Supporting Statement

OBJECTIVE YIELD SURVEYS

OMB No. 0535-0088

B. COLLECTION OF INFORMATION EMPLOYING STATISTICAL METHODS

1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection has been conducted previously, include the actual response rate achieved during the last collection.

The Soybean, Corn, and Cotton Objective Yield (OY) Sampling Frames comprise operations that reported Soybean, Corn, and Cotton acreage, respectively, on the June Area Survey. The Wheat OY Sampling Frame comprises operations that reported wheat acreage on the March Agricultural Survey. Sample sizes are determined using target CVs and previous survey data. Samples are selected using a probability proportional to size (PPS) sample design.

The 2021 U.S. planted and harvested acres, number of sampled OY units, and survey completion rates for the Field Crop OY Survey - Form A, by crop, are exhibited below.

Table B.1.a Projected Counts and Actual			
			Questionnaires
Survey Crop	Sampling Frame	No. of States	ID Numbers

The completion rate for the Field Crop OY Survey - Form A is calculated as follows:

Completion rate = a / (n – p)

Where;
a is the number of complete Form As and any field observations.
n is the number of selected sample units
p is the number of selected sample units that did not have a crop or targeted crop or the field was plowed or abandoned.

The respondent is only interviewed when the first questionnaire (Form A) is administered; therefore, respondent burden only occurs during this visit. During this interview, the sample field is verified and permission for the enumerator to enter the sample field to set up sample units for collecting plant data is requested. On subsequent farm visits, the enumerator will collect plant data, via Form B, from the sample units. Below are the 2021 completion rates by month and crop.

Completion Rate of Form B Instruments per Month by Crop, 2021

	Wheat	Corn	Cotton	Soybeans
May	64			
June	67			
July	72			
Aug	72		57	
Sept	73	59	63	61
Oct		60	67	64
Nov		61	66	64
Dec		61	67	64
Jan			67	

Respondents to the Tree Fruit Objective Yield Survey will be selected from databases with field level data on crop, variety, age of tree, and bearing status. The databases are updated annually using the

- California Fruit Acreage Survey (OMB No. 0535-0039),
- Florida Commercial Tree Inventory Survey that will utilize aerial photography and verification by Florida Department of Agriculture and Consumer Services (FDACS) staff, as well as
- Industry provided plantings by year and design using GIS data.

Completion Rate (Percent) of Measurement Instruments per Month, by Crop, 2021						
	CA Navel OM [1/]	**CA Valencia OM**	**CA Almond OM**	**CA Walnut OM**	**FL Citrus OM**	**OR Hazelnut OM**
June			96			
July						95
Aug	93			91	100	
Sept					100	
Oct					100	
Nov					100	
Dec					100	
Jan		92			100	
Feb					100	
March					100	

1/ Includes Mandarin & Cara Cara Varieties

The response rate for the Florida Citrus Processor Survey is 100 percent. The response rate for the Florida Maturity Survey is 100 percent.

2. Describe the procedures for the collection of information including:

•Statistical methodology for stratification and sample selection
•Estimation procedure
•Degree of accuracy needed for the purpose described in the justification
•Unusual problems requiring specialized sampling procedures

Field Crops

Field Crop OY surveys are conducted in major producing States for corn, cotton, soybeans, and winter wheat. For each commodity, a series of monthly yield forecasts culminates in a final estimated yield at maturity.

Acreage, yield, and production monthly forecasts from Objective Yield surveys are made from May to August for winter wheat, from September to November for corn and soybeans, and from September through January for cotton.

Forecasts and estimates, based on data obtained from the OY surveys as well as NASS's base agricultural surveys (OMB No. 0535-0213), are published in the monthly *Crop Production* reports.

For corn, cotton, and soybeans, the sampling universe is made up of all acres identified in the June Area Survey as being planted to the target commodity. The June Area Survey is sampled from NASS' Area Frame, in

which each state's complete land area is divided up into segments. After segments are randomly selected, enumerators are sent to account for all land in the segments, identifying any agricultural activity, demarcating boundaries of individual tracts (unique operating arrangement within the segment boundary), and calculating their acreages. Sample fields for the Objective Yield surveys are then randomly selected from within the tract.

