1954-2008 (continuation)

CROP	CORN	COTTON	SOYBEANS	WINTER WHEAT	SPRING WHEAT	DURUM WHEAT	POTATOES	RICE	SUNFLOWER	SORGHUM
1998	7	11	8	10	3	1	7			
1999	7	12	8	12	3	1	7			
2000	7	15	8	12	3	1	7			
2001	7	7	8	10	3	1	7			
2002	7	7	7	10	3	1	7			
2003	7	7	7	10	3	1	7			
2004	10	7	11	10	3	1	7			
2005	10	7	11	10	3	1	7			
2006	10	7	11	10	3	1	7			
2007	10	7	11	10	3	1	7			
2008	10	6	11	10	3	1	7			

7. NATIONAL PROGRAM

7.1 Corn

History

The corn objective yield survey started as a research project in 1954, in conjunction with the cotton objective yield survey. The first corn objective yield survey was conducted during the week of August 22, 1954. The plant observations during the first visit consisted of counts and the measurement of ears. The second visit took place during the week of September 19, 1954. Then, the samples of ears were weighed and tested for moisture content to derive a pre-harvest yield indication. Post harvest visits were made after the farmers had harvested the crop. This initial survey was conducted in 10 southern states: Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. For 1955, the corn survey was moved up a month to coincide with the first cotton survey in late July.

In 1956, the corn objective yield research program was expanded to the north central region of the country. An additional 13 states were added to the program for a total of 23 states. The additional 13 states were: Iowa, Illinois, Indiana, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, Virginia, and Wisconsin. In 1961, the program became operational in all these states.

In 1965, six new states were added to the program: New York, New Jersey, Pennsylvania, Delaware, Florida, and West Virginia. Maryland was introduced to the program a year later in 1966. Delaware, Arkansas, Louisiana, New Jersey, Oklahoma, and West Virginia were dropped from the program in 1968. In 1971, seven states were dropped from the program: New York, South Carolina, Florida, Tennessee, Alabama, Mississippi, and Texas. That same year, Delaware was reinstated to the program and Colorado was introduced for the first time. Texas was reinstated to the program in 1976. In 1977, Maryland and Delaware were dropped from the program.

In 1980, the corn sample was reduced from 3,200 to 2,870, primarily by dropping Virginia and Colorado from the program. In 1981, major financial restraints resulted in significant changes to the corn objective yield program. Six states were dropped from the program: Georgia, Kansas, Kentucky, North Carolina, Pennsylvania, and Texas. The total sample size was reduced by almost half.

In 1991, the sample sizes were increased for Illinois, Iowa, Minnesota, and Nebraska. In 1996, Michigan, Missouri, and South Dakota were dropped from the program. By 1997, the corn objective yield program was down to seven states. In 2004, three states were reinstated into the program: Kansas, Missouri, and South Dakota.

Corn Objective Yield Survey Timeline

1954	----------	Initial corn survey conducted in 10 states: Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas.
1955	----------	Corn survey moved up a month to coincide with the first cotton survey in late July.
1956	----------	Thirteen states were added: Iowa, Illinois, Indiana, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, Virginia, and Wisconsin.
1961	----------	Program became operational in all 23 states.
1965	----------	Six states were added: New York, New Jersey, Pennsylvania, Delaware, Florida, and West Virginia.
1966	----------	Maryland was added.
1968	----------	Delaware, Arkansas, Louisiana, New Jersey, Oklahoma, and West Virginia were dropped.
1971	----------	Seven states were dropped: New York, South Carolina, Florida, Tennessee, Alabama, Mississippi, and Texas; Two states were added: Delaware (reinstated) and Colorado.
1976	----------	Texas was added (reinstated).
1977	----------	Two states were dropped: Delaware and Maryland.
1980	----------	Corn sample was reduced from 3,200 to 2,870; Two states were dropped: Colorado and Virginia.
1981	----------	Total sample size was cut in half due to financial constraints; Six states were dropped: Georgia, Kansas, Kentucky, North Carolina, Pennsylvania, and Texas.
1991	----------	Sample sizes were increased for Illinois, Iowa, Minnesota, and Nebraska.
1996	----------	Three states were dropped: Michigan, Missouri, and South Dakota.
1997	----------	OY program includes a total of 7 states.
2004	---------	Three states were added: Kansas, Missouri, and South Dakota (reinstated).

Participating States and Sample Sizes

The tables below present sample size information for the participating states during the different stages of the program. Table 2 presents information for the research part of the program and Table 3 contains the information for the operational part.

Table 2: Corn Objective Yield Research Program: 1954 - 1960

STATE	1954	1955	1956	1957	1958	1959	1960
AL	24	26	70	70	60	60	150
AR	13	8	50	50	40	40	100
GA	34	32	70	70	60	60	150
IA			136	138	145	193	150
IL			109	113	125	166	150
IN			54	57	60	81	75
KS			16	17	20	26	45
KY			40	70	60	60	150
LA	8	6	50	50	40	40	100
MI			22	23	25	34	45
MN			66	75	85	114	75
MO			75	75	80	106	75
MS	21	28	50	50	40	40	150
NC	25	24	70	70	60	60	150
NE			65	52	55	74	75
OH			47	46	50	66	75
OK	3	2	50	50	40	40	80
SC	22	17	50	50	40	40	100
SD			51	48	55	74	75
TN	24	23	70	70	60	60	150
TX	26	27	70	70	60	60	120
VA			40	50	40	40	100
WI			36	36	50	66	45
Totals	**200**	**193**	**1,357**	**1,400**	**1,350**	**1,600**	**2,385**

Table 3: Corn Objective Yield Operational Program: 1961 - 1969

STATE	1961	1962	1963	1964	1965	1966	1967	1968	1969
AL	180	180	180	120	120	120	130	120	110
AR	120	100	100	100	100	80	100		
DE					60	60	70		
FL					30	80	110	110	110
GA	180	180	180	180	160	130	150	140	130
IA	180	200	200	200	185	170	190	220	220
IL	180	200	200	200	180	170	190	220	220
IN	120	120	120	120	130	130	160	180	180
KS	120	120	120	120	105	110	150	150	160
KY	180	180	180	150	145	130	150	150	150
LA	120	100	100	100	105	100	110		
MD						80	110	110	120
MI	40	100	120	150	130	120	150	160	160
MN	60	150	150	150	130	130	160	180	190
MO	60	120	120	150	140	130	150	170	170
MS	120	120	120	140	120	100	120	120	100
NC	180	180	180	180	155	130	150	160	160
NE	60	150	150	180	155	150	180	200	200
NJ					30	60	100		
NY					60	80	300	300	280
OH	60	120	120	120	125	130	140	160	150
OK	120	100	100	100	85	70	60		
PA					60	100	160	170	180
SC	120	120	120	120	105	100	120	120	120
SD	60	120	120	120	100	100	140	160	170
TN	180	180	180	150	130	130	150	150	150
TX	250	200	200	180	145	120	150	150	150
VA	60	120	120	120	110	110	150	150	160
WV					30	60	100		
WI	40	120	120	150	130	120	180	180	180
Totals	**2,790**	**3,280**	**3,300**	**3,300**	**3,260**	**3,300**	**4,280**	**3,930**	**3,920**

Table 3: Corn Objective Yield Operational Program: 1970 - 1979 (continuation)

STATE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
AL	80									
CO		160	170	170	170	170	170	170	160	165
DE		90	90	90	90	100	100			
FL	100									
GA	120	100	100	120	120	110	110	110	110	110
IA	220	230	230	230	220	220	230	240	240	240
IL	220	250	260	260	260	260	260	240	260	260
IN	180	200	210	200	210	210	210	210	210	210
KS	170	160	170	170	190	190	200	200	200	200
KY	140	140	140	140	140	150	150	140	140	145
MD	120	120	110	100	95	100	100			
MI	140	130	120	130	130	130	130	120	120	120
MN	190	210	200	210	210	210	210	210	210	210
MO	180	180	180	180	180	170	170	190	180	165
MS	100									
NC	170	170	170	150	155	150	170	130	130	130
NE	220	200	200	200	200	190	200	215	220	235
NY	240									
OH	160	180	180	180	190	180	180	180	180	180
PA	180	170	170	170	170	180	180	170	160	150
SC	120									
SD	170	150	140	140	140	130	130	130	130	130
TN	150									
TX	150						200	195	210	220
VA	160	160	160	160	160	170	160	180	170	160
WI	190	200	200	200	190	180	170	170	170	170
Totals	**3,870**	**3,200**	**3,200**	**3,200**	**3,220**	**3,200**	**3,430**	**3,200**	**3,200**	**3,200**

Table 3: Corn Objective Yield Operational Program: 1980 - 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
GA	110									
IA	240	240	240	240	240	240	240	240	240	240
IL	260	260	260	260	260	260	260	260	260	260
IN	210	210	210	210	210	210	210	210	210	210
KS	185									
KY	155									
MI	120	110	110	110	110	110	110	110	110	110
MN	210	210	210	210	210	210	210	210	210	210
MO	150	150	150	150	150	150	150	150	150	150
NC	130									
NE	235	235	235	235	235	240	240	240	240	240
OH	195	195	195	195	195	190	190	190	190	190
PA	145									
SD	140	140	140	140	140	140	140	140	140	140
TX	200									
WI	185	170	170	170	170	170	170	170	170	170
Totals	**2,870**	**1,920**	**1,920**	**1,920**	**1,920**	**1,920**	**1,920**	**1,920**	**1,920**	**1,920**

Table 3: Corn Objective Yield Operational Program: 1990 - 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
IA	240	270	270	270	310	330	330	330	330	330
IL	260	270	270	270	280	290	310	310	310	310
IN	210	210	210	210	210	210	200	200	200	200
MI	110	110	110	110	110	100				
MN	210	230	230	230	210	210	210	210	210	210
MO	150	150	150	150	150	150				
NE	240	270	270	270	270	270	300	300	300	300
OH	190	190	190	190	170	160	140	140	140	140
SD	140	140	140	140	140	140				
WI	170	170	170	170	160	150	130	130	130	130
Totals	**1,920**	**2,010**	**2,010**	**2,010**	**2,010**	**2,010**	**1,620**	**1,620**	**1,620**	**1,620**

Table 3: Corn Objective Yield Operational Program: 2000 – 2008 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
IA	330	330	330	330	330	330	330	330	330
IL	310	310	310	310	310	310	310	310	310
IN	200	200	200	200	200	200	200	200	200
KS					150	150	150	150	150
MN	210	210	210	210	210	210	210	210	210
MO					150	150	150	150	150
NE	300	300	300	300	300	300	300	300	300
OH	140	140	140	140	140	140	140	140	140
SD					150	150	150	150	150
WI	130	130	130	130	150	150	150	150	150
Totals	**1,620**	**1,620**	**1,620**	**1,620**	**2,090**	**2,090**	**2,090**	**2,090**	**2,090**

7.2 Cotton

History

The cotton objective yield research program began in 1954 in conjunction with the corn objective yield research program. Both programs followed the same guidelines except for their survey start dates. The sample of cotton growers was visited during the last week of July 1954 to get estimates of acreage for harvest and prospective production, together with counts of bolls, blooms and squares, and data on weevil damage on selected sampling units in randomly selected fields. These data were used to develop a forecasting equation. The same fields and field plots were visited again during the week of August 22, 1954. At this time, open cotton on the selected sampling units in the field was picked and weighed to provide a harvest indication of yield. The sample was visited a third time to get the growers' reports of acreages harvested, final production, and data on amount of cotton left behind in the sample fields. This initial research was conducted in 10 southern states: Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas.

In 1957, the program was expanded to three other states: Arizona, California, and New Mexico. A sample of 110 fields was selected from these last 3 states to study the behavior of plants on irrigated land. These states followed the same sampling procedures as all the others. Their schedule of surveys was also the same except that a fourth visit was made to a subsample of fields where only large bolls were counted. The data from these surveys were expected to provide a basis for developing preliminary forecasting procedures and for testing the extent to which relationships found in the rainfall cotton belt might apply to irrigated cotton.

