Agriculture Counts

The Founding and Evolution of the National Agricultural Statistics Service 1957-2007

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USDA

AGRICULTURE NASS COUNTS

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NOTE FROM THE AUTHOR

Preparing this publication has been a labor of love. It was particularly a joy to trace how original research or new ideas later became incorporated into the agency's estimating programs and standards.

The publication is dedicated to past and present USDA statistical programs staff members. Those employees have always embodied teamwork, and most new programs and activities resulted from many people working together. In keeping with that teamwork philosophy, this report concentrates on accomplishments and minimizes mention of specific individual's names. This approach was also taken to avoid unintentional omission of key individuals—if attribution had been attempted. Thus, past and present staff members reading the publication will have the opportunity to reminisce and personally relish their role(s) in the developments.

This publication is a written history of a statistical organization rather than a statistical publication. Thus, there are no formulas, explanations of complex estimating methods or detailed graphs included. Two types of data tables are included for each key time period. They summarize changes in U.S. cash receipts from farm marketings and per capita consumption of meat, poultry, and fish as those measurements do track important changes in the supply of and demand for agricultural products over time.

In preparing any detailed history, it is surprising how many contradictions are found when reviewing multiple documents from a specific period of time. When those types of discrepancies were uncovered, an effort was made to find additional sources to clarify the situation. However, there will be some details that individual readers disagree with—and likely some that escaped this research for which a reader has correct answers.

Thousands of pages of past publications, correspondence, and documents were reviewed in preparing this summary. The goal was to be informative and evenhanded in presenting a picture of the past 50 years. It would not have been possible, in this document, to cover all the developments.

Any history publication is shaped by the author. Thus, events based on my personal experiences are likely covered in more detail than others. Hopefully, all accounts are treated as impartially as possible.

I do want to recognize the contributions and encouragement of a number of people. First of all, there would not have been a publication without the initial invitation from Ron Bosecker and Jay Johnson's coordination and liaison efforts.

Bill Arends was my number one reviewer, clarifier, and consultant who suggested several alternative data sources. I received the legendary NASS "customer service" from Customer Service Coordinator Pat Joyce and her staff. Pat greatly assisted by contacting Larry Traub at the USDA Economic Research Service (ERS) to determine the best access to cash receipts and other databases that helped track U.S. agricultural changes. Another important customer service contact was David Stallings of the USDA World Agricultural Outlook Board (WAOB) who, in typical fashion, knew of an obscure USDA publication that documented Federal Farm Program changes.

John Ranek uniquely contributed to the research for this publication upon his retirement by donating two, three-ring binders of agency staffing and position rosters. These materials answered a number of questions about timing of specific events and subunit names at specific points in time. Jim Olson provided an important explanation of the reason why a large number of staff members retired just before the major increase in agency staff that occurred around 1990. Paul Walsh added a number of reminiscences from his career, which helped to round out details of Survey Division activities.

Because this publication sought to trace ongoing themes such as technology, research, international assistance, and training, several individuals were key contributors. Jerry Clampet's draft summary of agency technology efforts and developments up to 1986 was drawn upon substantially. Bob Young, Arnie Wilcox, and Jack Nealon helped clarify technology details in recent years, and George Patton clarified the agency's early electronic report access and Internet efforts.

Mike Craig provided invaluable details on the agency's remote sensing research efforts—from the earliest explorations through the significant changes in recent years. Clare Boryan assisted by demonstrating how some new techniques were being implemented. Other Research and Development Division assistance came from Denise Abreu and Zulma Riberas working on an objective yield research history, which complemented efforts for this publication.

Paul E. Williams and Linda Raudenbush of the Training and Career Development Office were willing contributors of background information and details of agency training developments over the past 20 years. Larry Sivers provided a number of summaries of past international training and assistance efforts, as well as firsthand explanations of recent activities that have not yet been fully documented. Larry also provided comments on the short-lived Economics, Statistics, and Cooperatives Service, as he was in a key staff position at that time.

Other important contributors included Rafael Sánchez, who provided agency civil rights accomplishments data tables; Dania Ferguson, who tracked some NASS/ERS financial arrangements; and Daryl Brinkman, who created a helpful table of annual Prices Received and Prices Paid Indexes. Dave Aune also provided opinions and suggestions whenever a new topic area was being pursued.

I would certainly be remiss if I didn't thank Amanda Pomicter for her efforts to categorize and organize the materials that have been donated to the Charles E. Caudill Library. Documentation for most events and activities recounted in this publication came from the library. Special thanks go to Karin Meyers, Debbie Norton, and Krissy Young for assisting with editing the publication, and to the staff in Administrative Support for printing.

Rich Allen

FOREWORD

The United States has long been regarded as having the world's foremost official agricultural statistics system. Early efforts to establish U.S. agricultural statistics starting in the late 18th century, and the establishment of a statistics unit in the U.S. Department of Agriculture (USDA) in 1862, are well-detailed in "The Story of U.S Agricultural Estimates," published in 1969 by USDA's Statistical Reporting Service (SRS). That publication masterfully highlighted key demographic, political, climatic, and agricultural factors that led to changes and improvements in the widely available official agricultural statistics.

Pages 100 to 104 of "The Story" briefly cover some USDA agricultural statistics development from 1957 to 1966. However, this publication starts with 1957 because it was the pivotal year Congressional approval was received for a long-range plan to implement probability-based survey procedures. Work on that plan was one factor that led to the establishment of the Statistical Reporting Service—now the National Agricultural Statistics Service (NASS)—as a USDA agency in 1961.

"Agriculture Counts" follows a format similar to "The Story" by dividing the past 50 years into five time periods—each marked by new programs or other advances—and highlighting the major developments that occurred in each period. A prologue is provided for each time period in order to identify factors leading to the significant changes. This publication differs from "The Story," however, by describing ongoing developments (such as personnel changes, training programs, research efforts, and new technologies adopted) in each time period. In this way, readers might better grasp how the working environment and staff responsible for agricultural statistics have changed and evolved.

Part 1 of "Agriculture Counts" starts with the 1957 Long-Range Plan and highlights the efforts to implement probability based area frame surveys. It also describes the role of the SRS in developing USDA data processing capabilities.

Part 2 of this chronicle explains how the new area frame survey capabilities were very helpful for improving and stabilizing major crop estimates, but were not as successful for livestock estimates. The solution was to apply additional probability-based survey techniques and to incorporate list and area frame surveys into a new, multiple frame estimation program.

Part 3 describes another new long-range plan established for the agency in 1982. This plan again had significant technology and statistical implications but primarily emphasized how a statistical agency and its staff should be organized for the most effective response to outside developments. The plan's emphasis on developing standards for all agency operations provided an important basis for introspection and improvement.

One lesson of "The Story" was that factors causing great concerns in the United States (such as preparation for World War I, the Great Depression, the Dust Bowl of the 1930s, and World War II) often led to expanding agricultural statistics needed for public policy and program implementation. This is again evidenced in Part 4, which describes how food safety and water quality concerns in the late 1980s led to funding and the creation of new survey programs.

The last portion of this publication (Part 5) covers the past 10 years, when U.S. census of agriculture responsibility was merged with the ongoing agricultural statistics programs of NASS.

The merger of the two organizations' staffs and their missions has been helpful in standardizing agricultural statistics for all data users.

Most of this publication has been based on available program, budget, and personnel files. Significant budget numbers are presented both in actual dollars and in 2007 equivalents (using a simple Consumer Price Index adjustment). Another important addition was the review of a vast array of national conference summaries, task force reports, research reports, outside review recommendations, and other special analyses of internal and external proposals throughout the 50-year period. Specific historical accounts were used to round out details of events during each period.

Part 1: Implementing Improved Survey Procedures - New Directions for Agricultural Statistics

PROLOGUE

By the mid-1950s, the United States had benefited from 90 years of United States Department of Agriculture (USDA) agricultural estimates. The statistical program had evolved from providing mainly annual production and price estimates at the national level to a system of monthly State forecasts of major crop yields, and monthly price and livestock production (e.g., milk, eggs, and hatchings) estimates. Sub-State estimates had been established for a number of commodities. All State offices were operating under Federal-State cooperative agreements, which avoided duplication of efforts and provided additional statistical products of interest within most States.

In spite of an enviable record of timely, on-schedule forecasts and estimates, plus top-quality security, concerns were often raised about the accuracy of some forecasts and estimates and the size of needed revisions. A major USDA statistical system limitation was the near total reliance on non-probability survey methodologies. Major crop and livestock surveys employed large sample sizes selected from all portions of each State, but sampling frames that could enable selection of units with known probabilities of selection did not exist. Also, sophisticated models did not exist for predicting final production from early season observations.

Some significant concerns about the agricultural statistics system arose from the challenging cotton crop season of 1951. A detailed explanation of the weather and crop conditions in 1951 and the subsequent hearings held by a subcommittee of the House of Representatives Agricultural Committee is found in "The Story of U.S Agricultural Estimates." One major outcome of the hearings was the acceptance of a recommendation (and provision of funds) for establishing a research unit within the Bureau of Agricultural Economics. That unit specifically focused on the possibility of utilizing the Master Sample developed at Iowa State University (then Iowa State College). The Master Sample was a cooperative effort of Iowa State, the U.S. Bureau of the Census, and USDA to create a probability-based sampling frame for selecting survey samples. When completed in 1945, it provided an area sampling frame sample that would include about 300,000 farms—if all area frame segments were included. The Master Sample had been used to conduct the 1945 Census of Agriculture and for a few special national surveys.

The House of Representatives Subcommittee on Agricultural Appropriations of the Appropriations Committee had been particularly interested in the hearings on the 1951 cotton crop estimates. On July 31, 1956, Subcommittee Chairman Jamie L. Whitten of Mississippi wrote Secretary of Agriculture Ezra Taft Benson to express his interest. He specifically asked for USDA recommendations for development and improvement of agricultural estimating work. The response to Chairman Whitten provides the starting point for this publication—and the improvements that have been made in the past 50 years.

Chapter 1: The 1957 Long-Range Plan

The 1957 Long-Range Plan entitled "A Program for the Development of the Agricultural Estimating Service," which was presented to the Subcommittee on Agricultural Appropriations of the House of Representatives Committee on Appropriations on February 7, 1957, was revolutionary. Instead of offering a "quick fix" to concerns about consistency of agricultural statistics forecasts and estimates (or just new surveys), the plan made the case for the orderly development of probability-based surveys to establish State and national estimates and forecasts for major topics and to integrate those surveys with existing, large-scale surveys, which would provide improved sub-State estimates.

Implementing the plan would change the size, structure, and character of the agricultural statistics organization. Funding was needed for the new surveys and associated research efforts. New sampling and survey techniques meant employees needed broader understanding of statistical techniques and alternative estimators. Advanced statistical skills were particularly essential for research and survey-testing efforts. A cadre of part-time interviewers needed to be hired. Trainers needed to be developed at both the headquarters and State office levels to instruct and supervise the interviewers. New analytic skills were required to interpret survey estimators and marry probability and nonprobability surveys into the best possible estimates and forecasts.

Considering its significance, "A Program for the Development of the Agricultural Estimating Service" was an extremely short, efficiently stated document—less than 15 pages. One reason for its brevity was that no timetables or budget estimate details were included. Instead, a detailed background of the improvement needs was provided, followed by descriptions of the recommended new programs. (The entire document is reprinted in "AS WE RECALL: The Growth of Agricultural Estimates, 1933–1961," which was published by SRS in 1977.)

The proposed program consisted of four "Projects" (A, B, C, and D, in order of priority). Project A was to develop operational enumerative and objective yield surveys (building on research efforts already underway) to improve midyear and end-of-year farm numbers, and crop and livestock estimates, as well as to form a basis for special surveys.

Project B was designed to improve agricultural price statistics. It called for establishment of a corps of price enumerators in each State and modernization of the prices received and prices paid by farmers survey items that would be collected. Project C had the goals of speeding up transmission of data from State offices to headquarters and improving dissemination of reports to farmers and the general public. It also proposed to add procedures for creating quicker and more frequent evaluations of adverse impacts such as freezes, droughts, and floods. Project D broadly aimed to provide new or more detailed estimates of items of interest such as employment on farms, fruit tree numbers, crop variety data and other variables.

The presentation to the Subcommittee on Agricultural Appropriations in February 1957 emphasized the plan itself and did not mention funding. Subcommittee Chairman Whitten expressed appreciation for the comprehensive response to his request, but he stated that funding requests needed to proceed through the normal annual budgetary processes. In 1957, annual funding received for research and development had increased to about $500,000 ($3.6 million in 2007 dollars), which allowed continued research.

Definition of Probability Area Sampling

To better appreciate the long-range plan and the new procedures to be tested, it is helpful to consider the basic concepts. Probability sampling requires that a sampling frame exist and the probability of selection of any specific sampling unit can be calculated. The basic sampling frame to be used for the agricultural, statistics improvements was the Master Sample for agriculture, which had been constructed at Iowa State College between 1943 and 1945. The Master Sample covered all land in the 48 States (incorporated and unincorporated areas, as well as open country areas where most farms were located).

Physical boundaries were used for defining all sampling units (segments). The original total sample of the Master Sample was expected to include 300,000 farms if all segments were visited. The sample design

was defined such that smaller sample sizes could be selected and still maintain the probability selection criteria.

Two basic estimators were created from the interview results. The first was referred to as the "open" segment. For this estimator, data were summarized and expanded only for farms that had their physical headquarters within the segment. This estimator was particularly appropriate for estimating total farm characteristics, such as farm numbers, economic data, and livestock numbers. For the "closed" estimator, expansions were made of all data located within the segment. This approach was efficient for estimating crop acreages, as all fields in the segments were drawn out on aerial photos and enumerated whether the headquarters compound was in the segment or elsewhere. The field-by-field collected data also provided an up-to-date frame of the current season's fields and crop types used to select objective yield samples for observation during the growing season.

Research in the Mid-1950s

Using funds provided earlier ($100,000 added to the base in 1954, an additional $104,000 in 1956, and an additional $289,000 in 1957), an ongoing research and development program was underway. The spring 1954 sample size was 703 area segments in 100 counties within 10 Southern States. A December 1954 survey of actual acreage planted and yields was conducted in 325 "tracts" (i.e., areas operated by one entity within a sample segment) selected from the spring survey.

Modifications to procedures were made annually based on experiences to date. For example, it was soon found that a "skip" technique, in which residents within a segment were asked about the farming status of neighbors within the segment, was helpful in reducing the costs of developing a list of possible farm operators if a random segment fell into a small town. The pilot work was extended to additional States each year in order to study possible differences in application of the new procedures by region of the country.

In 1954, a selection of 200 cotton fields in 76 counties was made from the spring acreage contacts. Monthly counts and observations were made in those fields in order to develop models for forecasting the average yield of cotton. Similar objective yield research projects were implemented in subsequent years for corn, soybeans, and wheat. In addition to the studies on these major field crops, exploratory research work was conducted on potatoes in several States, oranges in Florida, hazelnuts in Oregon, tobacco in Kentucky, and a number of crops in California including peaches, pears, lemons, grapes, and walnuts.

Objective Yield Approaches

The concept of determining crop yields per unit of area had long attracted attention in many countries. In some areas of the world where producers have very small holdings of land and may not know their amount of area harvested or their total production, some type of objective approach might be the only way to get a meaningful estimate of the total crop. In those situations, an approach called crop cutting is often employed. The actual boundaries of a producer's crop fields are marked and the area is carefully measured. At harvest, yield per unit of area is estimated by physically harvesting a portion of the crop. For small grains in areas where the crop was randomly sown instead of being in fixed rows, sample harvest areas are often determined by tossing a hoop and harvesting all the plants with stems within the boundaries of the hoop. Then the grain from those plants is weighed.

In the United States, the normal goal of an objective yield survey was to develop an early-season indication (at least two to three months ahead of harvest) of the yield at harvest time. Because the June Enumerative Survey pilot testing provided a probability-selected listing of fields of major crops, most objective yield research was done by selecting samples from those fields. Cotton, corn, and soybean fields were selected, and field visits were made in late July to provide yield indications for the annual August "Crop Production" report. Sample fields were visited each month until harvest in order to provide information for new monthly yield forecasts. Some fields were revisited after harvest to measure harvesting losses.

To control nonsampling errors, the sample units in major field crop yields were quite small. The original operational-size sampling units were two adjacent rows, 15 feet long for corn; two adjacent rows, 10 feet long for cotton; two adjacent rows, 3 feet long for soybeans; and three adjacent rows 26.1 inches long for wheat. Metal U-shaped frames of exactly

the right length were developed for the soybean and wheat samples to further control nonsampling errors.