For wheat, the sampling is done at the operation level. The sample is drawn from all operations reporting in the March Agricultural Survey as having planted or intending to plant wheat for harvest as grain. The March Agricultural Survey makes use of a Multiple Frame made up of NASS's list of producers (List Frame) and producers identified by the Area Frame.

For all four commodities, samples are selected with probability proportional to size (PPS) and the net effect is a self-weighting sample of areas for the commodity of interest in each State. The detail of the recorded area frame survey data allows sample selection at the tract level for corn, cotton, and soybeans. Winter wheat acres are collected at the farm level. Tracts with large acreage or expansion factors may be selected for more than one sample.

The major goal of the OY program is to produce indications of expected yield and final harvest yield using actual plant counts and measurements. OY indications calculated from actual plant counts and measurements eliminate some of the biases found in the farmer reported yields from other surveys.

The OY surveys produce indications for harvested acres, yield, and production. Objective measurements (counts of plants, ears, pods, bolls, etc.) are made on small plots of land. At maturity, the small plots are harvested, and yield is calculated based on the actual production taken from these small plots.

OY surveys collect data at different times during the growing season. During the initial OY interview (Form A), the operator is asked to verify the acreage reported on the parent survey. This is done on a field-by-field basis. The main purpose is to verify the sub-sampling frame by checking the acreage reported on the parent survey and recording any changes. Changes may be due to recording or reporting errors in the parent survey, failure to fulfill planting intentions, or switching to other utilizations. Only total farm winter wheat acres were asked on the base survey(s). Therefore, farmers are asked to report individual fields of winter wheat during the initial interview. Other data that must be obtained from the operator are collected at this time: planting date, planter row width, seeding practices, irrigation use, and application of pesticides. Enumerators ask for permission to enter the sample field to make counts and measurements on subsequent visits. For more information on NASS's Objective Yield Sample Design, please

reference Chapter 2, pages 4-9 of “The Yield Forecasting Program of NASS.” (Attached in the ROCIS submission system)

Ratio indications comparing the initial interview acres to the parent survey are computed to determine if acreage revisions are in order. The planting date gives an indication of harvesting date so enumerators are aware of when the final pre-harvest field visit will occur. Enumerators use the planter row width as an indicator of when the sample plots will be laid out. For example, narrow row soybean sample units are laid out as early as possible to limit the amount of destruction which can occur to the plants. When analyzing the data, the use of biological pest controls such as Bacillus thuringiensis (Bt) seed, herbicide resistant plant varieties, or irrigation are taken into consideration. Enumerators ask about applications of pesticides for data collection safety reasons since they will be handling the live plants.

Two units are laid out for each sample. The units are located and laid out according to specific procedures to assure randomness in field location. Plant and fruit counts, fruit measurements, and maturity determinations are recorded each month using the Form B until the crop is mature or harvested. Early season data are entered into regression equations used to forecast gross yield and the components of yield--number of fruit and weight per fruit. At maturity, the final visit obtains crop cutting data used to directly calculate final gross yield. The counts and measurements from all visits are added to the historical database used to derive future forecast equations.

Regional laboratories record measurements of fruit on the Form C. Lab samples are submitted for every sample hand-harvested by field enumerators. Lab measurements include weighing the fruit (ears, pods, bolls, heads, or tubers), weighing the grain after threshing, and determining moisture content. These data are obtained in a controlled environment. The data are used to calculate a threshing fraction and adjust to standard moisture. For wheat, labs count spikelets and grain from “green” heads early in the season which are used to forecast grain weight per head.

After the farmer has harvested the sample field, post-harvest gleaning data are collected on the Form E. All unharvested fruit and loose grains are gleaned from plots laid out after harvest in a subset of the sample fields. The gleanings are sent to the regional labs where they are weighed and tested for moisture. Harvest loss computed from these data is deducted from estimates of gross yield (calculated from Form B) to arrive at a net yield. During pre-harvest forecasting, historical average harvest loss is used.