In 1961, both the cotton and corn objective yield programs were expanded to the full operating level to provide estimates in 13 and 23 states respectively. Missouri was added to the cotton objective yield program in 1963. In 1977, New Mexico and North Carolina were dropped from the program and the total sample size was decreased by 110 samples.

In 1979, there were major changes to the cotton objective yield program. The total sample size was dropped from 2,390 to 1,780. The number of participating states was reduced from 12 to 6. The states that were dropped from the program were: Alabama, Georgia, Missouri, Oklahoma, South Carolina, and Tennessee.

In 1981, sample sizes were reduced in Arizona, Arkansas, California, Louisiana, Mississippi, and Texas due to budgetary constraints. In 1983, the total sample size was decreased again from 1,650 to 1,580. In 1984, the sample size was reduced from 1,580 to 1,345. This was attained by cutting the sample size for Mississippi and Arkansas in half. To reduce the severity of model instability, the models in 1985 were based on the most recent five years rather than just three years of data.

Arizona was dropped in 1996. By 1997, the cotton objective yield program was down to 5 states. In 1998, the concept of using regions was adopted. States were grouped by regions and sample sizes were set to meet target CVs at the region level. The Southeast region was the first region

defined to the cotton objective yield program with 145 samples. The Southeast region was comprised of: Alabama, Florida, Georgia, North Carolina, South Carolina, and Virginia.

The West region was defined to the program in 1999 with 235 samples. Arizona and California comprised the West region. The total number of states was increased to 12 when Arizona was reinstated into the program.

The Southwest and Delta regions were defined in 2000. The Delta region included Arkansas, Louisiana, Mississippi, which were already in the program. Missouri and Tennessee were added to this region in 2000. The total sample size for the region was 470. The Southwest region included Kansas, New Mexico, Oklahoma, and Texas, which was already in the program. The total sample size of the region was 560. Virginia and Florida were dropped from the program in 2000.

All regions were dissolved for the 2001 survey, and the samples were drawn at the state level. Alabama, Arizona, Missouri, Oklahoma, South Carolina, and Tennessee were dropped from the program in 2001. Only seven states remained in the program: Arkansas, California, Georgia, Louisiana, Mississippi, North Carolina, and Texas.

In 2003, a proposal to cancel this program was rejected. The program continued with similar procedures as in previous years. Sample sizes were reallocated across the states in 2007. The latest change occurred in 2008, when California was dropped from the program.

Cotton Objective Yield Survey Timeline

1954	Initial Survey: Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas
1957	3 states / 110 samples added - Arizona, California, and New Mexico, primarily to study behavior of plants on irrigated land
1961	Program expanded to full operational level, providing estimates in 13 states
1963	Missouri added
1977	2 states dropped - New Mexico and North Carolina Total sample size was decreased by 110 samples
1979	6 states dropped - Alabama, Georgia, Missouri, Oklahoma, South Carolina, and Tennessee 6 states remain, total sample size dropped from 2,390 to 1,780
1981	Sample sizes reduced in Arizona, Arkansas, California, Louisiana, Mississippi, and Texas (budget constraints)
1983	Total sample size decreased from 1,650 to 1,580
1984	Total sample size reduced from 1,580 to 1,345 by cutting Mississippi and Arkansas sample sizes in half
1985	Models based on most recent 5 years in lieu of recent 3 to reduce model instability
1996	Arizona dropped, leaving 5 states in survey
1998	Southeast Region (6 states/145 samples) added - Alabama, Florida, Georgia, North Carolina, South Carolina, and Virginia
1999	Arizona was added and West Region was created (2 state/235)
2000	Southwest Region (4 states/560 samples) was defined - Kansas, New Mexico, Oklahoma, and Texas Delta Region (5 states/470 samples) was defined - Arkansas, Louisiana, Mississippi, Missouri, and Tennessee
2001	Regions dissolved, samples drawn at state level 6 states dropped - Alabama, Arizona, Missouri, Oklahoma, South Carolina, and Tennessee 7 states remain - Arkansas, California, Georgia, Louisiana, Mississippi, North Carolina, and Texas
2003	Proposal to cancel Cotton OY rejected
2007	Sample sizes reallocated across the states
2008	California dropped from program

Participating States and Sample Sizes

The tables below present sample size information for the participating states during the different stages of the program. Table 4 presents information for the research part of the program; and Table 5 contains the information for the operational part.

Table 4: Cotton Objective Yield Research Program: 1954 - 1960

STATE	1954	1955	1956	1957	1958	1959	1960
AL	12	13	70	70	50	50	60
AR	33	18	125	125	100	100	100
AZ				30	30	30	60
CA				50	50	50	100
GA	8	8	70	70	50	50	60
LA	7	7	70	70	50	50	60
MS	21	21	125	125	100	100	100
NC	3	4	70	70	50	50	50
NM				30	30	30	50
OK	12	14	70	70	50	50	60
SC	11	10	70	70	50	50	50
TN	9	9	70	70	50	50	50
TX	84	83	260	250	200	200	200
Totals	**200**	**187**	**1,000**	**1,100**	**860**	**860**	**1,000**

Table 5: Cotton Objective Yield Operational Program: 1961 - 1969

STATE	1961	1962	1963	1964	1965	1966	1967	1968	1969
AL	150	150	150	130	140	150	130	130	130
AR	300	300	300	270	230	260	300	300	300
AZ	30	30	60	150	180	180	100	100	115
CA	55	55	100	100	200	230	250	250	250
GA	150	150	150	130	130	140	120	120	120
LA	150	150	150	120	120	130	100	100	100
MO			40	60	80	80	80	80	70
MS	300	300	300	325	260	300	360	360	360
NC	150	150	150	130	115	115	80	80	75
NM	25	25	50	70	100	80	60	60	60
OK	150	150	150	175	200	180	120	120	120
SC	150	150	150	130	115	115	100	100	100
TN	150	150	150	100	90	90	80	80	80
TX	500	500	500	600	630	630	700	700	700
Totals	**2,260**	**2,260**	**2,400**	**2,490**	**2,590**	**2,680**	**2,580**	**2,580**	**2,580**

Table 5: Cotton Objective Yield Operational Program: 1970 - 1979 (continuation)

STATE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
AL	130	120	120	120	120	120	120	110	110	
AR	300	285	285	285	285	270	270	260	250	230
AZ	120	120	120	110	110	110	110	110	110	120
CA	250	240	240	240	240	260	260	280	290	290
GA	120	100	100	100	100	80	70	70	70	
LA	100	100	100	100	100	130	130	130	130	110
MO	70	70	70	80	80	70	70	70	70	
MS	360	360	360	360	360	360	360	360	360	340
NC	70	65	65	65	65	50	50			
NM	60	60	60	60	60	70	70			
OK	120	110	110	110	110	110	110	110	110	
SC	100	100	100	100	100	80	80	80	80	
TN	80	80	80	80	80	90	90	100	100	
TX	700	700	700	700	700	710	710	710	710	690
Totals	**2,580**	**2,510**	**2,510**	**2,510**	**2,510**	**2,510**	**2,500**	**2,390**	**2,390**	**1,780**

Table 5: Cotton Objective Yield Operational Program: 1980 - 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
AR	220	200	200	200	110	110	105	105	105	105
AZ	130	115	115	115	115	115	115	115	115	115
CA	300	275	275	275	275	275	275	275	275	275
LA	110	100	100	100	100	100	100	100	100	100
MS	330	300	300	310	165	165	170	170	170	170
TX	690	660	660	580	580	580	580	580	580	580
Totals	**1,780**	**1,650**	**1,650**	**1,580**	**1,345**	**1,345**	**1,345**	**1,345**	**1,345**	**1,345**

Table 5: Cotton Objective Yield Operational Program: 1990-1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
AL									23	41
AR	105	125	150	150	150	150	150	150	150	150
AZ	115	115	115	115	115	115				70
CA	275	275	235	235	235	235	235	235	235	165
FL									8	9
GA									64	111
LA	100	100	130	130	130	130	130	130	130	130
MS	170	170	170	170	170	170	170	170	170	170
NC									34	59
SC									11	19
TX	580	560	560	560	560	560	560	560	560	560
VA									5	6
Totals	**1,345**	**1,345**	**1,360**	**1,360**	**1,360**	**1,360**	**1,245**	**1,245**	**1,390**	**1,490**

Table 5: Cotton Objective Yield Operational Program: 2000 - 2008 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
AL	47								
AR	90	95	95	95	95	95	95	112	112
AZ	55								
CA	160	150	150	150	150	150	150	104	
GA	115	115	115	115	150	150	150	160	160
KS	3								
LA	85	100	100	100	100	100	100	100	100
MO	56								
NM	7								
MS	161	150	150	150	150	150	150	150	150
NC	60	60	60	60	120	120	120	140	140
OK	16								
SC	23								
TN	78								
TX	534	545	545	545	545	545	545	545	545
Totals	**1,490**	**1,215**	**1,215**	**1,215**	**1,310**	**1,310**	**1,310**	**1,311**	**1,207**

7.3 Potatoes

History

The potato objective yield survey started in 1971 in six states: Idaho, Maine, Minnesota, North Dakota, Oregon, and Washington. Wisconsin was added to the survey in 1972 through matching state funds. In 1975, the program was expanded to 12 states, but no information on state specific sample sizes is available. In 1978, California was dropped from the program. Colorado, Michigan, New York and Pennsylvania were dropped in 1996. Currently only seven states remain in the program: Idaho, Maine, Minnesota, North Dakota, Oregon, Washington, and Wisconsin.

Participating States and Sample Sizes

The table below presents the states and their corresponding sample sizes for the potato objective yield survey.

Table 6: Potato Objective Yield Program: 1971-1979

STATE	1971	1972	1973	1974	1975	1976	1977	1978	1979
CA					P[3]	P	p		
CO					P	P	p	p	p
ID	150	290	330	330	P	P	p	p	p
ME	90	140	160	155	P	P	p	p	p
MI					P	P	p	p	p
MN	150	140	140	145	P	P	p	p	p
NY					P	P	p	p	p
ND	150	140	160	160	P	P	p	p	p
OR	150	140	140	140	P	P	p	p	p
PA					P	P	p	p	p
WA	150	140	160	160	P	P	p	p	p
WI		300	300	120	P	P	p	p	p
Totals	**840**	**1,290**	**1,390**	**1,210**	**2,100**	**2,100**	**2,175**	**2,100**	**2,100**

[3] The cells shown with a "p" represent those years for which only total sample sizes were available, but no information was available about specific states sample sizes.

Table 6: Potato Objective Yield Program: 1980-1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
CO	p[4]	p	p	100	100	100	100	100	100	100
ID	p	p	p	355	355	355	355	360	360	360
ME	p	p	p	210	210	210	210	210	210	210
MI	p	p	p	140	140	140	140	140	140	140
MN	p	p	p	175	175	175	175	175	175	175
NY	p	p	p	165	165	165	165	160	160	160
ND	p	p	p	275	275	275	275	275	275	275
OR	p	p	p	185	185	185	185	180	180	180
PA	p	p	p	110	110	110	110	110	110	110
WA	p	p	p	215	215	215	215	220	220	220
WI	p	p	p	170	170	170	170	170	170	170
Totals	**2,100**	**2,100**	**2,100**	**2,100**	**2,100**	**2,100**	**2,100**	**2,100**	**2,100**	**2,100**

Table 6: Potato Objective Yield Program: 1990-1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO	100	100	100	100	100	100				
ID	360	360	360	340	340	340	340	340	340	340
ME	210	210	210	210	210	210	210	210	210	210
MI	140	140	140	140	140	140				
MN	175	175	175	175	175	175	185	185	185	185
NY	160	160	160	160	160	160				
ND	275	275	275	275	275	275	295	295	195	195
OR	180	180	180	180	180	180	180	180	180	180
PA	110	110	110	110	110	110				
WA	220	220	220	220	220	220	220	220	220	220
WI	170	170	170	170	170	170	170	170	170	170
Totals	**2,100**	**2,100**	**2,100**	**2,080**	**2,080**	**2,080**	**1,600**	**1,600**	**1,500**	**1,500**

Table 6: Potato Objective Yield Program: 2000-2008 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
ID	340	340	340	340	340	340	340	340	340
ME	210	170	210	210	210	210	210	210	210
MN	185	155	155	155	155	155	155	155	155
ND	195	175	175	175	175	175	175	175	175
OR	180	150	150	150	150	150	150	150	150
WA	220	200	200	200	200	200	200	200	200
WI	170	150	150	150	150	150	150	150	150
Totals	**1,500**	**1,340**	**1,380**	**1,380**	**1,380**	**1,380**	**1,380**	**1,380**	**1,380**

[4] The cells shown with a "p" represent those years for which only total sample sizes were available, but no information was available about specific states sample sizes.