Separate models were developed for projecting both the number of fruit (soybean pods, cotton bolls, wheat heads, and corn ears) to be harvested and the weight per fruit. All information from previous years was retained and forecast models were created based on those data. It was easier to forecast the number of fruit to be harvested (particularly for corn) than the weight per fruit. The simplest August forecast model for ears at harvest was to multiply the current year's number of plants per acre by the previous five-year ratio of ears harvested per plant. The simplest August weight per ear forecast model was to use the previous five-year average ear weight. Statistical analyses of previous years' data were able to improve on these simplistic fruit and weight-per-fruit models. Objective yield approaches forecast biological yield for a sampling unit. It is essential to adjust that yield for the expected harvesting losses.

Many other factors were used to improve objective yield forecasts. When samples of fields were selected, each producer was asked for permission to visit his/her fields. Additional information was collected about the field, such as: the acreage of any areas within the field that were not planted with the crop of interest or that had been destroyed after planting; planting date; variety planted; and other data. The collected data were important in making sure that the sample plots would be established within areas of the field that would be harvested for the crop of interest. For example, if part of a corn field was to be harvested for silage instead of grain, that portion would be excluded from sampling and an adjustment in the forecast of acres for corn for grain would be made.

One important factor in formulating forecasting models was maturity stage of each unit at the time of the observation. Late-developing fields might have lower yield potential than normal fields. By retaining all information from previous years, different models were developed by monthly maturity stage in order to create appropriate forecasts in case of an early or late planting season.

Sample optimization calculations for objective yield surveys usually indicated that field-to-field variation had greater impact than within-field yield variation. That would argue for observing only one plot per field. However, because the cost of visiting a second unit in the same field was so much less than driving to a new field, the operational procedure was to establish two random plots in each field. This also permitted calculation of within-field variation for future optimization studies.

U.S. Agriculture, Circa 1957

American agriculture was undergoing a number of significant changes by the mid-1950s. Mechanical tractors, mostly very large steam tractors best suited to plowing and harvesting of small grain crops in the Great Plains, had been introduced about the turn of the 20th century. They were not practical for most farms, and the number of horses and mules on farms to provide power for field operations peaked at about 27 million at the end of World War I. Gasoline tractors that were smaller and more suited to tillage operations of row crops were developed around 1930, but the dire financial climate of the Great Depression limited the adoption of this new mechanization. Animal power was still the primary mode of operation for many U.S. farms up to and through World War II, with some 12 million horses and mules still used on farms.

Following World War II, raw materials were again available to increase the production of tractors and related machinery, and gasoline was in good supply. Use of the smaller tractors allowed many small farms to move away from animal power. The number of tractors on farms increased from 2 million in 1945 to nearly 4.5 million in 1957. Along with more tractors came the increased use of grain combines and hay balers.

Farm numbers declined rapidly after World War II, as many farmers turned to other vocations. The total number of U.S. farms declined from nearly 6 million in 1945 to less than 4.4 million in 1957—a decline of nearly 1.6 million (26.7 percent) in the 12 years.

In general, crop yields increased greatly in the postwar years as farmers increased the use of hybrid and other improved seeds. The use of commercial fertilizers also became more common. The U.S. average yield of corn for grain increased from 36 bushels per acre during 1945–49 to 48.7 bushels per acre average during 1955–59, an increase of 35.3 percent. The U.S. yield per acre for all winter wheat increased

from 17.8 bushels per acre during 1945–49 to 23.2 bushels per acre during 1955–59, an increase of 30.3 percent.

There were two significant changes occurring in U.S. cotton production. Average acreage harvested declined some 32.5 percent between the 1945–49 average of 21.3 million acres and the 1955–59 average of 14.6 million acres. At the same time (and possibly due in part to not planting much of the less productive acreage), average yield per harvested acre increased from 270 pounds per acre to 428.2—an increase of 58.6 percent.

Perhaps the biggest postwar-period field-crop story was the tremendous increase in acreage planted and harvested of soybeans for beans. Soybean production had increased during World War II when imports of fats and oils to the United States were cut off. After the war, the Nation became an exporter of oils, proteins, and oilseeds. At that time, soybean meal was also becoming an important ingredient in balancing animal and poultry feed rations. The average acreage harvested of soybeans for beans increased from 10.5 million acres during 1945–49 to 21.3 million acres during 1955–59, an increase of 102.9 percent.

Much of the acreage increase was due to shifts from corn for grain to soybeans. Soybean production affixes nitrogen in the soil, so it is a beneficial crop to use in a planting rotation with corn. In spite of the huge increase in soybean acreage from 1945 to 1949 and from 1955 to 1959, the combined total acres harvested of corn for grain plus soybeans for beans changed only from an average of 87.3 million to 87.8 million. The average yield of soybeans increased from 19.7 bushels per acre during 1945–49 to 22.6 bushels per acre during 1955–59, a 14.7-percent increase.

The second largest postwar agricultural crop theme was likely the decline in the harvest of oats. A good share of the traditional oat harvest went to the feeding of horses and mules being used for power on farms. With the rapid replacement of horse power with tractors, the average acreage of oats harvested in the United States declined from 39.9 million acres during 1945–49 to 33.1 million acres during 1955–59, a 17-percent decrease.

One livestock story in the making was the behind-the-scenes developments in the broiler chicken industry. Before World War II, chickens were mainly produced for eggs. Most farms purchased baby chicks in the spring to become the laying flocks for that fall through the following summer. The baby cockerels were sought after for meat when they were large enough because chicken meat available later in the year was not usually very tender or flavorful. Poultry was not rationed during World War II, and interest had developed in growing chickens for meat. New self-feeding and watering technologies were developed along with improved disease-control techniques. Around 1955, some national feed companies started contracting with farmers to produce broiler chickens. Before that time, no operations were selling 100,000 broilers per year, but by 1964, 12.5 percent of all chicken farms were selling 100,000 birds or more.

Table 1. Per Capita Consumption of Meat, Poultry, and Fish, United States, 1957

Total Population	171,274,000	
Category	Total Consumption (Pounds/person)	Percent of Total
Beef	65.6	37.6
Veal	7.8	4.5
Lamb	3.7	2.1
Pork	56.7	32.5
Chicken	24.5	14.0
Turkey	5.9	3.4
Total Fish	10.2	5.8
Total Meat, Poultry & Fish	174.4	100.0

Table 1 summarizes the U.S. average per capita consumption levels of various "meats" in 1957. Beef and pork accounted for more than two-thirds of the meat, poultry, and fish consumption. The country was primed to eat more meat, poultry, and fish in total, but the relative shares of consumption were going to change.

Table 2. Cash Receipts from Farm Marketings, by Commodity Groups, United States 1957

Category	Total Cash Receipts (Million dollars)	Percent of Total
All Cash Receipts	29,692	100.0
Total Crops	12,312	41.5
Food Grains	1,868	6.3
Feed Grains	2,394	8.1
Cotton	1,755	5.9
Oil-bearing Crops	1,181	4.0
Tobacco	971	3.3
Fruits and Tree Nuts	1,287	4.3
Vegetables	1,711	5.8
Nursery, Greenhouse, Flowers	529	1.8
Other Crops	616	2.1
Total Livestock and Products	17,380	58.5
Cattle and Calves	6,187	20.8
Hogs and Pigs	2,854	9.6
Sheep and Lambs	297	1.0
Dairy Products	4,630	15.6
Eggs	1,686	5.7
Broilers and Farm Chickens	1,041	3.5
Turkeys and Other Poultry	349	1.2
Wool	104	0.4
Other Livestock and Products	232	0.8

As shown in Table 2, 58.5 percent of all 1957 farm cash receipts came from livestock and products (such as eggs and milk). The 41.5 percent of cash receipts from crops included 5.8 percent from vegetables; 4.3 percent from fruit; and 1.8 percent from greenhouse, floral, and other nursery products.

The average U.S. value of farmland in 1957 was $97 per acre. However, there was great fluctuation from State-to-State. Average values per acre were in the $70 to $80 range for many Plains States such as Kansas, Nebraska, and Texas. Average value per acre was $276 in California and $275 in Illinois. In Indiana and Iowa, 1957 average farmland values per acre were $230 and $221, respectively.

Agricultural Statistics Staffing, Circa 1957

The USDA Agricultural Marketing Service's (AMS) Agricultural Estimates Division State field offices in the late 1950s were specifically staffed for the survey and summarization procedures at the time. Each office had a relatively small staff of statisticians who reviewed the survey summaries, submitted recommended forecasts and estimates to headquarters, and prepared State releases for most reports after the national reports were published. Field office Federal statisticians were all male. Field office directors recruited most of the new professional employees at agricultural colleges and, at the time, few women studied agricultural fields. There were a few women in statistician positions in headquarters and some in State payroll statistician or analyst positions in a small number of field offices.

Each office had a sizable cadre of experienced Comptometer operators who sorted survey questionnaires as they were received, added survey responses to subtotals and totals for each geographic division, and calculated State totals, averages, and percent changes, as appropriate. All calculations were checked by another person.

For greater computational speed and to improve accuracy, a technique known as pegstripping was used for many surveys. Questionnaires were printed on paper that had a series of precisely placed holes across the top of the page. Questions to be answered were on the left side of each page, and the answer blanks were placed in a column along the right border. When completed questionnaires were returned to the office, they were sorted by county (i.e., for major surveys requiring county estimates). The sorted questionnaires were then placed on special metal bars that had a row of embedded pegs matched to the pattern of holes in the questionnaires. A fully assembled pegstrip was held in place by another bar, which clamped tightly over the row of pegs. A summary questionnaire from a specific county (often a different color than the survey questionnaire) was placed first and returned questionnaires from that county were overlaid such that only the answer cells were visible.

A pegstrip could hold only about 20 questionnaires, so multiple subtotals were needed for counties with many responses. Each pegstrip was not taken apart until all item counts and totals had been added and

checked. County subtotals were added to county totals, if necessary, and the county answer sheets were placed on pegstrips by Crop Reporting Districts (CRDs). Similarly, after calculating CRD item counts and totals, those answer sheets were assembled in the same fashion in order to calculate State results. The process proceeded efficiently, as most offices utilized many large tables as staging areas to coordinate all the pegstrips during various stages of the tabulation process.

Office Comptometer operator staffs were usually large enough to handle monthly operations, but additional help was needed for large-sample quarterly, semiannual, and annual surveys such as crop-planted acreage in the spring and crop acreage and production surveys at harvest. To handle the added volume of tabulation work, each office had a separate cadre of individuals who would work during those peak periods. Those individuals were known as WAE (when actually employed) employees. WAE employees did not receive some benefits of full-time employees and were limited in the number of total days they could be employed each year.

When the enumerative survey and objective yield research efforts began, field enumerators and supervisors were hired under the WAE provisions. It was not envisioned that the new enumerative approaches would become a source of full-time employment.

Training in the 1950s

Until work started on the enumerative and objective yield procedures, there was little need for ongoing training schools. Survey due dates and submission schedules were transmitted in written instructions. Whenever a national or regional conference was held, there might be topics on analysis techniques, such as interpreting statistical regression relationships when submitting recommendations to headquarters after conducting mail surveys. In addition, training sessions on modern statistical methodology had been held for statisticians in charge of State offices at Iowa State College in 1939 and 1940.

The addition of personal interview and field observation surveys, as well as the use of part-time enumerators, meant that training schools would be needed on an ongoing basis. There were some past experiences to draw upon, as some special surveys had been conducted using the Master Sample area frame sample.

Three nationwide interview surveys on farm employment and wages had been conducted in 1945. In 1946, a Special Statistics Branch had been created in order to better focus on improvement of survey procedures. Branch employees took the lead in planning and carrying out a nationwide Enumerative Survey in January 1947; about 10,000 short-form questionnaires and 5,000 long-form questionnaires were collected. The Branch also assisted on special projects such as corn yield surveys in Virginia and North Carolina in 1949, 1950, and 1951, and the census of agriculture pretests.

Other major projects included the Farm Housing Survey of 1950 and the 1955–56 Farm Expenditure Survey, which provided information for updating the indices of prices paid and received. The Expenditure Survey had two components—farm production expenses and family living expenses—with about two-thirds of the sample devoted to farm production questionnaires. As a result of the USDA 1953 reorganization—which abolished the Bureau of Agricultural Economics and established the statistical work at AMS—the planning of and training for enumerative surveys fell under the Special Statistics Branch.

The Special Statistics Branch led the training for the 1954 June Enumerative Survey by conducting a training school in the spring for State supervisors. Each subsequent year, questionnaires and instructions were improved and updated in time for new training sessions. Trainers soon realized one of the most difficult tasks was to reorient experienced enumerators to new practices when required.

Testing Project A Approaches

Although the implementation of probability-based surveys was definitely the right course for improving agriculture statistics, there was no unanimous agreement within the Agricultural Estimates Division about this new approach. One concern was cost; proposals in the late 1940s for an annual sample census of agriculture (which would have involved the Census Bureau and USDA) were dismissed when it was discovered that operational costs would be about 10 times the original projections.

Another concern in many State offices was the possible disruption of the present data series and data relationships. Many offices had annual State farm census programs that provided detailed district and

county data for crops and livestock and served as convenient sources of new names for mail- survey sample replacements. An additional and likely concern was that direct adoption of new probability indications as estimates might lessen the role and prestige of State statisticians.

Perhaps one of the biggest underlying issues was that a new culture might be taking over. Most statisticians in the State offices at the time had developed their skills mainly through on-the-job training. Therefore, they were skeptical of having mathematical statisticians, who lacked the same practical experience, directing the new procedures.

Given the internal concerns in the agency, it was fortunate that a measured approach was taken in developing and proving the value of the new surveys. As mentioned earlier, the initial research sample size in 1954 was 703 area segments in 100 counties in 10 Southern States. A number of States were involved in learning the new procedures and there was opportunity for comparing results and survey problems across States. The scope was not overwhelming—a small group of survey trainers could keep in good contact with all 10 States. A similar approach was taken in testing cotton objective- yield procedures in 1954; a subsample of only 200 cotton fields were selected from the spring enumerative survey field listings.

Chapter 2: A New Agency Is Formed

From 1922 (when the Bureau of Markets and Crop Estimates became part of the Bureau of Agricultural Economics (BAE)) through 1960, the statistics function within USDA was part of another parent organization alternately called the Bureau of Agricultural Estimates or the Agricultural Marketing Service (AMS). When Orville L. Freeman became the Secretary of Agriculture in 1961, he reorganized the functions of the Department into four groupings of program agencies, plus a fifth grouping to include statistical reporting and agricultural economics research. This grouping was under the director of agricultural economics, instead of the Assistant Secretary of Agriculture.

The reorganization established two new agencies: the Statistical Reporting Service (SRS) and the Economic Research Service (ERS). SRS's functions included those that had been performed by the Agricultural Estimates Division and the Statistical Standards Division of the former AMS. ERS combined a number of activities formerly under AMS with some functions of the USDA Agricultural Research Service (ARS) and the USDA Foreign Agricultural Service (FAS). The reorganization was effective April 3, 1961.

When SRS was formed, it essentially received only one new professional employee, Dr. Harry C. Trelogan, who was named as its administrator. Dr. Trelogan received his Ph.D. in Agricultural Economics at the University of Minnesota in 1938 and subsequently served in a number of USDA positions. At the time of the reorganization, he was serving as the assistant administrator for marketing research in AMS. Dr. Trelogan was quite familiar with the statistics programs of the Department, though formerly he had had no responsibility for those programs.

The original SRS structure was comprised of three divisions and the Crop Reporting Board (CRB). The Agricultural Estimates Division had five branches: Agricultural Prices, Dairy, Field Crops, Fruit and Vegetables, and Livestock and Poultry. The Field Operations Division included 43 State offices and the Survey Operations Group. The Standards and Research Division included the four branches of Research and Development, Special Surveys, Statistical Clearance, and Data Processing. The Statistical Clearance Branch carried out a number of functions for the Department and coordinated all Department forms and surveys with the Bureau of the Budget.

The First SRS National Conference

In February 1961, at the same time that Secretary Freeman issued a Secretary's Memorandum establishing the SRS, the Agricultural Estimates Division State statisticians and branch chiefs were meeting in Biloxi, MS. Word of the upcoming change came during the Biloxi meeting, but participants continued their discussion of the important issues of proceeding with implementation of the 1957 Long-Range Plan. They were working to explore alternatives for better using producer lists and discussing ways to automate data processing.

Because of the reorganization, another national conference was scheduled for Denver, CO, in March of 1962. This conference again included all State statisticians, with wider participation from headquarters units.