A series of equations are used in forecasting the components of yield. In the case of wheat for example, the two components are weight of grain per head and number of heads for each sample. These regression equations utilize current monthly counts and measurements as the independent variables.

Linear regression equations relate historic number of plants per unit to number of plants at the end of the season. The correlation coefficient provides a measure of the relative effectiveness of the models and is used to weight equations together. For more information on this topic, please reference Chapter 4, pages 20-27 in “The Yield Forecasting Program of NASS” (attached).

The OY survey data are found to be reliable predictors of actual yield. In 2021 the coefficient of variation produced from models using data from the OY survey ranged from 1.5 to 6 percent in the major States, across all observed crops. When these major States are grouped together, the coefficient of variation is further reduced to 1 to 2 percent on average, across all participating States and all observed crops, which is considered a very reliable indicator of yield.

Fruits and Nuts

Fruit and Nut Objective Yield (OY) surveys will be conducted in major producing States for almonds, citrus, hazelnuts, and walnuts when funding is available from cooperators. For each of these commodities except citrus in Florida, there is only one objective yield forecast: the final net yield at maturity. Florida citrus will utilize a series of monthly net yield forecasts during the growing season, culminating in a final net yield at maturity.

Forecasts of acreage, yield, and production will be made monthly from October through July for citrus in Florida. One-time forecasts of acreage, yield and production will be made in:

- March for Valencia oranges and Clementines in California,
- July for almonds in California,
- August for hazelnuts in Oregon
- September for navel oranges, Mandarins, and walnuts in California

These forecasts and estimates, based on data obtained from the Objective Yield Surveys, will be published in a release published jointly by NASS and the cooperator.

Sample fields for citrus and tree nut objective yield surveys will be selected from databases with field level data on crop, variety, age of tree, and bearing status. All bearing age trees are assumed to be available for harvest. The databases will be updated using the:

- California Fruit Acreage Survey (OMB No. 0535-0039),
- Florida Commercial Tree Inventory Survey that utilizes aerial photography and verification by FDACS staff, as well as
- Data provided by the hazelnut industry with plantings by year and design using Geographic Information System (GIS) data.

The sample fields for all tree fruit crops (except hazelnuts in Oregon) will be selected with probability proportional to size (PPS) and the net effect is a self-weighting sample of areas with the crop of interest in each State. Hazelnuts in Oregon will be selected systematically. Samples will be selected at the State level. The detail of the fruit acreage databases will allow sample selection at the field level for citrus and tree nuts. Fields with large acreage or expansion factors may be selected for more than one sample. Separate trees and terminal branches will be selected and marked for each sample within a field up to four samples per field.

The major goal of the tree fruit OY program is to produce indications of expected yield and final production using actual plant counts and measurements. OY indications calculated from actual fruit counts and

measurements are free from some of the biases found in farmer reported yields from other surveys.

The OY surveys will produce indications for harvested acres, yield, and production. Objective measurements on fruit count and fruit size (for citrus fruits) will be made on a terminal branch (two terminal branches in California) of a selected tree. At maturity, fruit from the selected branch will be harvested and yield will be calculated based on the actual production taken from these terminal branches, less an allowance for harvest loss. In Florida, a fruit drop survey will estimate this allowance.

The tree fruit OY surveys (except citrus in Florida) will collect data at one time prior to harvest. The proposed forecast dates and usual harvest periods are summarized in the table below:

Forecast Date and Usual Harvesting Period by Commodity		
Commodity	**Forecast Date**	**Usual Harvest Period**
Citrus: Valencia – California	March	June – July
Citrus: Clementines – California	March	June – July
Citrus: Navel – California 1/	September	January – April
Citrus: Mandarins – California	September	January – April
Almonds – California	July	Late August – December
Walnuts – California	September	Late September – January
Hazelnuts – Oregon	August	September – October

1/ Includes cara cara varieties

During the OY interview (Permission Form, Form A), the operator will be asked to verify the acreage, variety, year planted, and plant spacing recorded on the fruit acreage database. This will be done for the selected block. Updates may be due to recording or reporting errors in the acreage survey, or other reasons. Enumerators ask for permission to enter the sample field and make counts and measurements, as well as obtain a sample of fruit from the terminal branch.