7.4 Rice

History

The rice objective yield survey started as a two year research project in Arkansas in 1981 and 1982. The sample sizes were 130 and 100, respectively. The emphasis then was on improving the at-harvest estimation capability and the early season forecasting procedures. California was added to the research program in 1983 with a sample size of 125. The emphasis was to extend and verify the at-harvest estimating procedures developed for Arkansas. In California, data collection was restricted to counts at-harvest to produce a final season yield estimate.

The rice objective yield survey became operational during 1984 in five states: Arkansas, California, Louisiana, Mississippi, and Texas. Detailed yearly information on sample sizes by state is provided in the table below. In 1985, to reduce model instability, the models were based on the most recent five years of data, rather than just three.

Mississippi and Texas were dropped from the program in 1989. California was dropped from the program in 1990. The entire program was discontinued in 1993.

Participating States and Sample Sizes

The table below presents the states and their corresponding sample sizes for the time period in which the rice objective yield survey was operational.

Table 7: Rice Objective Yield Program: 1984-1992

STATE	1984	1985	1987	1986	1988	1989	1990	1991	1992
AR	240	250	255	255	255	255	255	255	255
CA	200	190	190	190	190	190			
LA	160	165	165	165	165	165	165	165	165
MS	100	100	95	95	95				
TX	135	130	130	130	130				
Totals	**835**	**835**	**835**	**835**	**835**	**610**	**420**	**420**	**420**

7.5 Sorghum

History

The sorghum objective yield survey started as a three year research project in Kansas from 1981-1983 with samples of 141, 125, and 125, respectively. In 1983, Texas was included in the research project with a sample size of 125.

The survey became operational in 1984 in five states: Kansas, Missouri, Nebraska, Oklahoma and Texas. Yearly information on sample sizes by state is provided in the table below. Oklahoma was dropped from the program in 1987, since it was not producing enough sorghum to justify staying in the program. In 1987, Arizona requested to be included in the program was declined. The entire program was discontinued in 1988.

Participating States and Sample Sizes

The table below presents the states and their corresponding sample sizes for the time period in which the sorghum objective yield survey was operational.

Table 8: Sorghum Objective Yield Program: 1984 - 1987

STATE	1984	1985	1986	1987
KS	250	260	270	270
MO	100	110	110	110
NE	170	170	170	170
OK	100	90	90	
TX	380	370	360	360
Totals	**1,000**	**1,000**	**1,000**	**910**

7.6 Soybeans

History

The soybean objective yield research program began in 1956 in 11 states: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, South Dakota, Nebraska, and Kansas. It continued as a research project until 1962 at about the same sample size level as in 1956. Arkansas was added to the program in 1960 and Mississippi in 1962. South Dakota and Wisconsin did not participate in the research project in 1962. In 1966, Iowa was included in the research program.

The soybean objective yield survey became operational in 1967, and it was expanded to 14 states. The following states were added in 1967: North Carolina, South Carolina, Tennessee, and Louisiana. In 1967, Iowa was dropped from the program. In 1968, Iowa was reinstated into the program, and Michigan was dropped.

Three additional states were added in 1977: Alabama, Georgia, and Kentucky. In 1981, Kansas and Kentucky were dropped from the program. Kentucky was reinstated into the program in 1985, and South Carolina was dropped from it that same year. Alabama was dropped from the program in 1988. In 1989, 20 mid-western soybean samples were shifted to Ohio in an effort to increase precision. Ohio's soybean acreage was evenly divided between wide and narrow row plantings, resulting in a non-homogeneous population which required a larger sample.

In 1990, Kansas was reinstated into the program and Georgia, Kentucky, North Carolina, and Tennessee were dropped from it. The total sample size was reduced to 1,540, distributed in 11 states. Kansas, Louisiana, and Mississippi were dropped in 1993.

In 2002, Arkansas was dropped from the program, but it was reinstated in 2004 along with Kansas. South Dakota was also reinstated into the program in 2004 after having been dropped almost 40 years earlier. Also in 2004, North Dakota was included in the program for the first time, and the overall total sample size was increased to 1,865 in 11 states.

Participating States and Sample Sizes

The tables below present sample size information for the participating states during the different stages of the program. Table 9 presents information for the research part of the program; and Table 10 contains the information for the operational part.

Table 9: Soybean Objective Yield Research Program: 1956 - 1966

STATE	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
AR					30	30	30	na[5]	150	150	na
IA	23	23	20	20	30	60	60	na	110	110	na
IL	42	48	42	42	60	90	90	na	140	140	na
IN	19	17	16	16	26	60	60	na	160	160	na
KS	6	6	6	6	6	40	30	na	30	30	na
MI	6	6	6	6	6	6	6	na	20	20	na
MN	21	19	18	18	26	26	40	na	130	130	na
MO	21	14	14	14	30	30	40	na	130	130	na
MS							15	na	160	160	na
NE	6	6	6	6	6	6	20	na	20	20	na
OH	17	22	20	20	18	18	30	na	150	150	na
SD	6	6	6	6	6	6					
WI	6	6	6	6	6	6					
Totals	173	173	160	160	250	378	421	na	1,200	1,200	na

Table 10: Soybean Objective Yield Operational Program: 1967 – 1979 (continuation)

STATE	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
AL											80	80	80
AR	na	170	170	170	170	170	Na	160	160	160	160	150	150
GA											80	80	80
IA		135	135	155	155	155	Na	170	165	160	175	170	170
IL	na	160	160	160	160	160	Na	165	170	180	190	190	190
IN	na	140	140	140	140	140	Na	145	140	130	130	130	130
KS	na	35	50	50	50	50	Na	60	60	60	60	60	60
KY											80	80	80
LA	na	110	110	110	110	110	Na	105	110	110	100	100	100
MI	na												
MN	na	125	125	125	125	125	Na	125	135	130	120	120	120
MO	na	155	155	145	145	145	Na	155	150	160	160	160	160
MS	na	150	150	150	150	150	Na	140	140	130	130	130	130
NC	na	90	90	90	90	90	Na	80	80	75	75	80	80
NE	na	35	50	60	60	60	Na	60	65	75	80	75	75
OH	na	140	140	140	140	140	Na	140	130	130	125	140	140
SC	na	100	100	90	90	90	Na	80	75	75	80	80	80
TN	na	100	100	90	90	90	Na	90	90	100	90	90	90
Totals	na	1,645	1,675	1,675	1,675	1,675	Na	1,675	1,670	1,675	1,915	1,915	1,915

[5] The cells shown with a "na" represent those years for which no information on sample sizes was found.

Table 10: Soybean Objective Yield Operational Program: 1980 - 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
AL	80	80	75	100	100	100	100	100		
AR	150	150	150	150	150	150	150	150	150	150
GA	75	75	85	110	100	100	100	100	100	100
IA	170	170	165	165	165	170	170	170	170	160
IL	190	190	190	190	190	200	200	200	200	190
IN	130	130	130	130	135	130	130	130	130	130
KS	60									
KY	90					100	100	100	100	100
LA	100	100	115	120	120	120	120	120	120	120
MN	120	120	120	120	120	120	120	120	120	120
MO	160	160	170	170	170	170	170	170	170	170
MS	130	130	120	120	120	120	120	120	120	120
NC	80	80	75	100	100	100	100	100	100	100
NE	75	75	75	100	100	100	100	100	100	100
OH	140	140	135	135	140	140	140	140	140	160
SC	75	75	75	105	105					
TN	90	90	85	100	100	100	100	100	100	100
Totals	1,915	1,765	1,765	1,915	1,915	1,920	1,920	1,920	1,820	1,820

Table 10: Soybean Objective Yield Operational Program: 1990 – 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
AR	150	150	150	150	150	150	150	150	150	150
IA	160	240	240	240	240	240	240	240	240	240
IL	190	210	210	210	210	240	240	240	240	240
IN	130	180	180	180	180	180	180	180	180	180
KS	120	120	120							
LA	120	120	120							
MN	120	120	120	120	120	120	120	120	120	120
MO	170	170	170	170	170	150	150	150	150	150
MS	120	120	120							
NE	100	100	100	100	100	100	100	100	100	120
OH	160	160	160	160	160	150	150	150	150	150
Totals	1,540	1,690	1,690	1,330	1,330	1,330	1,330	1,330	1,330	1,350

Table 10: Soybean Objective Yield Operational Program: 2000 – 2007 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
AR	150	150			285	285	285	285	285
IA	240	240	240	240	240	240	240	240	240
IL	240	240	240	240	240	240	240	240	240
IN	180	180	180	180	180	180	180	180	180
KS					120	120	120	120	120
MN	120	120	120	120	120	120	120	120	120
MO	150	150	150	150	150	150	150	150	150
ND					120	120	120	120	120
NE	120	120	120	120	120	120	120	120	120
OH	150	150	150	150	150	150	150	150	150
SD					140	140	140	140	140
Totals	1,350	1,350	1,200	1,200	1,865	1,865	1,865	1,865	1,865

7.7 Sunflower

History

The sunflower objective yield survey started as a research project in North Dakota from 1981 to 1983. The sample size was 125 for all three years. The main objective was to improve the at-harvest estimation capability and to collect another year of data for developing early-season forecasting procedures.

The sunflower objective yield survey became operational in 1984 in three states: North Dakota, Minnesota, and South Dakota. In 1984, the intended sample size was expected to be 450; however, the estimated number of tracts with sunflower fields in Minnesota and South Dakota did not allow sampling at the desired rate. The sample size for 1984 ended up being 190. There were plans to develop a sampling frame for sunflowers to conduct a probability acreage survey in 1985 and use a multiple frame approach for future sunflower objective yield surveys. In 1986, sunflower fields were selected from both list and area frame operators to allow for substantially higher sample sizes in both Minnesota and South Dakota. The entire program was discontinued in 1988.

States and Sample Sizes

The table below presents the states and their corresponding sample sizes for the time period in which the sunflower objective yield survey was operational.

Table 11: Sunflower Objective Yield Program: 1984-1987

STATE	1984	1985	1986	1987
ND	125	125	125	125
MN	25	25	100	100
SD	40	50	100	100
Totals	**190**	**200**	**325**	**325**

7.8 Wheat

History

The wheat objective yield research program began in 1955 in Oklahoma and Texas. The program was expanded in 1957 to the following states: Illinois, Indiana, Kansas, Michigan, Missouri, Nebraska, and Ohio. The fields were selected by a random process, with probability proportional to size from farms reporting acreage in a survey conducted in December 1956. The same nine states continued in the program from 1959 to 1961. However, no detailed information on sample sizes is available for those years. In 1962, the winter wheat objective yield program became operational in nine states.

In 1966, the spring and durum wheat objective yield programs became operational. Spring wheat was conducted in five states, and durum wheat in three states. This change increased the number of states in the wheat objective yield program to 17. The program remained stable through the 1970s with no states being added or dropped from the program for either crop type. In 1973, the sample size for spring wheat was increased by 20 samples for a total sample size of 400. That same year the sample size for durum wheat was increased by 40 for a total sample size of 230.

In 1981, South Dakota was dropped from the winter wheat program, and Michigan was dropped in 1984. Montana and South Dakota were dropped from the durum wheat program in 1984, since sample sizes were too small to adequately forecast and estimate yields in both states. Arkansas and California were introduced to the winter wheat program in 1985. The sample sizes for the winter wheat objective yield program peaked in 1985 at 2,090 samples, but began a steady decline in 1987 until 1990.