One conference highlight was Dr. Trelogan's first address to the agency. He used the title "To Acquire and Diffuse Information" based on wording from the Organic Act that created USDA. He emphasized throughout the presentation that all staff members in the agency were important to its mission and success.

Dr. Trelogan compared the agricultural statistics system to electrical wiring in a house. Houses once existed without electricity and were built with just basic features when circuits were first installed. As new housing features such as improved appliances, heating devices, and air conditioning were installed, improvements were made in the capacity and efficiency of the wiring. He added that the house's existing wiring could not be discontinued as new improvements were awaited.

The speaker provided a good summary on the size and scope of the estimating and publication program as of 1961 and the basic methods being employed. The presentation then turned to the goals of the Long-Range Plan, the present status of research and funding, and his vision for the advantages and likely outcomes of implementing Projects A, B, C,

and D.

Dr. Trelogan would become particularly associated with efforts to expand the use of modern data processing technology, and during his presentation he did touch on the need to adopt improved procedures. However, his emphasis then was that automatic data processing (ADP) techniques were specifically needed to best calculate sampling errors and create improved estimating models, rather than for all the current procedures of the day.

Making Project A Fully Operational

The funding levels received since 1957 had permitted the expansion of enumerative and objective yield pilot efforts from 10 Southern States to include two more Southern States, 12 North Central States, and 4 Mountain States. The pilot efforts were generally encouraging. They demonstrated that enumeration was successful when enumerators used an enlarged aerial photograph to show interviewees the defined segment and to mark the boundaries of operations and fields within each individual's holdings. The enumerative survey approach also allowed calculation of sampling errors. The aerial photograph provided firm control of potential non-sampling errors, such as enumerating the wrong location, including too much land, or missing areas that should have been enumerated.

No additional funding was received until the 1961 budget. In that year, the AMS submitted a request for $2.2 million specifically for Project A. USDA submitted $500,000 in its request to the Bureau of the Budget, but noted it would be willing to recommend an increase of $700,000 for a total of $1.2 million if additional ceiling positions would be allowed. The Bureau of the Budget allowed only the request for $500,000, but the House Committee on Appropriations provided a total of $750,000. This appropriation was actively supported by Senator Milton Young of North Dakota. Thus, $750,000 ($5.1 million in 2007 dollars) became available July 1, 1960. It was the first funding installment needed to fully implement the new survey methods.

The 1961 funding allowed the enumeration of operational size samples in 15 States: Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. In addition, expansions were also made for Ohio, as a significant amount of research work on Project B price-improvement approaches was happening there.

The 1961 summary approach required State offices to add data responses within sample segments to segment totals and to expand those totals to State totals. Segment listing sheets were transmitted to Washington, DC, for conversion to input into the available electronic computer used for calculating sampling errors at the State and 16-State levels. The computer summaries also provided a check on the State expansions. The timing was tight because the June Enumerative Survey was conducted between May 27 and June 9, and the CRB needed the hog inventory and pig-crop expansions for the report to be issued June 19.

Expansions and sampling errors from the 1961 survey fell mainly within expectations, except for high sampling errors in Oklahoma and wider diversity than expected between traditional survey results and the enumerative survey acreage for cotton in Texas and Georgia. Intentions-to-farrow expansions also were hard to interpret compared to ongoing survey levels. The coefficient of variation (relative sampling error) for total numbers of farms in the 16 States was an encouraging 1.5 percent.

The high sampling errors in Oklahoma may have been symptomatic of problematic relationships noted in early testing of the enumerative survey procedures in Western States. The Master Sample of Agriculture was based on a concept of segments containing somewhat uniform numbers and types of farm operations. The approach worked quite well in the Midwest, Eastern, and Southern States in the 1940s and 1950s, but many of the Western States had a dichotomy of cropland and rangeland agriculture. In addition, many of those States had large areas devoted to American Indian Reservations, Federal parks and installations, and State land holdings. The answer for the Western States was to create area frames that first stratified land based on the intensity of cultivation. Sample selections would then be made within each of the land use strata.

There was quite a different concern in the Northeastern States. As those States became more and more urbanized, traditional segments varied considerably in the number of farm operations. For sampling efficiency, those States were also stratified by land use

before sample selection, but the key stratification variable was the amount of urbanization.

The basic enumerative survey design called for a systematic rotation of segments (normally one-fifth of the segments per year) to prevent respondent fatigue. Because of the new area frame construction work that was needed in addition to the preparation of new rotation segments between 1961 and 1965, an area frame unit was created in headquarters to supplement work continuing at Iowa State University.

The June Enumerative Survey was operational in 48 States in 1965; it provided the first probability-based estimates of national crop acreages.

New Technology in the 1960s

The biggest technology emphasis in the 1960s was to improve the summarization of agency data collection efforts by automating data processing procedures. The enumerative and objective yield surveys required statistical measures of survey variances and changes from previous surveys, which could only be provided in a timely manner through automation.

One of the earliest discussions of data processing advances occurred at the 1957 AMS Agricultural Estimates Division (AED) National Conference. Glenn Simpson, Agricultural Estimates Division deputy director, "spun a little pipe dream" as part of his presentation on "Possibilities for Electronic Computing." Although Simpson expressed his view that no one could foretell all innovations to come, his thinking was based on technology that had recently come into being. His vision was that the agency might develop a regional approach with small or midsized computers in three or four locations, each serving about 10 States. Individual offices would create survey outputs on paper tape and send the tape overnight to their regional center. Results would then be sent back to the originating offices on paper tape for the creation of estimates and recommendations for headquarters. In addition, the submission of materials on paper tape would be summarized on the larger computer—an IBM 650.

There were many complicating factors in addition to the technology itself. All State offices operated under Federal-State cooperative agreements and some State departments of agriculture were interested in computer technology. In some cases, State-owned computers became available to field offices and some offices received State funding and staffing that would allow them to take a leadership role.

Computer operations actually began in 1958 when AMS acquired an IBM 650 computer and established a Data Processing Branch within the Agricultural Estimates Division. Much of the initial staffing came from the Division, but many employees, including the branch chief, came from other parts of AMS. Some of the earliest programming efforts were to develop routines for processing monthly surveys such as for cold storage and livestock slaughter. However, a major priority was to automate summarization of the enumerative and objective yield surveys that were being pilot tested and that required detailed calculations for evaluating various estimators and approaches.

By 1961, when SRS was formed, at least 26 field offices had some access to computing facilities. However, the types of equipment and formats for input and output varied greatly; many of the capabilities used electronic accounting machine (EAM) equipment instead of what was normally considered as a computer. The State processing capabilities were largely used for State or cooperatively funded projects, or for Federal surveys that did not have specific formats for submitting results to headquarters in machine-readable media. One decision made in 1961 was to install EAM equipment in two States (Illinois and Wyoming) to determine the types of applications that might be feasible for other States.

The 1961 June Enumerative Survey pilot testing for 16 State offices was processed in headquarters by having those offices submit all segment-level raw data on listing sheets. Those data were keyed and processed on an IBM 360 computer. The processing time for data from 12,000 farms in the pilot study was 150 hours, which required around-the-clock shifts. The need for extra shifts continued for several years. In spite of incremental increases in computing power, the June Enumerative Survey size and workload was increasing each year, as the agency worked towards an operational 48-State implementation.

The data processing role of SRS was broadened in 1962 when the Washington Computer Center (WCC) was created by USDA from the original Data Processing Branch. A few months later, USDA defined the WCC as one of three USDA computer

centers around the country.

The WCC was originally located outside the USDA South Building, but for greater data security was eventually relocated to here in 1966 to a space adjacent to the Crop Reporting Board (CRB). At that time, the WCC was renamed as the Washington Data Processing Center (WDPC) and was established as a division in the new reorganization of SRS.

Training in the 1960s

One of the major culture changes for USDA's statistical effort in the 1960s was the largely expanded emphasis on training. As mentioned, regional training schools operated each year to prepare State field office supervisors for conducting the enumerative and objective yield surveys and training of enumerators. Those schools were expanded each year up to 1966 as more field offices were added.

The agency developed a new program to provide selected staff members with a yearlong program of graduate-level statistics training. The program started with two people attending North Carolina State University (NCSU) for the 1960–61 academic year, followed by two people each at NCSU and Iowa State University (ISU) for 1961–62. NCSU and ISU were specifically chosen for their strong sampling programs. The selected participants started during the summer session in order to get more familiar with the school, and then they were transferred to headquarters to work on research and methodology issues after completing their studies the next spring. The program was designed for up to four slots per year and is still in operation. A variety of graduate schools have been used over the years, but most participants have attended or currently attend either NCSU or ISU.

In addition to the full-time program, the agency developed two statistics correspondence programs (basic and advanced). For those hired under an alternative standard because of a deficiency of undergraduate statistics coursework, the completion of both programs met the additional training requirements. For someone who met the college coursework requirements, the advanced correspondence course offered good background for the statistical applications being adapted for the enumerative and objective yield programs. Taking the correspondence courses might also encourage an individual to apply for the full-time training program. Approximately 222 staff members took these courses between 1963 and 1968; an undetermined number took local mathematics and statistics courses. Many staff members in headquarters also took courses at the USDA Graduate School.

The new surveys and statistical applications not only affected the work of statisticians in the State offices, but also changed workloads and procedures for the clerical support staffs. In recognition of these facts, training sessions were provided for the support staff leaders in each State office.

Supervision and management training was another agency priority. A summary presented at the 1968 SRS National Conference showed 187 training sessions in the broad category of administration, management, and supervision; 151 of those were seminars organized and presented by USDA in which SRS participants were exposed to other USDA agency personnel.

During the 1960s, however, more people probably received training in data processing than in any other subject. Nearly every field office and headquarters staff unit provided some basic data processing training for their staff members. From 1957 onward, some individuals received specific programming training to assist with computer and EAM equipment being acquired. In 1964, five agency staff members were selected for an intensive six-month, full-time ADP Systems training program; they were then assigned to the five branches in the AED. A year later, a 12-month WCC intern program was started. It provided eight months of language and computer-concepts training and four months of WCC experience. The intern program was geared for four to six participants a year, and 15 SRS staff had completed the program by the time it ended in 1970.

The 1966 SRS Reorganization

During its first five years of operation, SRS experienced nearly constant change. Project A pilot testing involved additional States and new geographic challenges each year. These surveys were creating new indications that needed to be evaluated and interpreted in concert with the traditional survey indications. Total staff numbers were rapidly increasing and many new staff members had more diverse backgrounds than members hired 10 to 30 years earlier.

Data processing techniques were becoming more and more important for the smooth transition to the probability-based surveys and estimators. In addition to SRS priorities, the establishment of the WCC meant that attention had to be paid to a number of outside demands.

Concerns about these demands and about how to best manage communications and the technical statistical programs for the next 10 years or so were a major topic for the State statisticians in charge of field offices and branch chiefs who attended the SRS regional conferences in early 1965. Comments and discussions from those conferences led to a detailed study of the agency and a reorganization that was effective November 10, 1966.

Subsequently, many suggestions for improving agency structure and communication were received; one included grouping the field offices into regions led by regional directors. The 1966 reorganization continued to have all State field offices reporting to one person, but that position was given to an assistant administrator instead of a division director from the former structure.

The AED now included the Methods Staff, with responsibility for the enumerative and objective yield survey specifications and summaries. The former five commodity branches were reduced to three by including Dairy in the new Livestock, Dairy, and Poultry Statistics Branch, and creating a new Field Crop, Fruit, and Vegetable Statistics Branch by combining two former branches. To recognize the growing interest in farm labor statistics, the Agricultural Prices Branch became the Agricultural Prices and Farm Labor Branch.

A new Survey and Data Division included the following: the Data Collection Branch with responsibility for questionnaires, instructions, manuals, and training for the new surveys; the Data Services Branch, with responsibilities for receiving data and recommendations from field offices, preparing materials for the CRB, and printing and issuing all national SRS statistical publications; and the Systems Development and Programming Branch, which took the lead role in all agency data processing applications. The Standards and Research Division no longer oversaw the WCC but retained the Research and Development Branch, the Special Surveys Branch, and the Statistical Clearance Branch. The WCC was renamed as the Washington Data Processing Center (WDPC) and was considered to be the fourth agency division.

U.S. Agriculture, Circa 1967

The number of farms in the United States continued to decline at a rapid rate. By 1967, the total was down to about 3.2 million—a decline of 1.2 million (27.7 percent) from 1957 and about one-half the number remaining at the end of World War II. The amount of land for farms had not changed at the same rate. In 1967, 1.1 billion acres were dedicated to farms, down about 5 percent from 1957.

Crop yields were continuing to increase significantly as farmers planted improved varieties and increased the use of fertilizers. The five-year average corn yield for 1965–69 was 78.5 bushels an acre, an increase of more than 60 percent from 10 years earlier. Acres of corn harvested for grain declined in the 1960s compared to the 1950s (the 1965–69 average harvested acreage was 56.7 million acres compared to 66.4 million acres 10 years prior). But, acreage would increase again in the 1970s. A good part of the corn acreage decline was due to provisions of the Farm Bill in effect. Because of corn surpluses, acreage diversion programs were in place during most of the 1960s; farmers would receive dollar payments or "payments-in-kind" (i.e., titles to certain amounts of corn in Federal Government storage) for diverting specific amounts of their corn base to conservation practices. This type of program was not in place in the late 1950s.

The soybean crop average yield for 1965–69 was 25.7 bushels per acre, up nearly 14 percent from 10 years earlier. Acreage of soybeans harvested continued to increase significantly. The 1965–69 average of 38.7 million acres reflected an increase of more than 80 percent from 10 years earlier. The increased acreages and yields resulted in the first 1-billion-bushel soybean crop in 1968.

Cotton yields for the 1965–69 period averaged 480.8 pounds per acre, up 12.3 percent from 10 years prior. Acres harvested fluctuated greatly during the 10-year period from the late 1950s to the late 1960s, and declined to less than 10 million acres in 1966 and 1967. For the 1965–69 period, the average acres harvested were 10.5 million, down nearly 28 percent from 10 years earlier.

Winter wheat yields continued to increase in the 1960s. The first U.S. average yield above 30 bushels per acre occurred in 1969. The average yield for 1965–69 was 28.2 bushels per acre—a near 22-percent increase from 10 years earlier.

Production of oats in the United States continued its rapid decline. Acres harvested during the 1965–69 period averaged only 17.6 million acres, down nearly 50 percent from 10 years earlier. Yield per acre was increasing to an average of 50.4 bushels per acre for 1965–69, but the total annual production dipped below 1 billion bushels in 1962 for the first time since the 1930s. Total annual production will probably never reach that level again.

Table 3. Per Capita Consumption of Meat, Poultry, and Fish, United States 1967

Total Population	198,712,000	
Category	Total Consumption (Pounds/person)	Percent of Total
Beef	79.8	40.4
Veal	3.3	1.7
Lamb	3.4	1.7
Pork	55.0	27.8
Chicken	36.7	18.6
Turkey	8.7	4.4
Total Fish	10.6	5.4
Total Meat, Poultry & Fish	197.5	100.0

As shown in Table 3, total per capita consumption of meat, poultry, and fish in 1967 was up considerably from 174.4 pounds noted in 1957. Consumption of poultry was up almost 50 percent to 36.7 pounds per person. Inspection of all broilers traded across State lines had started in 1959, and retail broiler prices were very low between 1958 and 1961 when the industry was overproducing. Per capita consumption of beef rose from 65.6 pounds in 1957 to 79.8 pounds in 1967 (partly due to a decline in veal consumption from 7.8 to 3.3 pounds), and turkey consumption was up from 5.9 to 8.7 pounds during the same period. There were only small changes in pork (56.7 to 55 pounds), lamb (3.7 to 3.4 pounds), and fish (10.2 to 10.6 pounds) consumption during the 1957–67 period.

Farmland values were up considerably across the country from 1957. The average U.S. value per acre was $168 ($1,018 in 2007 dollars) compared to $97 ($699 in 2007 dollars) 10 years earlier. Prices increased 50 percent or greater in almost all States.