Chapter 601.29(2), Florida Statutes, the Florida Citrus Code authorizes site visits to the State's commercial groves for objective fruit measurements and counts. Initial phone calls will be made prior to each visit to announce the visit and to obtain information about dogs on the property or spraying.

Ratio indications of the initial interview acres to acres reported on the parent survey are computed to determine if acreage revisions are in order.

Enumerators ask about applications of pesticides for safety reasons, since they will be handling the live plants in the field.

Two trees will be selected for each sample. In Florida, one terminal branch will be marked for each tree. In California, two terminal branches will be marked for each tree. The terminal branches will be located and marked according to specific procedures to assure randomness in field location and branches on the selected tree. Fruit counts, fruit measurements, and maturity determinations will be recorded during each collection using the size card and measurements on Form C. In Florida, data are entered into regression equations used to forecast gross yield and the components of yield: number of fruit and weight per fruit. The counts and measurements from all visits are added to the historical database used to derive future forecast equations. In California, average fruit per tree and fruit size measurements are calculate. These variable along with bearing acres, trees per acre, are used in regression equations to forecast total production.

Regional laboratories record measurements of fruit on the Form C or size card. Lab samples are submitted for every sample hand-harvested by field enumerators. Lab measurements for tree nuts (almonds and hazelnuts) will include weighing as well as recording the length, width, cross-width, and weight of the fruit. These data will be obtained in a controlled environment.

A series of equations will be used in forecasting the components of yield based on fruit count, size, and weight. Linear regression equations relate historic number of fruit per terminal branch to number of plants at the end of the season.

3. Describe methods to maximize response rates and to deal with issues of non-response. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

The National Association of State Departments of Agriculture (NASDA), under a cooperative agreement with NASS, hires and helps NASS train quality field enumerators. The Florida Department of Agriculture and Consumer Services (FDACS) will hire and help NASS train quality field enumerators and analysts for the Florida Citrus Objective Yield program. The majority of the field enumerators come from rural or agricultural backgrounds. They are aware of many of the complexities of the farming industry and the importance of having accurate and timely data when making operating decisions. Many of the field enumerators have been collecting data for NASS for multiple years. Most of the field supervisors have been collecting data for NASS for over 20 years.

In addition to their experience in the farming industry and in prior data collections, enumerators receive rigorous initial and on-going interviewer training from NASS and NASDA/FDACS. Specifically, Objective Yield enumerators attend State training workshops in which field procedures, measurement techniques, and interview skills are reviewed. Enumerators also learn how the survey information is used, which enables them to communicate the purposes and use of survey data to potential survey participants. All enumerator procedures are subject to quality control review in order to keep non-sampling errors at a minimum.

To maximize response rates, NASS tries to utilize the same enumerators across all field enumerated surveys. This helps farm operators to become accustomed to providing data to the same enumerator on a regular basis.

4. Describe any tests of procedures or methods to be undertaken.

No tests of procedures or methods are planned.

5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), or other person(s) who will actually collect and/or analyze the information for the agency.

Survey design and methodology are determined by the Summary, Estimation, and Disclosure Methodology Branch of the Methodology Division; Branch Chief is Jeff Bailey (202) 690-8141.

The sample size for each State is determined by the Sampling, Editing, and Imputation Methodology Branch of the Methodology Division; Branch Chief is Mark Apodaca (202) 690-8141.

Data collection is carried out by NASS Regional and State Field Offices, the Director of Western Field Operations is Troy Joshua (202)720-8220. The Director of Eastern Field Operations is Jody McDaniel (202)720-3638.

Coordination of data collection, training, and quality control is the responsibility of the Survey Administration Branch in the Census and Survey Division. The Division Director is Barbara Rater, (202)720-4557. The current survey administrator is Doug Boline (202)720-7734.

January 2023