California, Idaho, Indiana, and Oregon were dropped from the winter wheat program in 1990, and South Dakota was reinstated to winter wheat after a decade. Idaho was dropped from the spring wheat program in that same year. Idaho, Indiana, and Oregon were reinstated to the winter wheat program in 1991. In 1993, Arkansas and Indiana were dropped from the winter wheat program. South Dakota, Idaho and Oregon were dropped from the winter wheat program in 1996. South Dakota was also dropped from the spring wheat program in that year. Oregon and Idaho were later reinstated to the winter wheat program in 1999 but dropped again in 2001. For 2006, due to an ongoing project with the Farm Service Agency (FSA), the Nebraska sample was selected from the winter wheat acres for harvest on land associated with a specific FSA farm number.

Wheat Objective Yield Survey Timeline

1955	----------	Initial survey: Oklahoma and Texas.
1957	----------	Seven states were added: Illinois, Indiana, Kansas, Michigan, Missouri, Nebraska, and Ohio.
1962	----------	Winter wheat objective yield program became operational.
1966	----------	Spring and durum wheat objective yield programs became operational; total number of participating states increased from 9 to 17.
1973	----------	Spring wheat sample size was increased by 20 samples for a total of 400. Durum wheat sample size was increased by 40 samples for a total of 230.
1981	----------	South Dakota was dropped from winter wheat program.
1984	----------	Michigan was dropped from winter wheat program. Two states were dropped from durum wheat program: Montana and South Dakota.
1985	----------	Two states were added to winter wheat program: Arkansas and California Sample sizes for wheat objective yield program peaked at 2,090.
1990	----------	Four states were dropped from the winter wheat program: California, Idaho, Indiana, and Oregon. South Dakota was reinstated to the winter wheat program. Idaho was also dropped from the spring wheat program.
1991	----------	Three states were added to the winter wheat program: Idaho, Indiana, and Oregon.
1993	----------	Two states were dropped from the winter wheat program: Arkansas and Indiana.
1996	----------	Three state were dropped from the winter wheat program: South Dakota, Idaho, and Oregon. South Dakota was also dropped from the spring wheat program
1999	----------	Two states were added to the winter wheat program: Oregon and Idaho.
2001	----------	Two states dropped from the winter wheat program: Oregon and Idaho.
2006	----------	Nebraska sample selected from winter wheat acres for harvest on land associated with specific Farm Service Agency (FSA) number due to an ongoing project with the FSA.

Participating States and Sample Sizes by Type of Wheat

7.8a. Winter Wheat

The tables below present sample size information for the participating states during the different stages of the program. Table 12 presents information for the research part of the program; and Table 13 contains the information for the operational part.

Table 12: Winter Wheat Objective Yield Research Program: 1955 - 1961

STATE	1955	1956	1957	1958	1959	1960	1961
IL			19	19	na	na	na
IN			13	14	na	na	na
KS			67	64	na	na	na
MI			15	11	na	na	na
MO			38	16	na	na	na
NE			27	22	na	na	na
OH			22	21	na	na	na
OK	31	na[6]	91	46	na	na	na
TX	29	na	58	19	na	na	na
Total	**60**	**na**	**350**	**232**	na	na	na

Table 13: Winter Wheat Objective Yield Operational Program: 1962-1963 and 1970 - 1979

STATE	1962	1963[7]	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
CO			120	120	120	120	120	120	100	90	100	100
ID			90	100	100	100	100	100	100	90	90	90
IL	100	100	85	85	85	85	80	80	100	100	90	90
IN	100	100	85	90	90	90	80	80	80	80	80	80
KS	300	300	300	300	300	300	300	300	300	320	320	320
MI	15	100	80	75	75	70	70	70	60	60	60	60
MO	20	100	90	100	100	100	90	90	80	90	90	90
MT			90	100	100	100	110	100	120	110	110	110
NE	30	150	145	130	130	140	150	150	130	130	130	120
OH	100	100	85	85	85	80	80	80	80	80	80	80
OK	150	200	200	200	200	200	210	220	200	200	200	200
OR			80	80	80	80	80	80	100	100	100	110
SD			55	55	55	55	60	60	60	60	60	60
TX	150	250	230	220	220	220	210	210	210	210	210	210
WA			145	140	140	140	140	140	160	160	160	160
Total	**965**	**1,400**	**1,880**	**1,880**	**1,880**	**1,880**	**1,880**	**1,880**	**1,880**	**1,880**	**1,880**	**1,880**

[6] The cells shown with a "na" represent those years for which no information on sample sizes was found.
[7] No information available on state participation or sample sizes between 1964 and 1969.

Table 13: Winter Wheat Objective Yield Operational Program: 1980 – 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
AR						100	80	75	75	75
CA						100	100	80	70	70
CO	100	100	100	100	120	120	120	110	100	100
ID	100	100	100	100	110	110	110	100	100	100
IL	90	90	90	90	90	90	90	80	70	70
IN	80	70	70	70	70	70	70	70	70	70
KS	320	300	300	300	310	310	310	295	275	275
MI	60	50	50	50						
MO	90	110	110	100	100	100	100	85	80	80
MT	110	110	110	110	130	130	120	110	100	100
NE	120	120	130	120	130	130	130	115	110	100
OH	80	90	90	90	90	90	90	85	80	80
OK	200	200	200	200	200	200	210	190	170	170
OR	110	120	120	120	120	120	120	110	90	90
SD	60									
TX	200	200	200	200	220	220	230	200	170	180
WA	160	180	170	190	200	200	210	180	160	160
Total	**1,880**	**1,840**	**1,840**	**1,840**	**1,890**	**2,090**	**2,090**	**1,885**	**1,720**	**1,720**

Table 13: Winter Wheat Objective Yield Operational Program: 1990 – 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
AR	75	80	na							
CO	100	100	na	100	100	120	120	120	120	120
ID		100	na	100	100	100				62
IL	70	80	na	80	80	80	80	80	80	80
IN		80	na							
KS	275	280	na	280	280	280	310	310	310	310
MO	80	80	na	80	80	80	80	80	80	80
MT	100	100	na	100	100	110	100	100	125	125
NE	100	110	na	110	110	110	110	110	110	110
OH	80	80	na	80	80	80	80	80	80	80
OK	170	180	na	180	180	180	170	170	195	195
OR		100	na	100	100	100				60
SD	80	80	na	80	80	80				
TX	180	210	na	210	210	200	200	200	225	225
WA	160	170	na	170	170	170	160	160	175	153
Total	**1,470**	**1,830**	**na**	**1,670**	**1,670**	**1,690**	**1,410**	**1,410**	**1,500**	**1,600**

Table 13: Winter Wheat Objective Yield Operational Program: 2000 – 2007 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
CO	120	120	120	120	120	120	120	120	120
ID	62								
IL	80	80	80	80	80	80	80	80	80
KS	310	310	310	310	310	310	310	310	310
MO	80	80	80	80	80	80	80	80	80
MT	125	100	100	100	100	100	100	100	100
NE	110	110	110	110	110	110	110	110	110
OH	80	80	80	80	80	80	80	80	80
OK	195	170	170	170	170	170	170	170	170
OR	60								
TX	225	200	200	200	200	200	200	200	200
WA	153	160	160	160	160	160	160	160	160
Total	**1,600**	**1,410**	**1,410**	**1,410**	**1,410**	**1,410**	**1,410**	**1,410**	**1,410**

7.8b. Spring Wheat

Table 14 contains the information for the operational part of the program.

Table 14: Spring Wheat Objective Yield Program: 1966 - 1969

STATE	1966	1967	1968	1969
ID	na[8]	na	50	50
MN	na	na	55	55
MT	na	na	60	60
ND	na	na	160	160
SD	na	na	55	55
Total	na	na	**380**	**380**

Table 14: Spring Wheat Objective Yield Program: 1970 – 1979 (continuation)

STATE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
ID	50	60	60	50	50	50	50	50	50	60
MN	55	50	50	60	70	80	90	90	90	90
MT	60	60	60	80	70	60	50	50	50	50
ND	160	160	160	160	160	160	160	160	160	150
SD	55	50	50	50	50	50	50	50	50	50
Total	**380**	**380**	**380**	**400**	**400**	**400**	**400**	**400**	**400**	**400**

Table 14: Spring Wheat Objective Yield Program: 1980 – 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ID	60	60	60	60	60	60	60	60	60	60
MN	90	80	80	80	80	80	80	80	80	80
MT	60	70	70	70	80	80	80	80	80	80
ND	150	140	130	130	130	130	130	130	130	130
SD	50	60	60	60	60	60	60	60	60	60
Total	**410**	**410**	**400**	**400**	**410**	**410**	**410**	**410**	**410**	**410**

Table 14: Spring Wheat Objective Yield Program: 1990 – 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MN	80	80	na	80	80	80	80	80	80	80
MT	80	90	na	90	90	90	90	90	90	90
ND	130	130	na	130	130	130	130	130	150	150
SD	60	80	na	80	80	90				
Total	**350**	**380**	na	**380**	**380**	**390**	**300**	**300**	**320**	**320**

Table 14: Spring Wheat Objective Yield Program: 2000 – 2007 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
MN	80	80	80	80	80	80	80	80	80
MT	90	90	90	90	150	150	150	150	150
ND	150	150	150	150	150	150	150	150	150
Total	**320**	**320**	**320**	**320**	**380**	**380**	**380**	**380**	**380**

[8] The cells shown with a "na" represent those years for which no information on sample sizes was found.

7.8c. Durum Wheat

Table 15 contains the information for the operational part of the program.

Table 15: Durum Wheat Objective Yield Program: 1966 - 1969

STATE	1966	1967	1968	1969
ND	na[9]	na	100	100
MT	na	na	50	50
SD	na	na	40	40
Total	na	na	**190**	**190**

Table 15: Durum Wheat Objective Yield Program: 1970 – 1979 (continuation)

STATE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
ND	100	100	100	140	140	140	140	140	140	140
MT	50	50	50	45	45	45	45	45	45	45
SD	40	40	40	45	45	45	45	45	45	45
Total	**190**	**190**	**190**	**230**	**230**	**230**	**230**	**230**	**230**	**230**

Table 15: Durum Wheat Objective Yield Program: 1980 - 1989(continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ND	140	130	130	130	150	150	150	150	150	150
MT	40	40	40	40						
SD	40	40	40	40						
Total	**220**	**210**	**210**	**210**	**150**	**150**	**150**	**150**	**150**	**150**

Table 15: Durum Wheat Objective Yield Program: 1990 - 1999(continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
ND	150	150	na	150	150	140	140	140	120	120
Total	**150**	**150**	na	**150**	**150**	**140**	**140**	**140**	**120**	**120**

Table 15: Durum Wheat Objective Yield Program: 2000 – 2007 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007	2008
ND	120	120	120	120	120	120	120	120	120
Total	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**

[9] The cells shown with a "na" represent those years for which no information on sample sizes was found.

8. STATE SPECIFIC PROGRAMS

8.1. Arizona

8.1a. Lemons

History

The Arizona field office participated in the lemon objective yield program in the 1970s. The program was discontinued in the early 1980s. Neither sample sizes nor any other related information was available at the time of this report.

8.2. California

8.2a. Navel Oranges

History

California produces approximately 84 percent of the navel oranges for fresh use in the United States.

A navel orange objective measurement (OM) survey was conducted by NASS for the first time during the 1984-85 crop season for the Navel Orange Administrative Committee (NOAC) in the Central Valley area. Data from the first two years were used for research purposes in developing crop estimating models. Size data used in estimating the models were obtained from the NOAC's monthly tagged fruit and growth survey. The first four forecasts were made using OM data and a September farm report of navel orange crop condition and yield.

The purpose of the survey is to collect data on fruit counts for use in forecasting models to estimate current season navel orange production. Individual fruit size data are collected by the industry and used in the forecasting models. No survey was conducted for the 1991-92 season due to a lack of industry funds because of the crop losses from the December 1990 freeze.

Methodology

Two trees are selected in each grove with two random paths per tree. Trunk and branch measurements along with fruit counts are then made on each tree.

Since establishing new samples are costly, the same basic sample is used each year. However, new samples are added each year in new bearing navel orange groves to replace samples in pulled out groves.