Table 4. Cash Receipts from Farm Marketings, by Commodity Groups, United States 1967

Category	Total Cash Receipts (Million dollars)	Percent of Total
All Cash Receipts	42,817	100.0
Total Crops	18,434	43.1
Food Grains	2,361	5.5
Feed Grains	4,393	10.3
Cotton	1,095	2.6
Oil-bearing Crops	2,795	6.5
Tobacco	1,391	3.2
Fruits and Tree Nuts	1,817	4.2
Vegetables	2,680	6.3
Nursery, Greenhouse, Flowers	861	2.0
Other Crops	1,041	2.4
Total Livestock and Products	24,383	56.9
Cattle and Calves	10,550	24.6
Hogs and Pigs	3,809	8.9
Sheep and Lambs	302	0.7
Dairy Products	5,742	13.4
Eggs	1,765	4.1
Broilers and Farm Chickens	1,314	3.1
Turkeys and Other Poultry	460	1.1
Wool	75	0.2
Other Livestock and Products	268	0.6

Cash receipts from farming in 1967 were significantly higher than in 1957, even when Consumer Price Index changes were factored in. The 1957 cash receipts had been $29.7 billion (in 1957 dollars) and the 1967 total was $42.8 billion (in 1967 dollars). In 2007 dollars, the totals are $213.9 billion and $259.5 billion for 1957 and 1967, respectively. Livestock cash receipts again accounted for more than half the total (56.9 percent). Some of the biggest percentage total increases from 1957 were for

feed grains (mostly corn), oil-bearing crops (mostly soybeans), and cattle and calves.

Research in the 1960s

A wide variety of research studies were conducted during the 1960s. Even though the enumerative and objective yield surveys were becoming operational, there were significant research efforts underway to improve procedures. One of the most important studies concerned the count units used for soybean objective yield plots. The original design called for detailed fruit counts for each plant per month within each of the 3-foot row spaces that made up the sample plots. Often by the first visit in late July, the plants had not yet started to bloom, so only the number of plants was counted. However, many fields might have been in full bloom by late August, and it might have taken four hours or so to count all the blooms on the plants in the four 3-foot sections of row. In later months, when only pods were present, the counts would not be as high. (Pods were easier to count.) Enumerators with a large soybean sample assignment might not be able to complete the full workload, and State office personnel were often assigned to help them.

There were two other major concerns: working outside in a hot crop field for three to four hours was a potential health issue, and the accuracy of difficult, detailed counts was in question.

Controlled, detailed studies were conducted using plant-by-plant counts compared to the plant averages from the 3-feet units. The studies searched for an optimum number of plants or fixed length of row (smaller than 3 feet) to use for counting fruit. After studying all correlation analyses, a new 6-inch fruit-count section was added. All plants were counted in each 3-foot section every month. Detailed fruit counts were made only in the next 6 inches of each row. To maintain strict control of nonsampling errors, new metal soybean frames were fabricated with three fixed tines (i.e., one at the start of the unit, one at the 36-inch point, and the third at the 42-inch mark). Because the tines were 4 inches long, the frame clearly indicated which plants should be included in each count.

Another important type of soybean analysis was proceeding in the Research and Development Branch. Detailed monthly counts of blooms, pods, pods with beans from previous years, and the final yield results from the same fields were subjected to a vast number of regression analyses. The goal was to find maturity breakpoints better related to the final yield levels than to just group all samples as pre-bloom, blooming, and podding. New maturity categories were created based on the relative percentages of fruit present in the bloom, the pods without beans, and the pods with beans stages. Those maturity categories were an important advance in creating improved forecasts of yields, particularly for the September 1 "Crop Production Report."

A few key 1960s corn objective yield research studies were yield validation efforts. Forecasted yields per acre tended to be higher than farmer-reported average yields for the same fields, particularly in the case of corn. Two types of studies were conducted. The first type was a 1965 corn-weighing project in which portable scales were used to measure all the corn harvested from special samples of fields in four States. Numerous objective yield units were laid out and harvested in those sample fields just ahead of harvest to form the objective yield estimate of average yield per acre.

A second type of study involved row-by-row, plant-by-plant inventory of two corn fields in Maryland and the establishment of 80 sample units in each field in 1969. Many Research and Development Branch office staff members, including the area frame construction unit staff, assisted in those detailed counts. That study also checked the weekly afterharvest to determine how fast the grain left on the ground at harvest time disappeared.

One interesting conclusion came out of the corn-weighing efforts. Although the calculated yield per acre was normally higher than the farmer-reported yield per acre for the same field, the calculated production from the objective yield approach was often close to the weighed production. The difference was in the acreage concepts. When a field was selected from the June Enumerative Survey for objective yield observations, the field and crop acreage figures from June were used as starting points. The farm operator was then asked about the size of any areas within the field that were not in the crop area planted (e.g., lanes and waterways). The operator was also asked about planted areas that would not be harvested at all (e.g., areas drowned out or destroyed by some mechanical problem). The resulting objective yield crop

field often had less net acreage than operators originally thought. When operators reported production figures at the end of the season, they were still using a larger acreage and, thus, a lower yield per acre.

The gross versus net acreage differences did not account for all differences between objective yield and farmer-reported yields, but they did narrow the gap. Another reason cited for possible differences in harvested yield levels is that the objective yield approach calculates biological yield and then subtracts out an estimate for harvesting loss. There was a concern that all harvesting losses could not be measured, especially as corn harvest shifted from harvesting in the ears to using combines that shelled the kernels from the ears.

One intriguing theory about differences in objective yield and farmer yield levels concerned treatment of the units themselves. Enumerators were trained to not do any damage within the count units. (They also were not to enhance the unit by pulling weeds or making other changes.) Enumerators did all their observations and counts from outside the unit and did not get between the two rows of the unit. (It should not be a factor for corn, but for soybean, wheat, and cotton units it has been speculated that working around the units tends to push back the plants in the adjoining rows and perhaps gives the plants within the unit the added benefit of more sunlight and even more rainfall. Thus, there might be a positive conditioning effect.)

Although definite evidence could not be found to support any theory of nonsampling errors when enumerators were establishing the initial units, an additional precaution was added. The original instructions were to walk the predetermined number of paces, lay down a dowel stick at that point, and then mark out the unit. Enumerators were not to notice anything about the plants before stopping and were not to increase or decrease their final steps to avoid anything atypical. To deter any human tendency to pick a convenient stopping point, a buffer-zone concept was added. The enumerators would proceed with their rows and paces as before and lay down their dowel sticks. However, they would then measure an additional 15 feet down the row to find the starting point for the unit.

Research into some different objective measurement approaches started in the early 1960s. Apple and peach objective yield studies in Virginia were conducted largely using Research and Development Division staff members who could drive out to one of the main fruit-growing areas. In addition to the usual limb count and fruit-size observations, these studies incorporated ground-based color photography. The concept was that if fruit could be counted from the photos, then a double sampling approach could be used. Many trees could be photographed, which would require less detailed limb counts of fruit. Because many photos could be taken in a day's time, the counts from the photos could be made in the evenings and on rainy days, thus increasing productivity over a set number of days. One approach was to use a lightweight aluminum frame in the shape of a large plus sign to divide the side of each tree into four quadrants for the photos. Photos were taken of different sides of the trees to determine if the counts varied by quadrant and by side.

A feasibility study using low-level aerial photography to count livestock was conducted in 1966 over a 3,800-square-mile area in California. The study included enumeration of sample segments within that area, and ground-level oblique photos were taken of all visible livestock in the segments. Several photographic shortcomings were noted, such as: no presence of livestock in vast portions of the area; large numbers of non-visible livestock taking shelter from the Sun in shaded areas; and animals lying on the ground in some areas being confused with large rocks.

One of the most successful objective yield research efforts was the development of procedures for estimating Florida citrus production. Research was originally conducted on a number of different citrus fruits, but the efforts had been focused on forecasting the size of the early and midseason orange crop and the Valencia orange crop. There was such great interest in Florida that the Florida Department of Citrus provided funding to the SRS Florida field office by levying a tax on every field box of oranges harvested. That funding provided for a complete fruit-tree inventory every two years as well as the field work for making sample fruit counts on random trees and monthly surveys to determine fruit-size development and droppage. By the end of the 1960s, the Florida orange estimates had been completely converted to the objective methods. With the continuous surveys

in place, Florida also had a good base for special follow-up surveys that could determine the impact of freezes, hurricanes, and other widespread crop stresses.

Remote Sensing Research

A major addition to the research program started in midyear 1968 when a remote sensing research unit was formed. The first satellite designed for measuring crop-related phenomena would not be launched for another four years, but some remote sensing proponents were already predicting what major changes would occur because of satellite-based observations. These claims were based on very broad assumptions, without regard to the difficulties of obtaining and processing the vast amounts of data created by sensors on an earth-rotating satellite or the rigor required to interpret the signals and create quality estimates.

Most initial remote sensing research conducted by the agency was in conjunction with the ARS laboratory at Weslaco, TX. ARS specialists had done pioneering studies that demonstrated how different living plants varied in their reflection of light across the spectrum of wavelengths. Their studies started with just one leaf at a time, and they were planning to test the reflection signatures under field conditions. The laboratory had an aircraft and a variety of cameras that could collect photographic data in the near-infrared light range as well as normal true color. The statisticians hoped to persuade the ARS scientists to set up specific experiments ahead of photo acquisitions so that defensible conclusions could be reached.

The important crops in the Rio Grande Valley were citrus, cotton, sorghum, and vegetables. Samples of the four types of crops were selected and objective yield procedures used to estimate crop yields or fruit per tree. For the citrus studies, counting fruit from current photography (as had been tried with Virginia apple and peach trees) was explored. In addition, a new two-stage sampling approach to selecting limbs for fruit counts was developed as an alternative to the traditional random-path selection method, which required counting about 10 percent of the fruit on each sample tree. One unexpected result of the Rio Grande Valley remote sensing research was that a pilot test of an operational objective yield program was performed in the third year of research. Proposals for creating an operational program were then presented to members of the Texas Citrus Mutual to see if they would be willing to fund the new operations approach.

Estimating Program Additions in the 1960s

Although the implementation of the enumerative and objective yield survey programs greatly changed the culture of the 1960s, there were a number of other modifications to the overall agricultural statistics program. Some changes were prompted by new or increased Congressional funding. In the mid-1960s, funding became available to expand the annual cut-flower estimation program to 11 States. As a result, 77 percent of five flower types produced in the U.S. and surveyed at the time were covered by detailed estimates. During the same period, a mushroom-estimation program was funded for the major producing States of Pennsylvania, Maryland, and Delaware. Later in the decade, a quarterly farm-labor pilot program and quarterly probability surveys for estimating grain stocks were launched. In addition, responsibility and funding for the annual fertilizer program were transferred from ARS to SRS.

Some new or enhanced surveys came about through the AMS Matching Fund Program. The program provided Federal funding if a State department of agriculture (or State extension service or State experiment stations) initiated an approved project and contributed at least as much funding as the budget request to AMS. The AMS goal was the creation of either one-time or continuous data summaries that would improve the marketing of agricultural products. Projects usually were approved for two years with the understanding that matching funds for a specific project would not be provided for more than five years (though longer-term projects could be renewed after an intensive review). Some approved projects were for industry structure analyses, such as separating egg production into hatchery flocks and commercial egg-production flocks. The Matching Fund Program was instrumental in starting wheat-quality surveys for many major winter wheat-producing States in the 1960s and a potato-grade and yield survey in Idaho in 1965.

One important program addition in 1965 was the first-ever Agricultural Chemical-Use Survey that provided three significant features. First, there had not ever been any effort to evaluate which insecticides, herbicides, and other chemicals were actually

being used by farmers—and at what rates. Secondly, this survey was conducted for (and in conjunction with) ERS, SRS's sister agency. ERS had economists assigned to many of the State land-grant institutions, but they normally did not work directly with the State SRS offices. ERS field staff members attended the national training with SRS state supervisors and were expected to help with State training schools and data review. The third interesting aspect was the approach used to create the edit specifications. As this was truly the first survey of its type, there was no previous set of edit limits available. SRS state supervisors were encouraged to do a preliminary edit/review of early survey returns and develop suggested edit parameters by crop and type of chemical. Those suggestions were shared with the Survey Operations Group staff members in charge of the survey, and a final set of edit specifications was created.

Some estimating programs were enhanced based on analyses of the quality of the existing survey data even if new funding did not become available. For example, the "Pig Crop Report" was renamed the "Hogs and Pigs Report," and features were added such as estimates by weight groups in June and estimates of quarterly farrowings for all states. Another important new feature for data users was the creation of cattle slaughter estimates by sex.

Congressional funding did not always increase from year to year. Several specific estimates were discontinued in Fiscal Year (FY) 1969 because of funding shortfalls. However, almost all of the cuts were restored in FY 1970. These included early-season lamb crop estimates for Kansas, Texas, and California; the May maple syrup estimate; and May and September broomcorn production forecasts. Additional restorations were the annual estimates and two forecasts for apricots and nectarines, as well as annual estimates for avocados, dates, figs, limes, persimmons, pomegranates, and tung nuts.

International Assistance Before 1970

The National Agricultural Statistics Service (NASS) and its predecessor organizations did not have responsibility for creating agricultural estimates for any country other than the United States. However, the agency has always been quite open to hosting foreign visitors and discussing survey and estimation procedures. In addition, assistance has been provided to foreign countries through reimbursable programs sponsored by organizations such as the U.S. Agency for International Development (USAID), the Food and Agricultural Organization of the United Nations (FAO), the World Bank, and development organizations in specific countries. Agency personnel also assisted with the Bureau of the Census international training center, which included conducting training on area frame construction.

Most foreign assignments included assistance to create area sampling frames as a starting point for improving agricultural estimates. However, some projects have concentrated more on evaluations of existing survey and estimation programs and making improvement suggestions.

Some assistance has been provided via resident assignments of two years or more in a specific country. Since the 1960s, however, assistance has usually been provided through a series of temporary duty visits by a team of NASS employees, which is occasionally supplemented by other USDA staff members.

The first documented resident assignment was to Puerto Rico starting in 1949, followed by a Guatemala assignment that began in 1957. During the 1960s, resident assignments included two residents to Argentina and one each to Turkey and Pakistan. Five people participated in six-month assignments to Vietnam, which began in 1967. Other single-resident assignments included Chile, Ecuador, Dominican Republic, and Paraguay.

Staffing in the 1960s

At the time SRS was formed as an agency, the Civil Service Commission (CSC) issued new standards for statisticians. The basic hiring requirements were 15 semester hours of mathematics and statistics, with at least nine semester hours of statistics. A person could be provisionally hired if they had the combined 15 semester hours with only three semester hours of statistics, but they needed to complete two more statistics courses within the first three years of being hired. The new standards allowed the hiring of qualified candidates who met the mathematics and statistics requirements at the GS-7 pay level if they had more than a 3.0 grade point average (on a 4-point scale). One other provision allowed an individual hired as a GS-5 to progress to a GS-7 in six months by completing a qualifying training program.

Many new statisticians were needed to implement the additional workloads as the phased implementation of the enumerative and objective yield surveys progressed. With the annual additions to the budget ($500,000 for 1962; $780,000 for 1963; $860,000 for 1964; $591,000 for 1965; and $112,000 in 1966 specifically for the Long-Range Plan) considerable new hiring occurred, particularly in 1963 and 1964. Most new hires came from State land-grant institutions with which State statisticians were used to working.

There had been significant expansion of the professional staff during the testing of the Project A procedures. There were 246 statisticians on board in 1955 (183 in field offices). That number had increased to 317 by 1961, along with the field offices count totaling 249. By early 1965, the total professional staff had grown to 451 (331 in the field offices and 120 in headquarters), which represented a 43-percent increase from 1961. Much of the staffing increase in headquarters was due to the evolving data processing work and expansion of the mathematical statistician ranks.

Many new field office statisticians were assigned to enumerative and objective yield surveys, as well as to other duties. This meant they were attending regional and national training schools and had the opportunity to meet many of their new peers. One of their first tasks was to organize and present the training program to the field enumerators and supervisors. To be out of college for a year or so and then be asked to present a training program to experienced workers possibly three times your age could be a daunting task.

A number of guidelines for conducting state training schools were given at the regional and national schools, such as sample agendas and training tips. However, the newly hired statisticians usually were given a lot of latitude as well as responsibility for the entire school.

Participation in enumerator training schools by the field office directors varied by State. Some directors enjoyed participating and would openly engage questions from the enumerators. Others felt that enumerators should not be given much information about the sensitive work that went on in the office (i.e., estimating and forecasting); their presentations were normally not as well-received by enumerators.

Promotion and transfer decisions in the 1960s were made through a committee deliberation process, not via an announcement and application procedure. All employees at each grade level were evaluated based on annual performance reviews. A data table presented at the 1968 National Conference summarized the evaluations of 292 professional employees between the grade levels of 7 and 14. Of the total, 185 (63 percent) were on the best-qualified lists. More than half of the remaining employees (61 percent) were considered as having potential for promotion. The CSC had just issued guidelines for ranking employees for promotion, which closely paralleled the SRS approach. The National Conference presentation used a case study to illustrate how an employee previously considered to have no promotion potential could improve their work habits and advance to the best-qualified list.

Promotions were made only from the best-qualified lists. The assistant administrator, deputy administrator, agricultural estimates director, survey and data division director, and staff officer for career development would identify individuals from the best-qualified list who they felt were best suited for specific vacancies in branch chief, section head, and field office director positions. From that selection, they created a ranked list. That list would be discussed with the administrator, and possibly adjusted based on his input, before offering the position to the first person on the list. If that person did not accept the position, offers would be made to the other candidates in ranked order.

Part 2: Improving Survey Procedures by Creating Multiple Frame Estimators and an Enhanced List Frame

PROLOGUE

The enumerative and objective yield survey procedures tested and implemented between 1957 and the late 1960s were more successful for crop estimates than for livestock. Because livestock holdings vary greatly from operation to operation, it was difficult to pinpoint estimates levels—and sampling errors were larger. The shortcomings of making livestock estimates from the ongoing nonprobability surveys and the June and December enumerative surveys were evident when livestock estimates for the 1960–65 period were made following release of the 1964 Census of Agriculture (which was completed by the Bureau of the Census).

The 1964 Census data were released later than expected and revisions were published in late 1966 that covered six years instead of the normal five-year period. The upward revision in the total U.S. cattle herd received much attention and criticism. The January 1, 1965 estimate of total cattle and calves was raised from 107.2 million head to 109 million. Analyses of all survey indications and livestock movement data (e.g., slaughter and exports) revealed that estimates had been too low throughout the period. Also, the discrepancy was widening because too much reliance had been placed on year-to-year, survey-level changes. (Therefore, the January 1, 1966 total rose by more than 2 million head.) Many people in the cattle industry were extremely critical of the new estimates and at least one person wrote about "the phantom cattle herd" that SRS must have found.

SRS was already aware of an improved procedure for livestock estimates— the development of a multiple sampling frame approach that would combine list sampling with the area frame. Plans were already in the works to request Congressional funding for multiple frame testing, and the livestock industry frustrations influenced approval of the funding request.

There were also some crop estimation concerns. The June Enumerative Survey estimates were not demonstrating the same sampling efficiency that was initially expected. The Master Sample of Agriculture was developed in the early 1940s when there were roughly 6 million farms in the United States. By the late 1960s, the number of farms was down to 3 million, which resulted in fewer operations being contacted for the June Enumerative Survey and fewer choices being available for follow-on surveys.

Chapter 3: Changes and Improvements in the Early 1970s

Multiple Frame Estimation Description

Although some use of combined-area and list frame sampling had been applied as early as 1949 and the SRS June Enumerative Survey area frame procedures did use a small list of livestock extreme operators to minimize sampling variances, the definitive theoretical work on multiple frame sampling was performed at Iowa State University by Professor H.O. Hartley (with support from USDA). Hartley's early results were published in 1962. In 1966, he was a keynote speaker at a dinner that celebrated 100 years of USDA statistical programs.

Multiple frame estimation requires two or more sampling frames. One frame must contain all sampling units, and it must be possible to determine overlap between the other frame(s) and the complete frame. The SRS area-sampling frame was a complete frame of all land in the United States, and it was possible to determine operators of land within sample segments. However, it is expensive to conduct area frame surveys because of the costs for materials and for visiting new segments to find the farm operators. If a good list frame was available, it should be possible to collect highly sought data directly by mail or by telephone at lower costs.

Hartley's original multiple frame survey approach was based on new surveys from all frames at each point in time. However, SRS wanted to limit area frame surveys to just June and December due to cost. Thus, the SRS approach was to sample from both the area frame and list frame for the base June survey. Farm operators found in the area frame were matched against the entire list, which had been sampled. Any area frame operators not found on the list frame would constitute the "non-overlap" (or, "not on list") domain. Selection and expansion factors for the non-overlap domain were known, and follow-up surveys consisted of sampling both the list frame and non-overlap domains. Expansions were made for each domain, and the results were aggregated for the total estimates.

The multiple frame theory is relatively straight forward. However, actual practice requires clear, easy-to-apply rules for accurately determining overlap. Also, if the list frame is not very complete, then the process will not be very efficient; expansion factors and sampling variances are usually higher for the area frame.

Fine-Tuning Enumerative Survey Applications

From 1965 on, the June Enumerative Survey was regarded as the largest and perhaps most important survey effort of the year. Its acceptance as an excellent measure of U.S. agriculture was evidenced by the request from the Bureau of the Census to use the 1969 June Enumerative Survey as a quality- control measure for the periodic census of agriculture.

There were still a number of June Enumerative Survey adjustments and improvements made in the late 1960s and 1970s. The smaller-than-expected numbers of farm operators in the area frame segments meant that individual operators were contacted more often than desired for follow-on contacts, such as the objective yield, December Enumerative, and farm employment surveys. As an interim improvement, a faster rotation of segments (50 percent per year instead of 20 percent) was employed for the North Central States by 1970. This change in rotation pattern did not increase costs greatly or require the creation of many new materials because the original sample allocation created "clusters" of four segments, and rotation was within the original clusters. New land-use area frame samples were also created for those States, starting with Iowa in 1971.

In addition to calculating both the "closed" estimators (which accounted for crops and livestock only within the segment boundaries) and "open" estimators (which accounted for the total operations of farm operators living within each segment), SRS started creating weighted estimators in the late 1960s. For this estimator, whole farm information is needed for each farm operation that has any land within a sample segment. In creating expansions, those totals are adjusted by the proportion of the operation located in the segment. The weighted-segment estimator has smaller sampling errors than the open estimator, but it does require more information collected from the nonresident operators. This estimator can also increase nonsampling errors if a nonresident operator can not be found and if estimates are entered for the total operation data.

By 1970, the June Enumerative Survey was regarded as mainly a crop and farm-numbers data collection survey; data collection had been moved back about a week to occur around the first of June. Also, only livestock inventory and calves born data were collected instead of detailed livestock information. This change provided less information for both the June hogs-and-pigs estimates and the July cattle-and-sheep estimates, but it did provide more current crop-acreage data. However, all plantings were not completed by the June Enumerative Survey interviews, and a July Update Survey was used to create harvested acreage estimates.

Initiating Multiple Frame Surveys

SRS started some evaluations of multiple frame surveys as early as 1963 in Ohio and Mississippi. Evaluations began in Wyoming and Mississippi in 1965, and in Texas between 1966 and 1967. The Research and Development Branch started quarterly research efforts to improve hog estimates studies in Illinois, Iowa, Missouri, and Nebraska in 1968 and in Kansas in 1969, which resulted in quite favorable results. The first Congressional multiple frame sampling appropriation of $250,000 ($681,000 in 2007 dollars) was received in 1970, and a January 1 Cattle Survey was added for the five States that had been in research mode. The major multiple frame funding of $1.05 million ($2.7 million in 2007 dollars) was received in 1971. Five additional hog States were added to the March 1971 Hogs Survey, and six more States were added to the July Cattle Multiple Frame Survey. By 1974, multiple frame livestock surveys had expanded to 14 hog States and 28 cattle States.

In addition to improving the precision of multiple frame survey estimates, the multiple frame appropriation had one important and permanent impact on SRS. At the time the multiple frame appropriation was received, the agency also received strict ceilings on the numbers of Federal Government employees. Because the intent of the multiple frame approach was to conduct more surveys and all enumerators were Federal employees, it seemed that Congress had thrown the agency quite a curve. The agency established a contract-work task force to explore alternatives that could provide the necessary enumerator corps.

The task force considered many alternatives for providing and paying enumerators, including agreements with State departments of agriculture, universities, private businesses, or with the National Association of State Departments of Agriculture (NASDA). Because there would be significant cost and paperwork benefits by contracting with one organization that covered all States, the NASDA-type approach was particularly appealing. The task force also identified desirable contract features such as 12-month contracts that spanned Federal Government fiscal years and fixed administrative costs for each contract year, instead of payments to the contractor being determined by the total amount of survey work in a specific year.

A formal contract was prepared and issued through Federal Government procedures. Organizations bidding on the contract needed to show that they had the administrative structure to handle hiring and employee payroll in all States. NASDA bid on and received the initial contract, and it has been able to keep the contract ever since. The initial contract covered work in the 12 North Central States, but it worked so smoothly that new predator loss surveys in eight Western States were added to the contract in 1974. The agreement was eventually extended to cover all enumerator hiring.

It was necessary for the agency to alter operating procedures to properly implement the contract. Hiring of enumerators in each State is done by NASDA through one designated coordinator. Supervisory enumerators hire new enumerators in their areas as needed for specific surveys. The NASDA agreement allows for a new person to be interviewed today and then be on the payroll tomorrow—a great advantage over the typical Federal hiring process. Staff members in each field office determine the total enumeration workloads and the NASDA coordinator distributes the workloads to the supervisory enumerators. Even though field offices do not hire enumerators, they are involved in evaluation and can request that poorly performing interviewers not be used for future surveys.

Program Modification Proposals

Two interesting and important SRS priorities in 1970 were a detailed program review and the wide distribution of proposals for modifications in the content and timing of reports, primarily to collect comments. The reviewing programs and activities concept was a key topic at the SRS National Conference in Sep-

tember 1968. The SRS Planning Committee, in a December 1969 report to the administrator, called for a careful and objective evaluation of the entire program of reports because of changes in agriculture and statistical methodology. That evaluation was to include changes needed to CRB laws and regulations and to the frequency of estimates and forecasts.

Administrator Harry Trelogan established a planning committee subcommittee on program priorities and laid out nine historic concepts (e.g., frequency of reports, coverage by States, and survey indications to use) that should be evaluated. The first subcommittee responsibility was to evaluate the field crops program—nine hypotheses were provided as the starting point for evaluation. The subcommittee was given one constraint: total cost of the new program of reports was not to exceed current budget levels.

Preliminary subcommittee recommendations were presented to an April 1970 SRS National Conference and discussed in small group break-out sessions. There were considerable differences of opinion among the statisticians in charge and the deputy statisticians in charge at the conference, which were influenced by the location and types of agriculture in their respective States.

In August 1970, SRS distributed a series of proposals for changes in the statistical reports for field, fruit, and nut crops. The proposals were sent to nearly 800 contacts by the administrator's office, and field office statisticians in charge were encouraged to also distribute the materials. A memo from the planning committee to the administrator in January 1971 summarized 285 written responses. A small group of 28 responses showed opposition to any changes; 94 favored all listed changes and perhaps some additional changes; and 163 responders provided thoughtful evaluations of the proposals.

A final list of program modifications was published February 4, 1971. Major changes and recommendations included continuing the December "Winter Wheat Seedings Report" and the March "Planting Intentions Report;" discontinuing the "Rye Seeding Report," the April winter wheat production forecast and the July forecasts of corn and selected other crops; and continuing to publish acres planted and acres to be harvested, in July. Also, the date for the "Crop Production Annual Summary" was changed to mid-January from mid-December.

Perhaps the two most significant conclusions of the review process were not to replace the September and October "Crop Production" reports with one late September report but to shift to a limited-forecast concept. For States with less than 1 percent of the total U.S. production of a crop, only one early-season forecast and end-of-season estimate would be published. The total production of limited-forecast States was capped at no more than 5 percent of U.S. production for each crop.

The subcommittee continued its review activities. A detailed set of proposals for the livestock, dairy, and poultry programs was sent to a wide set of data users whose comments were requested by August 1, 1971. That review resulted in the closing of the Chicago dairy office; its duties were divided between the Wisconsin field office and headquarters. [Historical note: The Chicago dairy office was created during World War II by Dr. Trelogan when he was in charge of War Food Orders covering dairy products.] Other changes included classifying cattle inventories by weight and sex (instead of the traditional age and sex) and starting a midyear inventory report by classes in 1973. The agency also adopted the national board concept for setting national and regional livestock estimates in 1972. Use of the national board approach held up well when 1973 and early 1974 cattle-and-hog estimates were criticized by some inventory sources.

The livestock review was followed first by similar efforts for the seeds, vegetables, and potato programs and then by the farm labor and wage-rates program. The final review was of the prices program, which began in 1975.

New Technology in the Early 1970s

There was tremendous interest and considerable activity related to data processing advances in the early 1970s, but little agreement and progress. An SRS request for proposal (RFP) was issued in 1968 to acquire IBM 360/20 computers for field offices, and a machine was acquired for the Mississippi field office. However, USDA delayed additional equipment purchases until SRS developed long-range ADP plans.

The first proposed long-range ADP plan was very ambitious; it had six major subsystems and 44 projects. It was regarded as a working plan and a new RFP was prepared that called for six regional centers

with IBM 360/40 type computers and either 360/20 computers or data terminals for other field offices and headquarters. However, USDA would not issue that RFP either. Similarly, SRS proposed buying a 360/40 machine that the WDPC had been renting, but USDA would not agree due to the cost and the fact that part of the SRS justification involved non-USDA needs.

There was interest around 1970 in sharing computer programs across field offices, but existing programs had been written for a wide variety of equipment and often would need considerable reworking to be used in other offices. There was also interest in creating an agency mailing system, but the field offices did not want to give up systems they had developed.

An ADP Priority Committee was created in 1971, led by a division director and populated with staff members from each division. A task force to create a universe file system to build and maintain a list sampling frame was chartered in 1971. One effort that paid very quick returns was a push to create a parameter-driven generalized edit system that could be adapted to any type of statistical data. Work on specifications and coding started in September 1971, and the system was used in June 1972 for processing the farm production expenditure survey. The system was further tested that August by rerunning the 1972 June Enumerative Survey data and was used operationally to edit the 1972 December Enumerative Survey. A companion generalized summary system was also created.

A variety of different programming languages had been used by various individuals and agency offices. Those included Assembler Language, COBOL (Common Business-Oriented Language), FORTRAN (Formula Translator Language), and RPG (Report Program Generator). In 1972, COBOL was adopted as the agency's standard programming language and most new programs were developed in COBOL. Statistical analysis software (SAS) was introduced to SRS in 1971 by the Research and Development Division and installed at the WDPC. SRS contracted with the SAS developers to enhance SAS for the agency's survey processing needs (e.g., handling multiple input data sets to support edit and analysis of data from multiple States). New division statisticians learned to use SAS to conduct complex data analysis. As statisticians rotated to other SRS positions, such as those in Methods Staff, they spread the use of SAS into the operational program. In the decades to follow, SAS would serve as the primary survey processing system to sample, edit, analyze, and summarize survey and census data.

An organizational meeting was held in February 1972 to create the first multi-State data processing and mailing center. This Common Services group included the Colorado, New Mexico, Oklahoma, and Wyoming field offices; Colorado was deemed the hub office. Arizona was later added to the group. In June of that year, Iowa, Kansas, Missouri, and Nebraska entered into a different type of cooperation effort called the "4-State Project" where each field office created computer programs to be used in all four States. Another key 1972 effort was a task force to implement the use of the generalized edit and generalized summary systems for all acreage surveys.

A significant change came about in 1972 when the WDPC was transferred to the USDA Office of Information Services, thus ending SRS's role and responsibility for data processing activities for USDA and other Federal agencies. The change did not impact the SRS operational budget since nearly all data processing work had been paid for through reimbursements from other organizations.

Separate from the transfer of the WDPC, SRS began testing use of INFONET, a commercial nationwide teleprocessing network. The testing was successful and SRS proceeded by adding a few offices every few months. The new system provided much of the standardized processing capability that had been lacking and would provide additional security and backup for SRS data and systems. It also provided temporary increases in storage and computer power available for SRS peak processing needs, which were difficult for WDPC to accomplish. Additionally, with terminal access to the central computers, the new system provided quicker transmission of CRB reports and instructions from headquarters to the field offices. In 1973, field offices received generalized edit training, and 19 offices were operational in time for the June Acreage Survey. An Automation of County Estimates Task Force was created to identify desirable features to include in a system that could handle county estimate processes for all field offices. After the main features were identified, a separate Systems Design Subgroup was named to outline the needed programs and interfaces. A few field office programmers were then assigned to write the new

programs under the subgroup's direction. The key new advance in the county estimates system was the creation of composite estimators. The system created estimates for yields, birth rates, and total production, as well as acreages and livestock inventories. As long as survey or check-data indications could be converted to ratios of previous indications or estimates, the new system created composite estimates using various options for weighting factors.

By 1974, all CRB reports were sent directly to data terminals in each field office through the INFONET connections. Work started on designing an SRS data system that would operate from an official estimates database. This effort led to a shift to a database systems approach for creating new programs such as for the new "Export Sales Report."