In mid-August, after the sample has been selected, field enumerators enter the selected groves to collect survey data. The data collected are incorporated into statistical models that indicate navel orange production. Since this estimate is generated from a probability sample, it has a measure of statistical confidence associated with it.

The four components used in establishing the production forecast are (1) bearing acres, (2) trees per acre, (3) number of oranges per tree, and (4) fruit size.

The four components are obtained as follows:

(1) Bearing Acres: Acreage data are kept on a parcel record database for navel oranges. This will provide a universe from which to draw sample orchards. Updates are made as new information becomes available. Since acreage data are used to determine the sample's distribution, current information such as this is vital to the success of the estimating program.

(2) Trees per Acre: Tree spacing, number of trees, and number of acres are maintained in the parcel record database. Therefore, trees per acre are calculated.

(3) Oranges per Tree: To determine oranges per tree, enumerators count oranges along randomly selected branches of a randomly selected tree. Work begins at the tree's trunk, where a cross-sectional measurement is taken. From here, enumerators take cross-sectional measurements at each branch forking. Using a random number table and the cross-sectional measurements, one branch is randomly selected to continue the path. This procedure is continued until a terminal branch is reached. Using this random methodology, it is possible to end up on any one of the tree's numerous terminal branches. Because random numbers are used, there is a probability of selection associated with the chosen path. This probability is used to expand fruit counts along the chosen path and then arrive at an estimated set for the entire tree. This procedure is used because of its statistical efficiency.

(4) Fruit Size: Size data are collected by the industry in August, and then monthly growth is measured through March 1.

Sample Sizes

The counts provided in table 16 represent the number of blocks with two trees randomly selected per block.

Table 16: Navel Orange Objective Yield Program: 1986/87 through 1989/90 Seasons

STATE	1986-1987	1987-1988	1988-1989	1989-1990
CA	300	300	350	350

Table 16: Navel Orange Objective Yield Program: 1990/91 through 1999/00 Seasons (continuation)

STATE	1990-1991[10]	1991-1992[11]	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000
CA	431		398	488	480	498	521	531	498	478

Table 16: Navel Orange Objective Yield Program: 2000/01 through 2006/07 Seasons (continuation)

STATE	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
CA	na[12]	527	510	498	526	569	557

[10] Data for 1990-91 (a freeze year) were not used in any of the forecasts after 1990.
[11] No objective measurement survey was conducted for the 1991-92 season due to lack of funding.
[12] The cells shown with a "na" represent those years for which no information on sample sizes was found.

8.2b. Valencia Oranges

History

California produces approximately 78 percent of the Valencia oranges for fresh use in the United States.

The Valencia orange objective measurement survey was funded by the Valencia Orange Administrative Committee and has been conducted in southern California since the 1984-1985 crop year and in the Central Valley since the 1985-1986 crop year. These data were used for research purposes until the 1986-1987 season. Forecasts provided until the 1990-1991 season were made using objective measurement data and the December Farm Report of Valencia orange crop condition and yield. The 1991-1992 forecast was made using objective measurement data and the subjective probability citrus survey of grower production and yield. Also, for this forecast and all subsequent forecasts, objective measurement data from the 1990-1991 crop year were not used due to the freeze. For the 1993-1994 crop year, only objective measurement data were used in the forecast. The program was discontinued in 1994 due to lack of funds. After a six year absence, a Valencia orange objective measurement survey was resumed for the 1999-2000 crop year. Starting with the 1999-2000 season, survey results were published in March prior to the December release of previous crop years. A forecast of Valencia production based on the objective measurement survey was not available until the 2003-2004 crop year. Several years of data are normally required before any estimating model can accurately forecast production.

Methodology

The methodology used for Valencia oranges is the same as the one used for navel oranges. For more information refer to section 8.2a.

Sample Sizes

The counts provided in Table 17 represent the number of blocks with two trees randomly selected per block.

Table 17: Valencia Orange Objective Yield Program: 1986-1987 through 1989-1990 Seasons

STATE	1986-1987	1987-1988	1988-1989	1989-1990
CA	271	285	292	304

Table 17: Valencia Orange Objective Yield Program: 1990-1991 through 1999-2000 Seasons (continuation)

STATE	1990-1991[13]	1991-1992	1992-1993	1993-1994	1994-1995[14]	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000

[13] Data for 1990-91 (a freeze year) were not used in the any of the forecasts after 1990.
[14] Program discontinued from 1994-1995 thru 1998-1999 seasons due to lack of funding.

CA	364	387	na[15]	385	343

Table 17: Valencia Orange Objective Yield Program: 2000-2001 through 2005-2006 Seasons (continuation)

STATE	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
CA	782	804	780	785	589	650

[15] The cells shown with a "na" represent those years for which no information on sample sizes was found.

8.2c. Pistachios

History

California produces virtually all the pistachios grown in the United States. Approximately 70 percent of the pistachio crop is consumed in the U.S., and the remaining 30 percent is exported. Almost three-fourths of the California pistachio crop is marketed in the shell for eating out-of-hand snack food. The remaining one-fourth consists of nut meats, which are obtained from unsplit nuts, referred to by the industry as shelling stock. Nut meats are used in candy, ice cream, and bakery products.

Forecasting research on the California pistachio crop began in 1980, sponsored and requested by the California Pistachio Commission (formerly, the California Pistachio Association). In 1980, six trees were randomly selected for the study of growth and production characteristics. Detailed observations were made of the total number of clusters, nuts within clusters, and the cluster locations on each tree. In 1981, 31 trees located in 17 orchards across the state were monitored. Weights and measurements were taken weekly and charted to display the amount of change. Most of the kernel growth had occurred by August 1st, and it was determined that early August would be the best time to conduct a full-scale survey. After the 1981 study, it was proposed to conduct a summer survey of at least 300 orchards for a minimum of two years to collect statistical data for the purpose of monitoring and refining methodology for a pre-harvest forecast. In addition to the summer survey, the proposal included visiting the orchards in April to estimate the number of fruit buds set on each tree. It was reasoned that the fruit bud counts might have a strong correlation to final production. The linear regression models developed were patterned after those models developed for walnuts and almonds, which had performed satisfactorily over time. In 1984, after the results of the summer survey, it was recommended that the California Pistachio Commission approve a 1985 production forecast to be issued with the USDA Crop Report. The forecast would be based on the August Survey using the clusters selected by the April Survey results. However, the Commission decided to keep the project on a research basis for one more year. In 1986, the first pistachio production forecast was issued in September with the USDA Crop Report. No objective measurement survey was conducted in 1993 due to lack of funds. Acreage data were usually collected by a special acreage update survey. Prior to 1993, collection of this information was funded by the state of California and the industry. In 1993, the State Legislature eliminated this funding. As a result, future acreage updates would require industry funding. In 1994, the California Pistachio Commission began funding a complete acreage survey of pistachio growers every third year. Starting in 1998, two random paths were performed for each tree. In 2003, the objective measurement survey was modified in order to provide an earlier production forecast to growers and processors. The survey was conducted primarily during July, one month earlier than in previous years, therefore eliminating much of the sizing data. The program was discontinued in 2004.

Methodology

Two trees are sampled in each orchard. Since establishing a new sample orchard is costly, when possible, sample orchards are reused. This, however, is not done at the expense of accuracy.

While some samples are retained from year to year, at least 20 percent of any year's samples are new. The pistachio tree population is not constant from year to year; it is necessary to add new samples and drop old ones to obtain an accurate representation of pistachio acreage.

The four components used in establishing the production forecast are (1) bearing acres, (2) trees per acre, (3) number of sound nuts per tree, and (4) nut size and/or weight.

The four components are obtained as follows:

(1) Bearing Acres: Acreage data are collected by a special acreage update survey. Since acreage data are used to determine the sample's distribution, current information is vital to the success of the estimating program.

(2) Trees per Acre: Tree spacing, number of trees, and number of acres are maintained in the parcel record database. Therefore, trees per acre are calculated.

(3) Clusters per Tree: To determine clusters per tree, enumerators count clusters along randomly selected branches of a randomly selected tree. Work begins at the tree's trunk where a cross-sectional measurement is taken. From there, enumerators work their way out the tree taking cross-sectional measurements at each forking branch. Using a random number table and the cross-sectional measurements, one branch is randomly selected to continue the path. This procedure is continued until a terminal branch is reached. Using this methodology, it is possible to end up at any one of the tree's numerous terminal branches. Because random numbers are used, there is a probability of selection associated with the chosen path. This probability is used to expand cluster counts along the chosen path and then arrive at an estimated set for the entire tree. This procedure is used because of its statistical efficiency.

(4) Nut Size: While conducting measurements and nut counts along the random path, enumerators pick a random portion of the clusters they encounter at the terminal branch. At the end of the sampling day, these nuts are taken to sizing stations. Additional personnel called “sizers” weigh, measure, and determine the number of sound nuts within each sample and within each cluster.

Sample Sizes

The counts provided in Table 18 represent the number of blocks with two trees randomly selected per block.

Table 18: Pistachio Objective Yield Program: 1986 through 1989

STATE	1986	1987	1988	1989
CA	332	286	347	367

Table 18: Pistachio Objective Yield Program: 1990 through 1999 (continuation)

STATE	1990	1991	1992	1993[16]	1994	1995	1996	1997	1998[17]	1999
CA	373	389	394		491	586	562	642	610	603

Table 18: Pistachio Objective Yield Program: 2000 through 2003 (continuation)

STATE	2000	2001	2002	2003
CA	555	632	623	636

[16] No objective measurement survey was conducted in 1993 due to lack of funds.
[17] Since 1998, two random paths were performed for each tree.

8.2d. Almonds

History

California produces virtually all the almonds grown in the United States. Approximately one-fourth of the almond crop is consumed in the U.S. and the remaining three-fourths is exported. California grows 80 percent of the world's supply, including the domestic market.

The USDA, National Agricultural Statistics Service, California Field Office began its almond forecasting work in 1962. At that time, handlers and growers of almonds were finding it difficult to market the crop solely on the basis of subjective (grower opinion) surveys. This subjective method provided reasonably dependable forecasts and was relatively inexpensive. However, as more and more reliance was placed on fruit and nut crop forecasts, more dependable and timely production forecasts were needed. This need for more accurate production information brought about objective yield survey research. Between 1962 and 1967, information was collected by our Agency in an effort to forecast the almond crop as of May 1. In 1968, after five years of research, survey data showed that a significant portion of total nut drop occurred after May 1, thus decreasing the accuracy of the report. It was also discovered that the magnitude of the loss varied greatly from year to year. Following these findings and starting in 1968, the objective survey forecast was moved to the current July 1 time frame. In addition to the July forecast, the National Agricultural Statistics Service issues a May production forecast that is based on a grower opinion survey.

Methodology

The methodology used for almonds is the same as the one used for pistachios. The only difference is that nuts-per-tree is the third component for almonds instead of clusters-per-trees. For more information refer to section 8.2c.

Sample Sizes

The following table presents the sample sizes available by year for the almond objective yield program in California.

Table 19: Almond Objective Yield Program: 1965 through 1979

STATE	1965	1966	1967	1968	1969	1970	1971 - 1976	1977	1978	1979
CA	535	534	566	491	539	480	na[18]	700	700	na

Table 19: Almond Objective Yield Program: 1980 through 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
CA	na	na	na	na	na	na	na	na	na	na

[18] The cells shown with a "na" represent those years for which no information on sample sizes was found.

Table 19: Almond Objective Yield Program: 1990 through 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CA	na	na	678	767	766	798	872	887	979	838

Table 19: Almond Objective Yield Program: 2000 through 2007 (continuation)

STATE	2000	2001	2002	2003	2004	2005	2006	2007
CA	686	798	786	777	749	838	834	865

8.2e. Walnuts

History

California produces virtually all the English walnuts grown in the United States.

NASS began walnut forecasting work using objective measurement procedures in 1958. Prior to this, subjective surveys were the basis for walnut production forecasting. As more reliance was being placed on fruit and nut crop forecasts, not only for pricing, but also in the efficient marketing of the crop, more accurate production information prior to harvest was needed. In response to this need, research was conducted which led to the walnut objective measurement survey. The original sample of blocks was chosen proportionally to county, variety, and the bearing acreage. With each succeeding year, additions and deletions were made to adjust the sample for acreage removed, new acreage planted, and refusals.