Training in the Early 1970s

As in the 1960s, much of the agency training emphasis in the early 1970s was on data processing. Staff members took courses from universities, vocational schools, data processing vendors, and programmed instruction sources, which were helpful for the most basic introductory courses. A wide variety of regional and national agency training sessions were provided for field-office ADP staff members. Early in the decade, courses covered basics such as job control language and systems analysis techniques. Later, training sessions emphasized network processing techniques.

One new training emphasis in the 1970s was civil rights training that focused on equal opportunity. Civil rights was one of the six themes for the 1970 SRS National Conference. At the conference, Administrator Trelogan presented strong support for expanding employment opportunities across the country. One significant part of the conference presentations was a resource panel of SRS professionals and support personnel sharing their first-hand experiences with civil rights issues. Training programs were developed for supervisors, which included suggestions for developing civil rights sessions for all employees in the field offices.

A new, upward mobility program for computer training was announced. Field offices needed considerable data processing assistance, so existing support office staff members could apply for training opportunities to develop the needed skills.

Response to a Crop Disease Emergency

The 1970 national corn crop was struck by a severe outbreak of southern corn leaf blight (SCLB). This disease, caused by the Helminthosporium maydis fungus, had normally been a minor problem, but a new fungus race adapted itself by 1969 to Texas male-sterile (TMS) cytoplasm corn. Hybrid corn breeders had used TMS to eliminate the need for hand detasseling the plants, which was costly and not error proof. By 1970, an estimated 85 to 90 percent of all corn was based on TMS cytoplasm. The disease was noted early in the 1970 crop year in Southeastern States, as spores were carried by southerly winds to the Corn Belt during July and August.

The blight problem was noticed shortly after the August 1 crop production forecast. The U.S. September 1 corn yield forecast was reduced by five bushels per acre (from 80.9 to 75.9) from August, but there were concerns that the situation was still greatly deteriorating. SRS conducted a special forecast as of September 23, which was based on visits to the corn objective yield samples in the 24 States in the program, and it released the results on October 2. There was additional crop-condition deterioration, but that special forecast was within 2 percent of the final crop size. In total, the crop prospects declined 15 percent from August 1 to harvest, but this was due in part to drought conditions in some producing areas.

SRS conducted seed corn surveys to determine what supplies of hybrid corn would be available for the 1971 crop and what percentage would be susceptible to SCLB. Industry surveys were conducted in September and October 1970 and in January 1971. In spite of efforts to produce additional non-TMS cytoplasm seed, more than half of the hybrid seed available in 1971 was either TMS or blends of TMS with normal cytoplasm. SRS also conducted an intentions-to-plant survey in January 1971.

The disease problem presented an ideal scientific research opportunity. The launch of the first Earth Resources satellite was not scheduled until 1972, but the SCLB concerns for the 1971 crop encouraged the National Aeronautics and Space Administration (NASA) to sponsor a major research project to simulate information that would be available in the future from the new satellite. The SCLB experiment was a complex, well-designed study that was conceived, planned, and delivered on a tight timeta-

ble. SRS took the lead for USDA and worked closely with NASA and the Laboratory for Applications of Remote Sensing at Purdue University in program planning and execution. In total, some 17 Federal and State agencies and more than 1,000 people participated in the effort.

The experiment's goal was to observe and track the severity of SCLB throughout the 1971 crop year. One of the first decisions was to define the area of the Corn Belt. The study area was determined as the entire States of Ohio, Indiana, Illinois, and Iowa; the southern three Minnesota Crop Reporting Districts (CRDs); the eastern three Nebraska CRDs; and the northern Missouri three CRDs as well as the State's eastern and southeastern CRDs. This provided a study area that normally had at least 60 percent of U.S. corn production; it spanned 1,500 miles from east to west and up to 1,000 miles from south to north. Since the satellite simulations were going to be provided by high-altitude, near-infrared photography across the entire Corn Belt and low-altitude scanner data in western Indiana, north-to-south flight lines were needed to simulate the paths of Earth-rotating satellites.

Data collection plans were based on the SRS June Enumerative and Corn Objective Yield surveys. SRS created the sample of areas to be observed and all survey materials; led the training of ground observation personnel; and summarized ground data collected every two weeks. It was fortunate that a temporary area frame construction unit had been established in Hagerstown, MD, to create a new economic-surveys area sample. That unit created 6-mile wide (east to west) flight lines with sample segments that were 6 miles wide and 1 mile from north to south. The June Enumerative Survey type interviews, which mainly concentrated on identifying all 1971 crop fields in the sample segments on the baseline aerial photographs, were conducted by county employees of USDA's Agricultural Stabilization and Conservation Service. This group was particularly experienced in working with aerial photography.

Once the basic data on all corn fields were collected, samples of the fields in each segment were selected for observations by Extension Service personnel. Observations were made every two weeks—about the same day that the aerial photography and scanner data were acquired. The main sample-plot data collected were blight-severity ratings on a 4-point scale, which ranged from "none" to "slight" and up to "severe." Photos of 1970 plants in the different severity ranges were included in the training materials.

SCLB was indeed prevalent in 1971, but farmers were able to plant early in most producing areas. Early season growing conditions were quite favorable, and the weather was cool and dry from mid-July to mid-August—all of which contributed to minimizing the blight's impact. By late August, only 5 percent of the acreage had "very severe" infections, and less than 20 percent was in the "moderate" or "severe" categories. The crop matured earlier than normal in most producing areas, and infections that occurred late in the growing season had little crop yield impact.

Early Satellite Remote Sensing Research

Because of the early SRS remote sensing work and its lead role in the SCLB experiment, SRS was selected by NASA to study the potential of satellite imagery to collect agricultural data. Specifically, SRS was to focus on developing methods for identifying crop species and estimating crop areas.

The first project selected CRD study sites in Idaho, Kansas, Missouri, and South Dakota. High-altitude photography was collected in addition to the satellite data. June Enumerative Survey segments were used as the data collection units within each study site. A sample of segments was used for training photo interpreters and a computer classification model. The remaining segments were then classified by the two methods. Those results were compared with the actual crop acreages. Monthly field visits to observe crop conditions were made from August 1972 to October 1972 and from August 1973 to October 1973. The 1972 satellite data were not usable for the key months of interest, but the 1973 satellite data were nearly cloud-free, especially for Kansas and South Dakota. Overall, satellite data crop-classification results in Kansas and Missouri were nearly as good as photo interpretations based on aircraft data.

Some basic conclusions had become obvious. Nearly cloud-free satellite data would be needed for acceptable crop classifications. Atmospheric conditions varied enough from day-to-day and from one satellite overpass to the next; specific training was needed for each satellite-data acquisition, rather than applying classification parameters from one date or one satellite scene to other dates and scenes. The most en-

couraging conclusions were that June Enumerative Survey segments were ideal for developing training samples for analyzing satellite data, and that most satellite scenes in the North Central States had large numbers (20 or more) of segments per scene.

SRS was asked to participate in and help evaluate a project called the Large Area Crop Inventory Experiment (LACIE). This effort primarily focused on wheat, and it selected large segments (5 miles by 6 miles) that would be studied each year in an effort to estimate U.S. and Canadian wheat acreage, yield, and production. A secondary goal of LACIE was to be able to use the segment information and satellite data to draw conclusions about other areas of the world that produced the same crops, but normally did not publish any crop yield information.

Estimating Program Additions in the Early 1970s

One significant new survey in the 1970s was initiation of an annual farm production expenditure survey (FPES). The last data collection of farmers' expenditures had been in 1955. Congress appropriated $80,000 for FY 1971 ($398,000 in 2007 dollars) for the survey preparation efforts. One of the keys was work at Hagerstown, MD, to create a new area frame sample (separate from the June Enumerative Survey sample) for the survey program. Congress appropriated $1.15 million ($5.57 million in 2007 dollars) in FY 1972 to begin the operational program.

At the request of the U.S. mink industry, Congressional funding of $40,000 was provided in the FY 1970 budget. Most survey information came from lists provided by the mink industry, but the grower lists were compared with all respondents in the June Enumerative Survey to measure possible list incompleteness. Another example of Congressional funding based on industry input was $100,000 in the FY 1971 budget for white corn estimates in 10 States. White corn was added to the March Prospective Plantings and July Acreage surveys.

An operational Michigan tart cherry objective yield survey began in 1972. The survey used fruit-size growth and fruit-droppage parameters from tart cherry research efforts in the 1960s to forecast total crop size from spring fruit counts to harvest. However, a two-stage sampling technique developed for Texas grapefruit in the remote sensing work was used to estimate the initial fruit set. Each randomly selected sample tree was divided into primary limbs based on cross-sectional area measurements; one primary limb was randomly selected on a probability proportional-to-size basis. All count limbs on the selected primary limb were then marked, and two limbs were randomly selected for the fruit counts. The Michigan field office arranged to have limb-selection gauges fabricated from quarter-inch Plexiglas®. Each gauge was 8 inches long and 3 inches wide at the widest point. The gauge looked like a large key with a convenient handle at one end and two sets of step-down openings—one at the end of the gauge and the other on one side. If a limb did not fit into the largest opening, it was too large to be a count limb and needed to be subdivided. If a limb fit into the larger opening but was too large for the small opening, it was the right size to be marked as a possible count limb. Having the openings at both the end and the side made it easier for an enumerator on a ladder to reach the limbs at all angles.

Potato objective work was started in 1970. It was not feasible to collect much data during the growing season in order to forecast numbers and weight of potatoes per plant, so the survey was essentially an objective- harvest survey. Numbers of potatoes, size distributions, and weights were determined. Samples were often taken for grade and yield determinations. Much of the original funding for potato objective yield work came from the AMS Matching Funds Program. Congress did appropriate $100,000 ($203,000 in 2007 dollars) in FY 1974.

In late 1973, SRS received a new USDA responsibility. There was great interest to improve the monitoring of U.S. export trade, and a new export sales report was requested. SRS staff members created the procedures to receive, edit, and summarize all weekly certificates relating to planned shipments. The first weekly report was issued November 2, 1973. SRS issued the reports until October 7, 1974, when the responsibility for the report and the staff members working on it were transferred to USDA's Foreign Agricultural Service (FAS).

Chapter 4: A Leadership Change in the Late 1970s

Dr. Harry Trelogan, the first SRS administrator, retired in late 1975, and was replaced by William E. (Bill) Kibler. In contrast to Dr. Trelogan, Administrator Kibler had an almost exclusively USDA statistics career, starting as a Georgia field office student assistant in 1951. After graduation, he joined the North Carolina field office and later transferred to Georgia. He was in the first Math/Stat program during the 1960–61 school year at North Carolina State. After the year in school, he transferred to the Standards and Research Division (SRD) in headquarters and subsequently held several positions, including chief of the Research and Development Branch. He was selected as the Research and Development Division director in 1970 and became the Survey and Data Division director in 1972. Kibler had transferred to the North Carolina field office as state statistician in late 1974 before being called back to headquarters to take over as administrator in November 1975.

Selecting a new administrator from within might have meant few changes in the agency. However, there were a number of other retirees in 1975 and many changes in headquarters and field office assignments. At the September 1976 National Conference, Kibler remarked that nearly 30 percent of conference participants were in different positions than 12 months earlier. One-fifth of the state statisticians had changed during that period. In a small front-office reorganization, the former program planning officer and career development officer positions were phased out. The assistant administrator was now responsible for agency administrative management as well as managing State statistical office operations. A new deputy assistant administrator position was established to aid with the new duties. The deputy administrator continued to direct the agency's technical program and chair the CRB.

List Sampling Frame—the Next Major Improvement

Since its inception in the 1860s, the USDA statistics unit had utilized list surveys. The earliest procedures contacted lists of county reporters monthly and utilized township reporters lists for the bigger acreage surveys. A hundred years later, headquarters and field offices had multiple lists for different purposes. In the 1960s, a monthly farm report list was maintained, along with larger lists for plantings and acreage and production surveys. Separate lists of livestock, fruit, vegetable, and specialty crop producers were also maintained.

The Bureau of the Census also relied on lists of farmers—particularly since they shifted to conducting the periodic census of agriculture almost entirely by mail. A new list of farmers was created for each census of agriculture by acquiring lists, such as USDA Farm Program participants, and adding to the list used for the previous census four or five years earlier. In the early 1970s, it appeared that Bureau of the Census (Census Bureau) and SRS might be able to work together and develop one list of farm operators. A Presidential Executive Order of January 17, 1973 created the standard statistical establishment list (SSEL) concept. SSEL would allow Census Bureau, Bureau of Labor Statistics, and other organizations that did business surveys to create common-standard sampling lists. Part of the SSEL would be a farm operators list that both the Census Bureau and SRS could utilize. List creation and maintenance costs should have been lowered and list coverage improved.

However, the SSEL concept could not be pursued for agriculture since it was determined that the special provisions that allowed the Census Bureau to receive names and addresses of farm income tax filers from the Internal Revenue Service would prevent the Bureau from sharing any lists with SRS. If SRS was to improve its lists of farm operators—and thereby improve its multiple frame surveys—it must develop its own procedures.

The list sampling frame concept went well beyond just an improved list of farm operator names. An efficient list sampling frame would be complete, have detailed and correct contact information such as address and telephone numbers, and have up-to-date information on commodities being produced and size of production. Operation size information would be especially important. With such a frame, effective stratification could be used to select efficient surveys for specific purposes, as well as to provide good coverage for multi-purpose surveys. It would be the perfect partner, in conjunction with the SRS

area frame, to create top-quality multiple frame estimates.

The February 1975 SRS National Conference themed "Maintaining Statistics with Integrity" introduced the SRS list sampling frame (LSF) approach. One presentation discussed the model to be used to create an unduplicated list. The underlying record linkage theory had been created by I.P. Fellegi and A.B. Sunter of Statistics Canada and had been published in the Journal of the American Statistical Association in 1969—but had not been used operationally for as challenging an application as the SRS LSF. Funding for developing the LSF was included in the FY 1976 budget submission, and new funding of nearly $1.23 million ($4.36 million in 2007 dollars) was received.

There were a number of greater problems in creating a top-quality farm operators list frame, compared to creating a list frame for other types of businesses. Many farms did not have a name, and ones that did often conducted business using individual names. Many farm business transactions were relatively informal; companies dealing with farmers might keep records under nicknames instead of given names used for farm programs and other formal purposes. Many farms were family operations where transactions might take place under various family members' names. Many individuals on farm program lists were farm owners instead of active farm operators. In addition to these problems, many lists that contained farm operators were being kept in relatively informal fashions and in many different formats. Another difficulty for SRS was that many field office lists were maintained on State-owned computer systems and needed to be converted.

A fully integrated system of software programs and subsystems was needed, but there were few commercially available programs. (SRS was able to acquire a version of Soundex software that was used by law enforcement agencies to help match names that might have been misspelled.) Thus, many agency programmers were added to the effort along with mathematical statisticians working on specifications of each subsystem and agricultural statisticians preparing instruction manuals and helping field offices with research, testing, and implementation.

List Sampling Frame Development

The initial subsystem standardized names and addresses within each list source and classified each record as individual, partnership, or other (mainly corporate). The next major subsystem was record linkage, which used the agreement and disagreement of name and address information in the records to create linkage groups that should have referred to the same record. Agreement/disagreement weights were the key to the entire approach and would be set for each State based on a detailed analysis of input list samples. For example, two similar records from the same town would not get much agreement weight if each was listed just as RFD or RR1. However, if they had differing mailbox numbers, they would have a high disagreement weight. Once all list sources for a State were standardized and run through record linkage, manual resolution was used to determine if all records in a linkage group did actually relate to the same person (or operation), and if the automated-resolution computer programs had created the best name and address. A separate program matched records specifically on address to identify names that appeared to be different, but were likely related to the same operation.

In addition to the necessary features needed to build a list frame, additional subsystems were needed for overlap/non-overlap checking, sample select, mailing, maintenance, and others. Those routines were to have enhanced features, such as improved stratification capabilities, and the possibility of using a response-burden index during sampling to reduce the numbers of surveys for which an operation would be contacted. Work on all aspects of the total system was progressing at one time because it was hoped that the early programs could be written and tested in relative short periods of time.

South Carolina was the LSF test bed. An extremely wide collection of possible list sources was identified and acquired. These included rural electric power-user mailing lists, State commodity association lists, marketing program lists, a Farm Program tobacco list, County Extension agents' lists, and all existing South Carolina field office mailing lists. Nearly 200,000 mail records were used as input at a time when South Carolina was estimating 47,000 farms. One conclusion from the South Carolina experience was that using so many marginal list sources created excessive workload for little or no benefit.

Much of the September 1976 National Conference was devoted to detailed explanations of the list sampling frame system and plans. Some contractors had been brought in to help with the programming effort. At the time, it was projected that most list-build routines would soon be finished and an interim update system would be available within a year. However, the contract programmers were not effective, and additional agency staff members were added. Programming and testing of nearly every subsystem took much longer than expected due to complexity challenges, and most schedules for field office operations were missed.

Frustrations grew during 1977, and an intensive review session was held in February 1978 to re-evaluate plans and consider alternatives. During that session, it was recommended that nonessential features of the system should be dropped or postponed for future consideration. Following the review session, Administrator Kibler announced the formation of a temporary agency unit, named the List Frame Project Team (LFPT), to finish the LSF. Few personnel assignment changes were made, but all Survey Division and Research Division employees working on the system were now assigned to the same team and not reporting to different supervisors. Since the South Agriculture Building area frame construction and maintenance staff had recently been relocated to Fairfax, VA, there was space to co-locate all LFPT members in the same area. Formerly, the mathematical statistician designers and the agricultural statisticians assisting the field offices were located three floors away from the data programmers and system analysts.

The most important LFPT adjustment was having the key specifications designer and the main programming supervisor share the same physical office. The timelag in getting these two individuals together whenever a new idea or problem arose was now eliminated. They also now had the responsibility—and authority—to make final decisions.

The LFPT approach was quite successful in encouraging improved communications within the team and with field offices. The team was soon able to have the resolution subsystem outputs ready for field office action and to reschedule field office training sessions. Additional thinking solved some technical problems, such as creating an affordable cross-matching of individual type records with partnership and other records. The LFPT was dissolved in early December 1979, and all members returned to their operational unit positions.

U.S. Agriculture, Circa 1977

One illustration of how U.S. agriculture had changed by the mid-1970s occurred in 1975 when milk production, egg production, and farm labor and wage rates questions were removed from the monthly farm report survey. Milk and egg questions had been asked since the late 1920s, and labor questions started in the 1930s. During those eras, most U.S. farms produced much of their own food and needed considerable human power (family supplied or other) to operate a farm. As agriculture changed with fewer and larger farms, more mechanization, and specialization of commodities produced, the nonprobability farm report survey was no longer an effective vehicle for these questions. Thus, the farm report survey now had no standard monthly questions, but it focused on crop production, grain stocks, and special once-a-year questions.

The rate of decline in total numbers of farms slowed somewhat between 1967 and 1977. There were nearly 2.46 million farms in 1977, down 705,900 farms or 22.3 percent from 1967. During that same period, the numbers of hog farms dropped almost 40 percent, sheep farms dropped 50 percent, and cattle farms fell nearly 25 percent. However, the total numbers of both hogs and cattle on farms increased during those years. The number of farms with at least one dairy cow decreased less than 5 percent during the period. The total number of dairy cows on farms did decline by nearly 25 percent, but milk produced (per cow) increased by about a third, so milk production remained almost constant.

In the 1970s, most feed companies left the broiler contracting industry, but poultry processing plants were increasingly taking over ownership of the birds. This concept, referred to as vertical integration, ensured the processors steady supplies of broilers. Farmers were paid on a contract basis, with specific provisions based on weight gains and survivability of the birds that were placed on their farms. Some processors also were acquiring feed mills and hatcheries, in order to integrate the whole process from birth to slaughter.

Table 5. Per Capita Consumption of Meat, Poultry, and Fish, United States 1977

Total Population	220,239,000	
Category	Total Consumption (Pounds/person)	Percent of Total
Beef	91.5	44.2
Veal	3.2	1.5
Lamb	1.5	0.7
Pork	46.7	22.6
Chicken	42.7	20.6
Turkey	8.7	4.2
Total Fish	12.6	6.1
Total Meat, Poultry & Fish	206.9	100.0

Table 5 indicates that 1977 per capita consumption of beef was 91.5 pounds, up more than 14 percent from 1967. Beef supplies were at a record high in 1976, and per capita consumption of beef peaked at 94.1 pounds in that year. Chicken consumption in 1977 was 42.7 pounds per person, up 16 percent from 1977. Pork consumption in 1977 was 46.7 pounds, down 8.3 pounds, or 15 percent, from 1967. Lamb consumption per person continued its decline in the 1970s, dropping to 1.5 pounds per person. Veal per capita consumption in 1977, at 3.2 pounds, was nearly the same as in 1967, but it would quickly drop after 1977. Turkey per capita consumption in 1977 (8.7 pounds) was the same as in 1967, but fish consumption was up 2 pounds to 12.6 pounds.

In general, crop yields continued their steady increase from the late 1960s to the late 1970s. Average corn yields for 1975–1979 were 94.1 bushels per acre, up 15.6 bushels (or 20 percent) from 1965–1969. Average acreage of corn harvested was also up about 25 percent to more than 71 million acres. The comparable yield increases for soybeans and all wheat, respectively, were 3.7 bushels (14 percent) and 4.6 bushels (16 percent). Average acres of soybeans harvested increased more than 50 percent during the period to an average of 59 million acres—and a record of more than 70 million acres in 1979. Average acreage harvested of all wheat in 1975–1979 (at 46.3 million acres) returned to the approximate levels of the early 1950s, and they were up 6.4 million acres (16 percent) from 10 years earlier. The average yield of all cotton per acre was essentially unchanged between the two periods, but the acreage harvested did increase 11 percent.

In 1977, about 30 percent of the corn utilized was being exported. A new use for corn in the 1970s was the production of high-fructose corn syrup (HFCS). This thick liquid made from corn starch tasted sweeter than refined sugar, so smaller amounts could be used compared to sugar. It was also easier to blend into beverages than sugar. A specific total of the corn used for HFCS was not found for 1977, but 165 million bushels of corn were used in 1980.

Prices received by farmers increased rapidly from 1970 to 1974, then leveled off before increasing again in 1978. In 1977, the cash receipts to farmers from crops were slightly higher than from livestock and livestock products ($48.6 billion vs. $47.6 billion), a reverse from the usual relationship. Because of the higher crop yields, proportional marketings of feed grains, oil-bearing crops, and food grains were all higher than 10 years earlier. Fruit and nursery cash receipts made up slightly higher percentages of the total cash receipts than 10 years earlier.

Table 6. Cash Receipts from Farm Marketings, by Commodity Groups, United States 1977

Category	Total Cash Receipts (Million dollars)	Percent of Total
All Cash Receipts	96,235	100.0
Total Crops	48,600	50.5
Food Grains	6,055	6.3
Feed Grains	11,906	12.4
Cotton	3,470	3.6
Oil-bearing Crops	9,722	10.1
Tobacco	2,331	2.4
Fruits and Tree Nuts	4,603	4.8
Vegetables	5,609	5.8
Nursery, Greenhouse, Flowers	2,251	2.3
Other Crops	2,652	2.8

[table continues on next page]

Total Livestock and Products	47,635	49.5
Cattle and Calves	20,225	21.0
Hogs and Pigs	7,281	7.6
Sheep and Lambs	386	0.4
Dairy Products	11,752	12.2
Eggs	2,919	3.0
Broilers and Farm Chickens	3,235	3.4
Turkeys and Other Poultry	1,059	1.1
Wool	77	0.1
Other Livestock and Products	700	0.7

The average value of U.S. farmland in 1977 was $474 per acre, more than double the $168 for 1967. In 2007 dollars, the value was $1,583, which represented a 50-percent increase from 1967 and a higher figure than those for 1987 and 1997. Average farmland value from 1967 to 1977 in California increased only about 50 percent, but average values in Illinois, Indiana, and Iowa more than tripled. Average values in the Plains States were up about 2.5 times the 1967 averages.

Estimating Program Additions in the Mid- to Late 1970s

One government-wide emphasis in the mid-1970s was "metrification." Because of added interest in international trade, government agencies were to prepare for possible conversion to metric units or the necessity of providing information in both metric and English units. SRS responded by adding metric-converted data summary tables to its "Crop Production" reports. No questionnaire or data collection procedure changes were made. The philosophy was that questions about metric units would only be added if American agriculture started conducting domestic trading in metric units.

The wheat marketing year was changed to begin June 1 instead of July 1, in order to better measure changes occurring in harvest and marketing practices. With the change in wheat, all other grain and soybean stocks reports were changed from July 1 to June 1.

The farm labor surveys were changed to a probability basis in the mid-1970s. Broad nonprobability surveys were not effective when so few farms were actually hiring labor most months of the year.

In 1975, the white corn program was expanded by adding an acreage and production survey in the 12 estimating States. However, two years later, Congress withdrew the annual white corn and mink funding. Within three years, Congress again provided funding for mink statistics.

A significant portion of the SRS total budget each year came from reimbursements from other organizations (mostly Federal agencies and State cooperators). Around 1970, reimbursements (excluding work done by the WDPC) exceeded $3 million and added nearly 19 percent to the agency budget. By 1979, reimbursements exceeded $5 million and added 14.4 percent to the total budget. One important ongoing reimbursements source was funding of county estimates by the USDA Federal Crop Insurance Corporation and the Agricultural Stabilization and Conservation Service, which needed the estimates to administer their programs.

Another important source of reimbursable funding was ERS. Some 1970s ERS funding was for fertilizer practices, cropland use, and farm population numbers. In the late 1970s, funding came from ERS for cost of production surveys (of specific commodities) mandated by Congress. In addition, ERS sponsored and funded a number of special and one-time data collection efforts, such as a survey in the late 1970s on the extent of farmers' direct marketing practices. Because of the wide variety of survey and analysis efforts for ERS and its status as a sister agency, both agencies established data coordinator positions. This change improved communications about definite and possible upcoming projects, and led to better survey planning and execution.

The increased numbers of requested surveys for ERS and other organizations led to a reorganization of the Data Collection Branch. A new Economic and Special Surveys Section was created with responsibility for the annual farm production expenditure survey (FPES) and cost of production surveys, as well to take the lead in most new survey requests. The mail surveys and objective yield sections were combined. The enumerative surveys section now concentrated on all SRS surveys involving enumeration, except for FPES.

Crop Reporting Board Improvements

The Crop Reporting Board (CRB) had been known, since its inception in 1905, for its strict attention to security and for providing equal access to all users of published information. It also continually examined its procedures for possible improvements.

Once the June and December Enumerative Surveys became operational, the CRB adopted a national-board approach for major crop acreages, yield, and production estimates, as well as for cattle and hog inventory reports. Because the probability surveys were selected separately by State, there was no between-States sampling variance component when summarizing expansions to regional or national levels. Thus, State sampling variances were additive and, when divided by the national expanded totals, sampling errors were often in the order of 1 or 2 percent. State sampling errors for most of the major States might be on the order of 2–4 percent and higher for other States.

In a national-board approach for crop-planted acreage, the national indications are presented along with the sum of the State recommendations. CRB members then concentrate on reviewing the current, indicated level and performance of the surveys in past years compared with end-of-season revisions, and a tentative national (or regional) recommended total is set. If there is a large discrepancy between the national target and State recommendations, the entire board might review comments from the States that seem to be contributing to the difference. If not, a subset of CRB members closely reviews the indications and recommendations from each State office. Once the review of the State indications and the setting of a total for each State are finished, the new summed total should be within rounding of the target; that summed total becomes the estimate to publish.

The national-board approach has performed quite well for the agency. Even in the case of severe droughts, flooding, or other unusual conditions, having a standard, disciplined approach provides a helpful starting point for reviewing the new information.

In the mid-1970s, an important change in CRB analysis procedures was made. Past analyses were mainly based on linear regression of indications on final estimates. The change was shifting to a time series-based approach. There had been a number of concerns with reliance on the regression approach. If past indications had not shown much variation, regression tended to provide estimates that were always close to the average. If there had been an extremely unusual year in the data set, it likely had too much influence and distorted future regression indications. Another time-series benefit was improved crop-breeding technology, which meant that yields were constantly improving for the same crop-condition appearance levels.

Most textbook time-series procedures preferred to have at least 30 time periods of observation. However, since crop yields, milk per cow, and other factors were changing so rapidly in U.S. agriculture, time-series analysis for SRS usually meant a review of the past 10 years (or 10-20 quarters, in the case of hog and pig estimates).

The time-series approach was particularly helpful for setting crop yield forecasts. Farmer responses early in the growing season were known to be quite conservative, with the level of conservatism declining as the harvest neared. Thus, the hope (and reality) was that farmer reporters were consistently conservative from year to year.

A more visible CRB improvement occurred in 1977 when a feature referred to as the root mean square error (RMSE) was added to report summary tables. The RMSE calculates the difference between past forecasts or estimates (such as the August 1 U.S. corn yield forecast) and the final estimate (such as the end-of-season corn yield estimate, after revisions a year later). Those differences are squared, summed to a total, and divided by the number of years in the data set. The square root of this calculation becomes the RMSE. Presenting the RMSE provided an answer to data users who wanted to know how a particular data series had performed in the past. For additional information, an accompanying table was usually included, which summarized the average change from the forecast to final, the largest and smallest past changes, and the number of times a forecast had been below and above the final.

Project B Breakthroughs

Most of the funding, research, and new innovation following the introduction of the 1957 Long-Range Plan through the mid-1970s was devoted to Project

A (Introduction of Enumerative and Objective Yield Procedures). Significant progress was also made on Project C goals to improve data communications between headquarters and State offices and to provide CRB reports to State offices within minutes of release. The new enumerative and objective yield surveys in place also provided excellent approaches for quickly responding to adverse weather impacts, as called for under Project C. Quite a variety of new estimating programs, such as for farm labor, had been established as specified under Project D. At the 1975 SRS National Conference, one speaker referenced 34 Project D data needs that had been identified during a 1963 review of the 1957 Plan. Those data needs had been placed in four priority groups, from highest to lowest. By 1975, 12 of the 34 priority items had been essentially satisfied and four were now high priority. It was suggested that eight of the original 34 should be retained at a lower priority level, and 10 might be deleted.

However, in the first 15 years after the 1957 plan, little was accomplished toward the major Project B goals of improving the prices paid and prices received programs. Some early research on using enumerators was done in Ohio in the late 1950s, and the farm production expenditure survey was tested and implemented in the early 1970s, but little work was done on improving the methods used for prices paid and received. At the same time, SRS-published price estimates were being used for the administration of many Federal Government programs such as the milk price program and target price programs for cotton, soybeans, and grain crops.

Starting in late 1974, a probability survey of cotton buyers was tested, and operational surveys for cotton and rice were started in 1976. Funding of $310,000 (a little more than $1.10 million in 2007 dollars) was received in FY 1977; $500,000 (more than $1.55 million in 2007 value) in FY 1978; more than $1.16 million (nearly $3.24 million in 2007 terms) in FY 1979; $800,000 (almost $1.97 million in 2007 value) in FY 1980; and $341,000 ($759,000 in 2007 terms) in FY 1981. The new funding covered probability grain price and probability livestock price surveys, special point of sales surveys (to create better weights for probability surveys), and improvements in prices paid surveys.

The probability grain price survey concept was quite simple. Major purchasers of grain directly from farmers, such as local rural elevators and soybean crushers, were identified and stratified by size and type of operation. Samples were selected in each strata and each operation was asked to report monthly on the amount of grain purchased from farmers, and the total dollars paid. Since both the grain amount and dollars were expanded by the inverse of the sampling fractions, the resultant total expansion provided an average price weighted by volume. Sampling errors of the calculated averages were often less than one percent of the calculated price. The new grain price survey meant that one third of U.S. cash receipts from farming were now collected on a probability basis.

The concept was simple, but because dealings between farmers and rural elevators often involved storage of grain, drying, and other arrangements, it was essential to determine the actual price for just the grain. Each selected sample operation was visited to explain the program and to discuss proper handling of items, such as drying and storage costs.

The original 1957 Plan concept of collecting most price information through the use of enumerators was abandoned. However, enumerators were used for collection of some data, such as sales at selected livestock auction markets when no summaries were available, and it was necessary to copy specific records.

Other significant prices work was also progressing during the same period. SRS worked closely with agricultural price experts at the University of Minnesota to review all price indices and update them to a 1971–73 base period. As part of that review, some minor prices received estimates were discontinued, and States that had very minor levels of production and sales were dropped from the monthly prices received estimating program. In total, the number of monthly State estimates was reduced from 1,178 to 787.

Another significant prices program change was implemented in 1977. SRS had traditionally conducted a number of family-living surveys, such as the prices farmers paid for food and clothing. Analyses of those price levels in the 1970s indicated that the levels and shifts in prices for farm families were now similar to all U.S. families. Thus, the decision was made to discontinue the SRS surveys and use the appropriate Consumer Price Index (CPI) sub-indices for calculating indices of farmers prices paid.