Methodology

The methodology used for walnuts is the same as the one used for pistachios. The only difference is that nuts-per-tree is the third component for walnuts instead of clusters-per-tree. For more information refer to section 8.2c.

Sample Sizes

The following table presents the sample sizes available by year for the walnut objective yield program in California.

Table 20: Walnut Objective Yield Program: 1960 through 1969

STATE	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
CA	468	468	488	500	501	520	na[19]	na	na	na

Table 20: Walnut Objective Yield Program: 1970 through 1979 (continuation)

STATE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
CA	na	na	na	na	575	na	600	600	na	600

Table 20: Walnut Objective Yield Program: 1980 through 1989 (continuation)

STATE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
CA	na	na	na	na	na	na	na	na	na	na

[19] The cells shown with a "na" represent those years for which no information on sample sizes was found.

Table 20: Walnut Objective Yield Program: 1990 through 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CA	na	na	na	na	na	na	na	678	731	640

Table 20: Walnut Objective Yield Program: 2000 through 2007 (continuation)

STATE	2000[20]	2001	2002	2003	2004	2005	2006	2007
CA		626	679	686	694	655	682	665

[20] Survey not conducted in 2000.

8.2f. Grapes

History

California produces virtually all the raisin-type variety grapes grown in the United States. The three primary uses are dried for raisins, fresh, and crushed for wine. USDA's National Agricultural Statistics Service (NASS) California Field Office has been funded by the Raisin Administrative Committee (RAC) to conduct an objective measurement (OM) survey on the state's raisin-type grape crop. The grape objective measurement survey uses randomly selected vines, bunch counts, and bunch sizes to forecast crop production.

In 1956, objective measurement research procedures began with the selection of 1,300 sample vineyards in counties having 500 or more acres planted to grapes. Individual units were selected by a random method within variety groups. From three vines in each sample block, counts of bunches and measurements were taken at specified times. Ratios of counts and measurements with the previous year were available for the first time in 1957. In 1958, the principal expansion to a production forecast was produced. A new sample was selected in 1959 with probability of selection proportional to acreage. The accumulation of data over a series of three years permitted refinements in the 1959 methods of forecasting. In 1960, after an analysis of sample size requirements, the number of units was reduced by 24 percent. To test the effects of sampler bias in the selection of bunches to be sized, a random method of selection was started in the 1961 season. Results from 1961 were encouraging for raisin grape varieties, while disappointing for wine and table varieties.

The survey was conducted consecutively each year until 1982, when California terminated survey funding during a budget crisis. Several attempts were made by interested grape industry entities to find funds to restart the project. It was not until 1985 that a funding agreement was arranged between the California Wine Grape Growers and the RAC to continue the annual survey. In 1988, the California Wine Commission took over the wine segment portion of the funding from the California Wine Grape Growers. The wine industry decided not to fund the survey after the 1990 season. From 1991 to 2000, only raisin-type varieties were sampled and funded by the RAC. The raisin industry decided not to fund the survey after the 2000 season. The RAC decided to reinstate the OM survey for 2005 and 2007.

NASS forecasts grape production in July, August, and October. Grape growers are surveyed and asked to estimate (subjective) the expected yield for their grape acres. These reports are tabulated and summarized in Sacramento to arrive at a crop forecast in July for raisin, table, and wine type varieties. In August and October, forecasts are revised based on updated subjective reports. The OM survey conducted in mid to late July is the main foundation for the season's raisin-type grape forecast.

Methodology

Since establishing new samples are costly, the same basic sample is used each year. However, new samples are added each year in new bearing vineyards to replace samples in pulled-out vineyards.

In early July, after the sample has been selected, field enumerators enter selected vineyards throughout the state to collect survey data. The three components used in establishing the production forecast are (1) bearing acres, (2) number of normal bunches per vine, and (3) bunch size.

The three components are obtained as follows:

(1) Bearing Acres: Acreage data are collected by a special grape acreage update survey. This annual survey of all grape growers in the state is funded by the grape industry. Growers are contacted to update their grape acreage data by county, variety, and year planted. This survey provides a basis from which to draw sample vineyards. Since acreage data are used to determine the sample's distribution, current information is vital to the success of the estimating program.

(2) Bunches per Vine: To determine bunches per vine, enumerators count the grape bunches in a randomly selected vine space.

(3) Bunch Size: A few randomly selected bunches in the sampled vine space are clipped. At the end of the sampling day, these bunches are taken to sizing stations. Sizers measure the length, width, and thickness of the sampled bunches.

Sample Sizes

The counts provided in Table 21 represent the number of vines sampled.

Table 21: Grape Objective Measurement Program: 1986 through 1989

STATE	1986	1987	1988	1989
CA	327	328	319	285

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Table 21: Grape Objective Measurement Program: 1990 through 1999 (continuation)

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CA	319	346	317	248	330	294	362	376	313	303

Table 21: Grape Objective Measurement Program: 2000 through 2007 (continuation)

STATE	2000	2001	2002[21]	2003[21]	2004[21]	2005	2006[21]	2007
CA	294	294				319		298

[21] Survey not conducted from 2002 through 2004, and 2006

8.2g. Lemons

History

A research project was initiated in 1955 with the primary purpose of assessing the feasibility of developing an objective crop forecasting procedure for lemons.

For tree fruit which has a single, well-defined harvesting period and for which the forecast precedes harvest by only two or three months, the basic data taken at forecast time was more likely to refer to (1) the fruit set, as measured, for example, by the average count of fruit per sample tree and (2) size of fruit as measured by diameters of individual fruit. The basis of the forecast was that the set at forecast time would likely be a good indicator of the set at harvest and similarly, that size of fruit at forecast would likely be well related to size at harvest.

While the same principles appeared to be applicable to the forecasting of lemon production, the problem was complicated by the fact that production was continuous and that harvest was spread over the whole marketing year in a multiplicity of picks. Changes in the timing of these picks created substantial differences in the aggregate volume of lemons harvested during the year. The forecast of lemon production on March 1 included production that would be harvested over eight months, although the bulk of the production to be forecasted was concentrated in the four months, March through June. Under such conditions, even an optimal procedure would possibly yield forecasts with a wide error band. Due to these factors, it was deemed likely that more elaborate measurements would be needed for lemons than for fruit which is completely harvested each year within a relatively short period of time.

As a result, the research on the development of an objective yield forecasting program for lemons was initiated as a two year intensive pilot study in which a variety of measurements would be collected and analyzed. Three surveys were carried out in Ventura County: (1) a set-size survey made in March in which counts of fruit and diameter measurement of fruit on 51 randomly drawn trees were obtained; (2) a growth survey in which weekly or biweekly measurements of diameters were made for a sample of tagged fruit from March through October; and (3) a harvest survey in which the number of fruit, fruit size, and weight of fruit were obtained for each pick during the period, March-October, for a sample of 90 trees.

No further documentation was available on the results of the two year research pilot study. However, a report from 1995 outlined a series of releases related to the lemon objective measurement forecast. It lists releases from 1959 until 1985. Sample sizes were not available.

8.2h. Peaches

History

The California Field Office participated in the peach objective yield program in the 1970s, 1980s, and early 1990s. The program was discontinued in the mid to late 1990s. Neither sample sizes nor any other related information were available at the time of this report.

During the late 1960s, four years of experimentation were devoted at improving the forecasting model for the California cling peach crop. It was determined that the best objective yield estimates of peach production were obtained from the expansion of counts from sample limbs (terminals). Sample limbs were selected by a random path method using probabilities proportional to size (PPS).

The South Carolina Field Office also conducted research on peach objective yield in the early 1980s. Again, neither sample sizes nor any other related information were available.

8.3. Michigan

8.3a. Tart Cherries

History

Tart cherry yield and production estimates have been made by the Agricultural Statistics Board of USDA's National Agricultural Statistics Service for over three decades. Before that time, estimates were made for tart and sweet cherries combined. Historically, reports by growers of yield prospects for their own orchards or localities were the primary basis for these estimates. Experience over many years, though, proved that growers' surveys are not accurate in years of very heavy or very light crops.

To strengthen the source of data from which cherry crop estimates are made, a pilot tart cherry objective yield program was started in Michigan in 1958. This survey was expanded in 1960 and again in 1961. Results from these surveys were very encouraging. In 1962, the tart cherry yield project was introduced in New York, Pennsylvania, and Wisconsin. The pilot project was discontinued after 1963 because of a lack of funds, but research resumed in 1967 and 1968 in Michigan. In 1972, the tart cherry objective yield survey became operational in Michigan. Procedures to be followed were based on the experience from earlier pilot projects and previous surveys. The information collected was used to compute a state average yield per tree.

The last complete tart cherry objective yield survey was conducted in 2001. The survey was underway in 2002 when a devastating series of freezes occurred which reduced the crop to 15 million pounds of production. This compared with an average of 234 million pounds for the previous 5 years. It was the smallest crop since 1927 when 18 million pounds were harvested. In 2003, funding for the survey was discontinued because the industry did not have sufficient assessment dollars collected from the 2002 crop to conduct the survey.

At various times, the Michigan Field Office conducted other objective yield surveys: corn, potatoes, wheat, and dry beans. Also, a pilot objective yield survey was conducted for blueberries.

Sample sizes were not available.

8.4. New York

8.4a. Onions

History

The first onion objective yield survey was conducted in Michigan in 1956 as a five year research program designed to measure the harvest yield of onions in a given area.

In New York, the onion objective yield survey began in 1971 in response to the need for more accurate yield estimates. Limited resources kept the sampling rate at one sample unit per 100 acres in Orange County, New York. In 1977, the survey was expanded to all major onion producing areas at the same sampling rate of one unit per 100 acres.

Sample sizes were not available.

8.5. Oregon

8.5a. Hazelnuts

History

Objective yield research for hazelnuts began in the mid-to-late 1960s. The initial number of sampled orchards was 90 for each year, most of the time. For each orchard, three trees were sampled. However, 99 orchards were sampled for one or two four-year periods beginning in 1988. In 2000, the number of sampled trees was reduced to 2 per orchard, following a study which found that the third tree did not reduce coefficients of variation by a significant amount.

Sample sizes were not available.

REFERENCES

1989 Corn Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1989 Cotton Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1989 Potato Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1989 Rice Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1989 Soybeans Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1989 Wheat Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1993 Corn Objective Yield Survey Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1993 Soybeans Objective Yield Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

1993 Wheat Objective Yield Specifications. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

Almond Objective Measurement Survey Manual. Unpublished Manual. California Crop and Livestock Reporting Service. 1970. Author Unknown

Almond Objective Measurement Survey Sizing Instructions: 1978 Survey. Unpublished Manuscript. California Crop and Livestock Reporting Service.

Aune, D. (1986). Changes in the Sorghum Objective Yield Program. Unpublished Manuscript. Statistical Methods Branch. Estimates Division. National Agricultural Statistics Service. USDA.

California Pistachio Production & Survey Projections, 1982-1986. Unpublished Manuscript. CASS.

Data Processing Operations for 1963 Almond. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Davis, A., Krug, K, and Birkett, T. (1983). 1983 August Pistachio Objective Measurement Survey. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.
Fenley, D. (1965). Summary of SRS Sorghum Research. Unpublished Manuscript. Statistical Reporting Service. Standards and Research Division. USDA.

Field Instructions (1958). Objective Walnut Crop Forecasting Surveys Field Instructions – 1958 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1959). Objective Walnut Crop Forecasting Surveys Field Instructions – 1959 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1961). Objective Walnut Crop Forecasting Surveys Field Instructions – 1961 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1962). Objective Walnut Crop Forecasting Surveys Field Instructions – 1962 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1963). 1963 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1963). Objective Walnut Crop Forecasting Surveys Field Instructions – 1963 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1964) – 1964 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1964). Objective Walnut Crop Forecasting Surveys Field Instructions – 1964 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1965). 1965 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1965). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1965). Objective Walnut Crop Forecasting Surveys Field Instructions – 1965 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1966). 1966 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1966). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1966). Walnut Objective Measurement Forecasting Research Project—Preliminary Report 1966California Crop and Livestock Reporting Service. CASS.

Field Instructions (1967). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1967. Objective Walnut Crop Forecasting Surveys Field Instructions – 1967 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1968). 1968 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1968). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1968). Objective Walnut Crop Forecasting Surveys Field Instructions – 1968 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1969). 1969 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1969). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1969). Objective Walnut Crop Forecasting Surveys Sizing Instructions – 1969 Surveys. California Crop and Livestock Reporting Service. CASS.

Field Instructions (1970). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1971). Objective Grape Surveys Size Increment Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1972). 1972 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1972). Objective Walnut Crop Forecasting Surveys Field Instructions. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1973). 1973 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1973). Grape Forecast Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1974). 1974 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1974). Grape Forecast Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1975). 1975 Almond Count Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1975). Grape Forecast Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1978). Grape Objective Measurement Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1980). Grape Objective Measurement Survey. California Crop and Livestock Reporting Service. USDA.

Field Instructions (1990). 1990 Grape Objective Measurement Survey. California Agricultural Statistics Service. USDA.

Grain Sorghum Study (1966). Unpublished Manuscript. Statistical Reporting Service. Standards and Research Division. USDA.

Grape Objective Measurement Forecasting Project- Final Report 1961. Unpublished Manuscript. California Crop and Livestock Reporting Service. USDA.

Halley, R. (1997). History of Crop Yield Surveys in the U.S. Unpublished Presentation Slides. Houston, TX. National Agricultural Statistics Service. USDA.

Henderson, W. W. & Todd, R. L. (1969). Almond Objective Measurement Forecasting Research Project. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Houseman, E. E., and Huddleston, H. F. (1966). Forecasting and Estimating Crop Yields from Plant Measurements. Unpublished Manuscript. Monthly Bulletin of Agricultural Economics and Statistics, Vol. 15 #10.

Huddleston, H. F. (1958). Objective Methods in Forecasting Components of Corn Yield. Unpublished Manuscript. Agricultural Estimates Division. Agricultural Marketing Service. USDA.

Huddleston, H. F. (1960). Report on 1957 Research Surveys. Unpublished Manuscript. Agricultural Estimates Division. Agricultural Marketing Service. USDA.

Huddleston, H. F. (1978). Sampling Techniques for Measuring and Forecasting Crop Yields. Unpublished Manuscript. Economics, Statistics and Cooperatives Service. USDA. Research Report # ESCS-09

Kelly, B. W. (1957). Preliminary Report on Objective Procedures for Soybean Yield Forecasts. Unpublished Manuscript. Agricultural Estimates Division. Agricultural Marketing Service. USDA. Research Report # 57-01.

Kelly, B. W., and Kirkbride, J. W. (1964). Forecasting Crop Yield. Unpublished Manuscript. Statistical Reporting Service. USDA.

King, A. J., and Jebe, E. H. (1940). An Experiment in Pre-Harvest Sampling of Wheat Fields. Unpublished Manuscript. Agricultural Experiment Station Iowa State College of Agriculture and Mechanic Arts. Statistical Section. Research Bulletin #273.

Krug, K. (1985). Crop Reporting Service Pistachio Research, 1980-1984. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Krug, K. (1986). Crop Estimating Progress Report to the California Pistachio Commission. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Krug, K., and Kleweno, D. (1984). 1984 August Pistachio Objective Measurement Survey. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Kuznets, G.M. (1959). Statistical Limitations of Grape Crop Forecasts. Unpublished Manuscript. University of California.

Matthews, R. V. (1985). An Overview of the 1985 Corn, Cotton, Soybean, and Wheat Objective Yield Surveys. Unpublished Manuscript. Statistical Reporting Service. Statistical Research Division. USDA.

McGregor, R.A. (1981). 1981 Pistachio Research Report. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Peak, R. W. (1977). Almond Objective Measurement Survey Sizing Instructions. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Progress Report on Objective Surveys for Forecasting Winter Wheat Yields (1959). Unpublished Manuscript. Agricultural Marketing Service. USDA.

Raisin and Grape Surveys - 1963. Unpublished Manuscript. California Crop and Livestock Reporting Service. USDA.
Report on 1955 Research Surveys (1957). Unpublished Manuscript. Agricultural Marketing Service. USDA

Report on 1961 Objective Surveys for Forecasting Soybean Yields (1962). Unpublished Manuscript. Statistical Reporting Service. Standards and Research Division. USDA. Research Report # YRB 62-01.

Report on 1962-1963 Research Projects (1968). Unpublished Manuscript. Statistical Reporting Service. Standards and Research Division. USDA.

Report on Objective Cotton Yield Studies (1959). Agricultural Marketing Service. USDA. Report #YRB 59-04.

Report on Validation of Soybean Objective Yield Field Procedures (1965). Unpublished Manuscript. Statistical Reporting Service. Standards and Research Division. USDA.

Rockwell (1954). Report on 1954 Research Surveys. Unpublished Manuscript. Agricultural Marketing Service. USDA.

Sampling Instructions (1974). Walnut Objective Measurement Survey Sampling Instructions. California Crop and Livestock Reporting Service. USDA.

Sampling Instructions (1976). Walnut Objective Measurement Survey Sampling Instructions. California Crop and Livestock Reporting Service. USDA.

Sampling Instructions (1977). Walnut Crop Measurement Survey. California Crop and Livestock Reporting Service.

Sampling Instructions (1979). Walnut Objective Measurement Survey Sampling Instructions. California Crop and Livestock Reporting Service. USDA.

Sarle, C. F. (1932). Adequacy and Reliability of Crop-Yield Estimates. Unpublished Manuscript. National Agricultural Statistics Service. USDA.

Sizing Instructions (1963). Objective Grape Forecast Survey 1963 Sizing Instructions. California Crop and Livestock Reporting Service. CASS.

Sizing Instructions (1979). Grape Objective Measurement Survey. California Crop and Livestock Reporting Service. USDA.

Summary and Order of Field Operations – Almond Count Survey. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

T-Instruction (1955). Research Program—Objective Yield – Size Determinations. Agricultural Marketing Service. USDA. Instruction 1911.

T-Instruction (1956). Research Program—Objective Yield Surveys for Cotton, Corn and Soybeans. Agricultural Marketing Service. USDA. Instruction 1964.

T-Instruction (1959). Research Program—Objective Winter Wheat Yield Surveys. Agricultural Marketing Service. USDA. Instruction 2149.

T-Instruction (1959). Research Program—Objective Yield Surveys for Cotton, Corn and Soybeans. Agricultural Marketing Service. USDA. Instruction 2167.

T-Instruction (1960). 1960 Objective Yield Surveys for Cotton, Corn and Soybeans. Agricultural Marketing Service. USDA. Instruction 2228.

T-Instruction (1960). 1960 Objective Yield Surveys for Cotton, Corn and Soybeans (Supplement to Instruction 2228). Agricultural Marketing Service. USDA. Instruction 2233.

T-Instruction (1960). Research Program—Objective Winter Wheat Yield Surveys. Agricultural Marketing Service. USDA. Instruction 2208.

T-Instruction (1961). 1961 Objective Winter Wheat Yield Surveys. Agricultural Marketing Service. USDA. Instruction 2258.

T-Instruction (1961). 1961 Objective Yield Surveys for Cotton, Corn and Soybeans. Agricultural Marketing Service. USDA. Instruction 2284.

T-Instruction (1962). Objective Yield and Interview Survey Manuals. Statistical Reporting Service. USDA. Instruction 31-62.

T-Instruction (1964). May Winter Wheat Objective Yield Survey Transmittal of Data. Statistical Reporting Service. USDA. Instruction 29-64.

T-Instruction (1964). Transmittal of Objective Yield Survey ADP Output. Statistical Reporting Service. USDA. Instruction 60-64.

T-Instruction (1966). Moisture Adjustment for Wheat Objective Yield Data. Statistical Reporting Service. USDA. Instruction 31-66.

T-Instruction (1967). 1967 Objective Yield Surveys for Cotton, Corn and Soybeans. Statistical Reporting Service. USDA. Instruction T-79-67.

T-Instruction (1967). 1967 Winter and Spring Wheat Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-25-67.

T-Instruction (1967). Corn, Cotton and Soybean Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-115-67.

T-Instruction (1967). Wheat Objective Yield Record Form. Statistical Reporting Service. USDA. Instruction T-51-67.

T-Instruction (1968). 1968 Objective Yield Surveys for Corn, Cotton and Soybeans. Statistical Reporting Service. USDA. Instruction T-32-68.

T-Instruction (1968). 1968 Objective Yield Surveys for Corn, Cotton and Soybeans. Statistical Reporting Service. USDA. Instruction T-52-68.

T-Instruction (1969). 1969 Objective Yield Surveys for Corn, Cotton and Soybeans. Statistical Reporting Service. USDA. Instruction T-49-69.

T-Instruction (1969). 1969 Winter and Spring Wheat Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-16-69.

T-Instruction (1969). November 1 Cotton Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-107-69.

T-Instruction (1970). 1970 Objective Yield Surveys for Corn, Cotton and Soybeans. Statistical Reporting Service. USDA. Instruction T-51-70.

T-Instruction (1970). November 1 Cotton Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-107-70.

T-Instruction (1970). Objective Yield Surveys for Corn, Cotton and Soybeans – 1970. Statistical Reporting Service. USDA. Instruction T-66-70.

T-Instruction (1971). 1971 Objective Yield Surveys for Corn, Cotton and Soybeans. Statistical Reporting Service. USDA. Instruction T-47-71.

T-Instruction (1971). Corn, Cotton, and Soybean Objective Yield Post Harvest Surveys. Statistical Reporting Service. USDA. Instruction T-12-71.

T-Instruction (1971). Corn Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-82-71.

T-Instruction (1971). Objective Yield Surveys for Corn, Cotton and Soybeans – 1971. Statistical Reporting Service. USDA. Instruction T-65-71.

T-Instruction (1971). Potato Objective Yield Surveys and Storage Research Project. Statistical Reporting Service. USDA. Instruction T-101-71.

T-Instruction (1971). Potato Probability Acreage and Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-138-71.

T-Instruction (1971). SSO Computer Edit Programs - Objective Yield. Statistical Reporting Service. USDA. Instruction T-109-71.

T-Instruction (1971). Winter and Spring Wheat Objective Yield Surveys -- 1971. Statistical Reporting Service. USDA. Instruction T-22-71.

T-Instruction (1972). June Multiple Frame Potato Acreage and Potato Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-47-72.

T-Instruction (1972). Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-86-72.

T-Instruction (1973). Corn and Soybean Objective Yield "Mini" State School. Statistical Reporting Service. USDA. Instruction T-91-73.

T-Instruction (1973). Corn, Cotton and Soybean Objective Yield Post-Harvest Surveys. Statistical Reporting Service. USDA. Instruction T-13-73.

T-Instruction (1973). Objective Yield Stakes & Sacks – Inventory and Supply. Statistical Reporting Service. USDA. Instruction T-114-73.

T-Instruction (1973). Objective Yield Surveys for Corn, Cotton and Soybeans – 1973. Statistical Reporting Service. USDA. Instruction T-56-73.

T-Instruction (1973). Potato Objective Yield. Statistical Reporting Service. USDA. Instruction T-82-73.

T-Instruction (1973). Winter and Spring Wheat Objective Yield Surveys - 1973. Statistical Reporting Service. USDA. Instruction T-12-73.

T-Instruction (1974). 1974 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-74-74.

T-Instruction (1975). 1975 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-57-75.

T-Instruction (1975). 1975 Winter and Spring Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-18-75.

T-Instruction (1975). Objective Yield Surveys for Corn, Cotton and Soybeans – 1975. Statistical Reporting Service. USDA. Instruction T-48-75.

T-Instruction (1976). 1976 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-49-76.

T-Instruction (1976). 1976 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-13-76.

T-Instruction (1976). Objective Yield Surveys for Corn, Cotton and Soybeans – 1976. Statistical Reporting Service. USDA. Instruction T-46-76.

T-Instruction (1977). 1977 Corn and Cotton Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-86-77.

T-Instruction (1977). 1977 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-54-77.

T-Instruction (1977). 1977 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-16-77.

T-Instruction (1977). Objective Yield Surveys for Corn, Cotton and Soybeans – 1977. Statistical Reporting Service. USDA. Instruction T-46-77.

T-Instruction (1978). 1978 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-61-78.

T-Instruction (1978). 1978 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-15-78.

T-Instruction (1978). Objective Yield Surveys for Corn, Cotton and Soybeans – 1978. Statistical Reporting Service. USDA. Instruction T-55-78.

T-Instruction (1979). 1979 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-74-79.

T-Instruction (1979). 1979 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-17-79.

T-Instruction (1980). 1980 Corn, Cotton and Soybean Objective Yield, Fertilizer Usage and Pesticide Surveys. Statistical Reporting Service. USDA. Instruction T-54-80.

T-Instruction (1980). 1980 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-61-80.

T-Instruction (1980). 1980 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-14-80.

T-Instruction (1981). 1981 Corn, Cotton and Soybean Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-29-81.

T-Instruction (1981). 1981 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-37-81.

T-Instruction (1981). 1981 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-9-81.

T-Instruction (1982). 1982 Corn, Cotton and Soybean Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-34-82.

T-Instruction (1982). 1982 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-39-82.

T-Instruction (1982). 1982 Wheat Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-14-82.

T-Instruction (1983). 1983 Corn, Cotton and Soybean Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-38-83.

T-Instruction (1983). 1983 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-34-83.

T-Instruction (1983). 1983 Rice, Sorghum and Sunflower Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-24-83.

T-Instruction (1983). 1983 Wheat Objective Yield Survey and Wheat Validation Study Surveys. Statistical Reporting Service. USDA. Instruction T-11-83.

T-Instruction (1984). 1984 Corn, Cotton, Rice and Soybean Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-21-84.

T-Instruction (1984). 1984 Potato Objective Yield Survey. Statistical Reporting Service. USDA. Instruction T-23-84.

T-Instruction (1984). 1984 Wheat and Grain Sorghum Objective Yield and Wheat Validation Study Surveys. Statistical Reporting Service. USDA. Instruction T-1-84.

T-Instruction (1985). 1985 Corn, Cotton, Rice and Soybean Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-24-85.

T-Instruction (1985). 1985 Potato and Sunflower Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-28-85.

T-Instruction (1985). 1985 Wheat and Grain Sorghum Objective Yield Surveys. Statistical Reporting Service. USDA. Instruction T-11-85.

T-Instruction (1986). 1986 Corn, Cotton, Rice, Sorghum, and Soybean Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-6-6.

T-Instruction (1986). 1986 Potato Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-22-86.

T-Instruction (1986). 1986 Sunflower Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-27-86.

T-Instruction (1986). 1986 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-7-86.

T-Instruction (1987). 1987 Midyear Objective Yield Survey Training Workshops. National Agricultural Statistics Service. USDA. Instruction T-20-87.

T-Instruction (1987). 1987 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-5-87.

T-Instruction (1988). 1988 Midyear Objective Yield Survey Training Workshops. National Agricultural Statistics Service. USDA. Instruction T-15-88.

T-Instruction (1988). 1988 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. T-4-88.

T-Instruction (1989). 1989 Midyear Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-15-89.

T-Instruction (1989). 1989 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-4-89.

T-Instruction (1990). 1990 Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-11-90.

T-Instruction (1991). 1991 Midyear Objective Yield and Cropping Practices Surveys. National Agricultural Statistics Service. USDA. Instruction T-15-91.

T-Instruction (1991). 1991 Potato Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-16-91.

T-Instruction (1991). 1991 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-5-91.

T-Instruction (1992). 1992 Objective Yield and Cropping Practices Surveys. National Agricultural Statistics Service. USDA. Instruction T-8-92.

T-Instruction (1997). 1997 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-10-97.

T-Instruction (1997). 1997 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-4-97.

T-Instruction (1998). 1998 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-13-98.

T-Instruction (1998). 1998 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-3-98.

T-Instruction (1999). 1999 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-12-99.

T-Instruction (1999). 1999 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-3-99.

T-Instruction (2000). 2000 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-12-00.

T-Instruction (2000). 2000 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-6-00.

T-Instruction (2001). 2001 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-13-01.

T-Instruction (2001). 2001 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-3-01.

T-Instruction (2002). 2002 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-18-02.

T-Instruction (2002). 2002 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-8-02.

T-Instruction (2003). 2003 Cotton Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-14-03.

T-Instruction (2003). 2003 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-11-03.

T-Instruction (2003). 2003 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-3-03.

T-Instruction (2004). 2004 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-15-04.

T-Instruction (2004). 2004 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-6-04.

T-Instruction (2005). 2005 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-23-05.

T-Instruction (2005). 2005 Objective Yield Workshop. National Agricultural Statistics Service. USDA. Instruction T-10-05.

T-Instruction (2005). 2005 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-8-05.

T-Instruction (2006). 2006 Midyear Objective Yield Surveys. National Agricultural Statistics Service. USDA. Instruction T-26-06.

T-Instruction (2006). 2006 Wheat Objective Yield Survey. National Agricultural Statistics Service. USDA. Instruction T-8-06.

USDA Crop Report (2003). 2003 California Pistachio Objective Measurement Survey Report. CASS. Released July 31, 2003.

USDA Crop Report (2002). 2002 California Pistachio Objective Measurement Survey Report. CASS. Released August 29, 2002.

USDA Crop Report (2001). 2001 California Pistachio Objective Measurement Survey Report. CASS. Released August 31, 2001.

USDA Crop Report (2000). 2000 California Pistachio Objective Measurement Survey Report. CASS. Released September 1, 2000.

USDA Crop Report (1999). 1999 California Pistachio Objective Measurement Survey Results. CASS. Released September 1999.

USDA Crop Report (1998). 1998 California Pistachio Objective Measurement Survey Results. CASS. Released September 1998.

USDA Crop Report (1997). 1997 California Pistachio Objective Measurement Survey Results. CASS. Released August 1997.

USDA Crop Report (1996). 1996 California Pistachio Objective Measurement Survey Results. CASS. Released August 1996.

USDA Crop Report (1995). 1995 California Pistachio Objective Measurement Survey Results. CASS. Released September 1995.

USDA Crop Report (1994). August 1994 California Pistachio Objective Measurement Survey Results. CASS. Released September 1994.

USDA Crop Report (1992). August 1992 California Pistachio Objective Measurement Survey Results. CASS. Released August 1992.

USDA Crop Report (1991). August 1991 California Pistachio Objective Measurement Survey Results. CASS. Released August 1991.

USDA Crop Report (1990). August 1990 California Pistachio Objective Measurement Survey Results. CASS. Released August 1990.

USDA Crop Report (1989). August 1989 California Pistachio Objective Measurement Survey Results. CASS. Released September 1989.

USDA Crop Report (1988). Pistachio Objective Measurement Survey 1988 August Survey Results. CASS. Released September 1988.

USDA Crop Report (1987). 1987 Pistachio Objective Measurement Survey. CASS. Released September 1987.

USDA Crop Report (1986). 1986 Pistachio Objective Measurement Survey. CASS. Released September 1986.

USDA Crop Report (1986). Navel Orange Objective Measurement Survey: 1986-87 Survey. CASS. Released September 1986.

USDA Crop Report (1987). 1987-88 Navel Orange Objective Measurement Survey. CASS. Released September 1987.

USDA Crop Report (1988). 1988-89 Navel Orange Objective Measurement Survey. CASS. Released September 1988.

USDA Crop Report (1989). 1989-90 Navel Orange Objective Measurement Survey Results. CASS. Released September 1989.

USDA Crop Report (1990). 1990-91 Navel Orange Objective Measurement Survey Results. CASS. Released September 1990.

USDA Crop Report (1992). 1992-93 Navel Orange Objective Measurement Survey Results. CASS. Released September 1992.

USDA Crop Report (1993). 1993-94 Navel Orange Objective Measurement Survey Results. CASS. Released September 1993.

USDA Crop Report (1994). 1994-95 Navel Orange Objective Measurement Survey Results. CASS. Released September 1994.

USDA Crop Report (1995). 1995-96 Navel Orange Objective Measurement Survey Results. CASS. Released September 1995.

USDA Crop Report (1996). 1996-97 Navel Orange Objective Measurement Survey Results. CASS. Released September 1996.

USDA Crop Report (1997). 1997-98 Navel Orange Objective Measurement Survey Results. CASS. Released September 1997.

USDA Crop Report (1998). 1998-99 Navel Orange Objective Measurement Survey Results. CASS. Released September 1998.

USDA Crop Report (1999). 1999-00 Navel Orange Objective Measurement Survey Results. CASS. Released September 1999.

USDA Crop Report (2001). 2001-02 Navel Orange Objective Measurement Survey Results. CASS. Released September 2001.

USDA Crop Report (2002). 2002-03 Navel Orange Objective Measurement Survey Results. CASS. Released September 2002.

USDA Crop Report (2003). 2003-04 Navel Orange Objective Measurement Survey Results. CASS. Released September 2003.

USDA Crop Report (2004). 2004-05 Navel Orange Objective Measurement Survey Results. CASS. Released September 2004.

USDA Crop Report (2005). 2005-06 Navel Orange Objective Measurement Survey Results. CASS. Released September 2005.

USDA Crop Report (2006). 2006-07 Navel Orange Objective Measurement Survey Results. CASS. Released September 2006.

USDA Crop Report (1986). Valencia Orange Objective Measurement Survey: 1986-87 Survey. CASS. Released December 1986.

USDA Crop Report (1987). 1987-88 Valencia Orange Objective Measurement Survey. CASS. Released December 1987.

USDA Crop Report (1988). 1988-89 Valencia Orange Objective Measurement Survey. CASS. Released December 1988.

USDA Crop Report (1989). 1989-90 Valencia Orange Objective Measurement Survey Results. CASS. Released December 1989.

USDA Crop Report (1990). 1990-91 California Valencia Orange Objective Measurement Survey Results. CASS. Released December 1990.

USDA Crop Report (1991). 1991-92 California Valencia Orange Objective Measurement Survey Results. CASS. Released December 1991.

USDA Crop Report (1993). 1993-94 California Valencia Orange Objective Measurement Survey Results. CASS. Released December 1993.

USDA Crop Report (1999). 1999-00 California Valencia Orange Objective Measurement Survey Results. CASS. Released March 1999.

USDA Crop Report (2000). 2000-01 California Valencia Orange Objective Measurement Survey Results. CASS. Released March 2000.

USDA Crop Report (2001). 2001-02 California Valencia Orange Objective Measurement Survey Results. CASS. Released March 2001.

USDA Crop Report (2004). 2004-05 California Valencia Orange Objective Measurement Survey Results. CASS. Released March 2004.

USDA Crop Report (2005). 2005-06 California Valencia Orange Objective Measurement Report. CASS. Released March 2000.

USDA Internal Report. Summary of SRS Optimum Plot Size Research. Unpublished Manuscript.

USDA Internal Report. Summary of SRS Optimum Plot Location Research. Unpublished Manuscript.

Vogel, F. (1963). Preliminary Report on 1962 Objective Surveys for Forecasting Soybean Yields. Unpublished Manuscript. Research and Development Branch. Statistical Reporting Service. Standards and Research Division. USDA.

Waldhaus, E., Oaks, E., and Steiner, M. (1993). History and Procedures of Objective Yield Surveys in the United States. Unpublished Manuscript. National Agricultural Statistics Service. USDA.

Walnut Survey – August 1958. Unpublished Manuscript. California Crop and Livestock Reporting Service. CASS.

Warren, F. B. (1985). Corn Yield Validation Studies, 1953-83. Unpublished Manuscript. Statistical Reporting Service. Statistical Research Division. USDA. Research Report #YRB-85-07.

Wood, R. A., and Warren, F. B. (1972). A Study of Sampling and Estimating Procedures for California Cling Peaches. Unpublished Manuscript. Research and Development Branch. Standards and Research Division. Statistical Reporting Service.

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http://www.nass.usda.gov/research/reports/Internet_Yield/reportsxyield.html