Remote Sensing Research in the Mid- to Late 1970s

The early CRD studies in four States, which matched SRS ground data from June Enumerative Survey segments with satellite data, were quite encouraging. Improvements were quickly made in the procedures for digitizing field boundaries and handling such large data files. A joint agreement was written with the University of Illinois Center for Advanced Computation (CAC) to design and enhance a software system to process such large files. Various alternatives were considered for processing the satellite data files. Initially, computers at CAC were used. Then, larger computers at the Bolt, Beranek, and Newman Data Processing Center (BBN) in Cambridge, MA, were employed. Finally, even larger supercomputers at the NASA-Ames facility in California were used. Both the BBN and NASA-Ames computers were accessed through the ARPANET, which was the original version of the present Internet.

The SRS approach for making land cover type and crop acreage estimates from satellite data was not based on classifying whole fields correctly. Instead, all satellite data pixels (with each pixel representing the reflectance reading of a ground area of 60 by 80 meters in size for the first satellites) falling within the boundaries of a June Enumerative Survey corn field would be classified as corn. All pixels within each segment used for training would be labeled in the same fashion. The multivariate data routines being used would then determine various clusters of energy readings in 4-dimensional space; energy reflectance readings in 4 wavelengths were collected for the sensors aboard the early satellites, which was increased to 7 wavelengths for advanced sensors on some later satellites, which corresponded to each crop or field type. Once clustering of the training samples was completed, all satellite pixels within all counties wholly contained in the same data pass would be classified. A regression estimation approach was used to form acreage estimates for each crop type, which were based on the relative percentages of pixels of each type in the whole population relative to the training data.

A major 1975 research project was the collection and classification of satellite data for the entire State of Illinois. The Illinois State statistical office was extremely interested in the project, and it added to the effort by developing data processing programs that captured field-level data (normally only tract-level field data were keypunched) during the June Enumerative Survey. This was so forms could be automatically printed for follow-up visits to verify original crop data before training the satellite data classifier.

The Illinois experiment was quite successful. Satellite data with acceptably low cloud-cover levels and close-to-optimum crop progress dates were acquired for all but two counties. State-level estimates of acreages for all crop types could still be created by using the June Enumerative Survey data relationships for the missing counties.

As SRS had expected, satellite data could not replace the existing data series based on sample surveys. For example, data users expected planted acreage estimates by early July at the latest, and the first yield forecasts for major crops by about August 10. Remote sensing studies indicated that the optimum time for satellite acquisition of corn versus soybeans differentiation data in the Midwest States was late August. There still would be lag time as satellite data were acquired, registered against the ground training data, and run through the training and clustering routines to form estimates. Thus, satellite data could not match the timing of the existing statistical reports, but the tremendous information value of collecting data for entire States could likely be used to improve major crop acreage estimates by the end of the crop-season estimating cycle. The relative efficiencies calculated by dividing the June Enumerative Survey sampling error estimate by the regression estimator sampling error) of using the satellite data in the 1975 Illinois study in most analysis districts were about 3.0. Achieving the same improvement in precision of the acreage estimates by using conventional survey procedures would require nine times (3.0 squared) as many resources to hire enumerators, collect data, and create estimates from ground-based surveys.

The Illinois pilot research project took nearly two years to complete. To determine if satellite data could be obtained and processed in time for final end-of-season estimates to be published in early January, a full State study was conducted in Iowa in 1978. Estimates of major crop acreages were created and available to the Iowa State statistical office and the CRB in time for the "Annual Crop Production Report." Improvements in data handling and other procedures between 1975 and 1978 meant that the

Iowa pilot study cost only 40 percent of the Illinois research effort conducted three years earlier.

There was another benefit from the remote sensing research that aided ongoing procedures. Improvements in digitization equipment and software that aided the satellite interpretation efforts were used to digitize area frame land-use strata and primary sampling-unit boundaries starting in 1979. Doing so resulted in more accurate and cost-efficient measurements, and the storage of critical materials on computer files, as well as paper.

Other Research Efforts in the Mid- to Late 1970s

As multiple frame survey procedures became the norm for major data series, there were many continuing research efforts to study and minimize non-sampling errors. Re-interview surveys were commonly used to verify original survey responses on enumerative surveys. These commonly showed that the respondent was often the major source of nonsampling errors. If the primary farm operator was not available during the survey interview, another family member or farm employee might answer the questions. This alternate respondent might know most information for crops and land use within the segment, but did not have complete information on the total farm size, livestock breakouts, and other details. There normally were not many differences in the answers given by the primary respondent at both the time of the initial survey and on a re-interview survey.

A special type of re-interview survey involved intensive review of the procedures and rules used for determining if list frame names were overlapping with the operations contacted on the current area frame survey. Studies showed that even small changes in the instructions or the rules for determining overlap could change the resulting estimates more than the sampling errors of the original estimates. This led to even more rigor used for defining overlap/non-overlap procedures.

A related line of research was how to handle overlap determinations when a person contacted in the area frame was involved in a partnership operation. The issue was complicated because some individuals did have separate individual farming operations, as well as involvement in partnership arrangements. Study of many operating arrangements led to the decision to consider a partnership as overlap with the area frame if any of the partners were in the area frame survey.

Several techniques were tried in efforts to reduce non-sampling errors. Original June Enumerative Survey questionnaires contained all possible questions, and enumerators needed to follow somewhat-complicated skip instructions for items that did not apply to a particular respondent, such as a nonresident operator. A later approach was to have supplies of separate questionnaires for resident, nonresident, and non-overlap operators, along with a screening form used to direct the enumerator to the correct form. An even later approach was to use only one questionnaire version to improve the internal coding.

For more efficiency, programs were written to capture all area frame tracts in one master file, which could be used for sample selections and to create expansion factors. Various methods of imputation for missing tracts or missing items were tested. It was quickly found that imputation was greatly improved by having enumerators indicate the presence or absence of various crops and livestock species for tracts that were refusals, or for which no respondent could be found. If livestock presence was noted, imputation would be based on the average livestock numbers for that species in the survey, rather than the average of all reports, which would include zeroes.

Another key methodological study aspect was how to handle new information received on follow-on surveys. Incorporating all corrections for previously missing or incorrect information could greatly alter expansion weights and new survey expansions. Testing indicated that the most prudent approach was to freeze the original sampling rates, and the tract and farm acres, during an estimation cycle.

Additional research was devoted to area frame sample-selection alternatives. Starting in 1974, replicated sampling was used for all samples. This meant a number of independent subsamples or replicates were selected instead of one fixed-sized sample. Selecting the replicates provided benefits such as allowing for simpler rotation schemes, providing flexibility to quickly increase total sample size, and providing information to determine within land-use stratum-sampling variances. Study also went into determining the most efficient approach for arraying primary sampling units within land-use strata before sample selection. The final approach was to cre-

ate paper strata, rather than using a strict ordering scheme for each sample selection. Use of the paper strata led to interpenetrating samples, which again provided minimum estimation variance.

New Technology in the Mid- to Late 1970s

In addition to the remote sensing research and the list sampling frame (LSF) development efforts, there were many other initiatives to improve the use of data processing technology in the mid-1970s. Several of these had goals of improving transmission of files and creating more efficient estimates and reports with fewer chances for errors.

In 1974, the SRS data system was designed with the major component being the official estimates database (OEDB). Besides the estimates, the OEDB was to contain survey data and indications. It would have different levels of access, as it could be used by agency personnel for creating new estimates and forecasts. However, public users could only access the published estimates. It was hoped that use of the new data-system approach would allow electronic transmission from and to State statistical offices, and replace reliance on the U.S. Postal Service (USPS).

In 1977, the June Enumerative Survey was processed on INFONET for the first time—the last major project to be moved from the old WDPC. Some major reports were now available through INFONET.

Training in the Late 1970s

In 1977, a new ADP training plan was issued. Agricultural and mathematical statisticians could apply for specific training to become qualified as ADP statisticians, and they could be considered for positions throughout the agency. Support staff could be selected for upward-mobility ADP training for positions in their present field office.

The annual training calendar in the late 1970s provided for national or regional June Enumerative Survey training schools each year, along with objective yield survey schools for wheat and a combined corn, soybeans, and cotton school. The latter school was held in a southern location each year that had fields of all three crops available for field practice. All State survey coordinators were trained regardless of how many years they had already attended those same training schools.

By the late 1970s, a program of new statistician orientation programs was in place. New professional employees were brought to headquarters when they had at least six months agency experience. These sessions were held whenever there were enough new employees to form two groups of 20 or so participants. Employees spent the week learning more about agency history and structure, receiving briefings on the headquarters units' functions, and participating in a question-and-answer session meeting with agency managers.

A different type of training program was started around 1974—a live presentation on the SRS program and procedures. It was dubbed the "Road Show," and it usually involved the administrator and two or three agency officials, including the statistician in charge of the State where a session was being held. A large number of 35mm slides had been prepared, which illustrated the agency's history, organizational structure, and policies. Security in handling individually reported data and the release of information to everyone at the same time were always stressed.

International Assistance in the 1970s

The increasing interest in improving agricultural statistics around the world led to more coordination of SRS assistance efforts in the 1970s. Several books for use in international assistance were written, and some were translated into Spanish. Those included "Expected Value of a Sample Estimate," "Area Frame Sampling in Agriculture," and "A Training Course in Sampling Concepts for Agricultural Surveys." Many foreign visitors visited SRS offices for training in Washington, DC, and often visited State field offices. SRS also had a cooperative training program with the Bureau of the Census International Statistical Program Center. One SRS employee was detailed to that center, and other staff members participated in teaching five courses.

The in-country emphasis on training largely shifted to providing assistance on a temporary duty (TDY) basis in the 1970s. However, resident assignments continued in some countries such as Afghanistan, Liberia, Paraguay, Dominican Republic, Costa Rica, and Saudi Arabia.

When a TDY approach was used, the team usually started with a mathematical statistician and a sampling frame technician. Teams often found that it was easier to get meetings scheduled and activities started when they were in the country for only specific periods, in contrast to when a person was stationed full time and country counterparts did not feel a need to rush. If a TDY project got off to a good start, team personnel would change as help was needed on questionnaires, manuals, and supervision. In some cases, a TDY approach was used following an earlier resident assignment.

TDY projects in the early and mid-1970s included work in Bolivia, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Nicaragua, Pakistan, Panama, Paraguay, Thailand, and Tunisia. The Jamaica area frame project resulted in an unusual construction sidelight. Area frame construction in the United States normally started by creating primary sampling units (PSUs), which contained about 10 possible segments. Normal sampling rates were about 1 in 150 segments, so only every 15 PSUs would need to be divided into actual segments. When the Jamaica project was conducted, the U.S. PSU size was used, but it turned out that the optimum segment sampling rate was 1 in 10, so all PSUs had to be divided.

In 1979, the U.S. Agency for International Development (USAID) started funding the Remote Sensing for Agriculture Program, which led to projects in a number of countries. The SRS approach was that four stages of development were needed to build an agricultural statistics system. First was area frame construction, followed by data collection, analysis, and summarization. If the country moved through the first two stages, computerized classification of agricultural areas using remote sensing data would be added. The final stage was the development of agricultural crop yield models, including the use of weather data.

Staffing in the 1970s

By 1975, about 10 percent of SRS professional staff members were mathematical statisticians, which was largely due to the full-time Math/Stat training program and direct hires. There was also a marked need for experienced data processing specialists, so 13 staff members were hired from a Department of Defense (DOD) location in Ohio that was closing down and from the USDA Agricultural Stabilization and Conservation Service (ASCS).

An emphasis on hiring minority agricultural statisticians for field offices began in 1965. In 1973, an SRS employee was stationed at Tennessee State University in a cooperative effort to broaden that institution's mathematics and statistics offerings, with the goal of developing minority graduates qualified for SRS statistician positions.

The first professional women staff members for field offices were hired in the late 1960s. By 1975, at least 25 women were in professional statistician or data processing positions in the field offices, and a number of women had been hired as mathematical statisticians for headquarters positions.

A summary in 1979 showed that the agency had 406 agricultural statisticians on board, including 14 women and 23 minority employees. At the same time, eight of the 68 mathematical statisticians were women, and two were minorities.

By the end of the 1970s, all of the State statisticians from 1961 (the year SRS was founded) had retired or moved to other positions. One development unforeseen in 1961 was that some individuals completing the Math/Stat full-time training program in order to strengthen the agency's research and methodology capabilities had become State statisticians or deputy State statisticians.

Adjusting to a New Organization Structure

In 1977, Secretary of Agriculture Bob Bergland wanted to reduce the number of agencies that reported to his office, and he announced a USDA reorganization. Many existing agencies were merged into new organizations. For example, ARS, Extension Service, and Cooperative States Research Service were combined as the Science and Education Administration (SEA). SRS was combined with ERS and Farmer Cooperatives Service (FCS) to form the Economics, Statistics, and Cooperatives Service (ESCS). The new organizational structure was effective January 1, 1978.

The ESCS structure led to new titles with the agency administrators becoming deputy administrators who reported to the ESCS administrator (a former ERS administrator). However, day-to-day statistical program and the State office operations did not change.

One key consistency was that all statistical reports from headquarters were still released through the CRB, thus avoiding confusion to data users.

There now was a sizable infrastructure at the top level of ESCS. A Program Evaluation and Development Staff, a large Information Staff, and an Equal Employment Opportunity Staff were all part of the ESCS front office. One aspect of the new structure that was very positive was continuation and strengthening of the Economics Management Staff (EMS). EMS had been formed earlier to coordinate many of the personnel, budget submission, and other necessary administrative duties for SRS and ERS. By having a larger size and serving more than one agency, EMS was able to attract more highly trained staff members and to develop backup procedures when staff members left or were promoted.

From the start, there was considerable feeling that the cooperatives function did not logically fit within ESCS. In 1980, the cooperatives function was removed, and the agency was now known as the Economics and Statistics Service (ESS).

In 1981, ESS was disbanded, and ERS and SRS were once again designated as individual agencies reporting to the Assistant Secretary for Economics. The EMS organization continued to provide management services to the two agencies and the Assistant Secretary.

Part 3: Creating and Implementing a New Long-Range Plan

PROLOGUE

Improvements to the prices received and prices paid programs in the mid- to late 1970s essentially completed work on the 1957 Long-Range Plan. At least as early as 1976, at the first SRS National Conference after Dr. Trelogan retired as administrator, there was interest expressed in creating a new long-range plan. At that conference, Deputy Administrator Bruce Graham outlined the benefits of a long-range plan, recounted the agency's strengths, enumerated current problems facing the agency, and listed alternative activities that might be appropriate for the SRS of the future.

One key benefit highlighted was that a formal plan sets a direction and provides consistency for creating annual plans. For example, the detailed 1957 Plan goals had been helpful in presenting coordinated funding requests to Congress. Another benefit cited was that such a plan essentially marked SRS territory and possibly avoided duplication of efforts within the statistical agencies. It was also mentioned that a long-range plan would be essential for setting priorities and allocating scarce resources.

SRS statisticians were described as highly competent employees who exercised informed judgment and creativity in handling subject matter problems. Agency personnel were particularly skilled in dealing with quantitative biological and economic issues. SRS had developed effective survey design, sampling, and data processing techniques. Those had been applied to collecting information for other State and Federal agencies' needs as well as for the SRS estimating program. In particular, SRS was a leader in crop yield forecasting, international agricultural statistics assistance, and agricultural remote sensing applications. One of the agency's greatest attributes was its ability to respond quickly to weather or other emergency situations.

The number one problem cited in Graham's presentation was deteriorating response rates at a time when the numbers of farms were declining. Inflation affecting both Federal and State cooperators' budgets was another concern. A perennial weakness mentioned was the inability to forecast future weather and measure its potential impact on crop yields.

The first alternate activity mentioned was the census of agriculture. Although not advocating that SRS seek the census, Graham pointed out that SRS should have a contingency plan in case Congress suddenly shifted the census responsibility. Because of the SRS remote sensing expertise, expanding to international agricultural statistics was suggested as a possible future role. New reports and services to better meet emerging agricultural industry needs was another broad area of future activities. The presentation ended with an interesting discussion of appropriate policy considerations should the Federal Government shift to requiring data users to pay for products.

In early 1978, the USDA Office of Audit issued its survey results that identified a large number of issues that affected agricultural statistics, such as the impact of refusals and low response rates, the exclusion of outliers, and the use of statistical judgment. An audit conducted about the same time by the Government Accounting Office (GAO) recommended an outside review be conducted of SRS procedures. A contract was issued for a review by a small group of nongovernment statisticians, and a task force was established in 1980 to evaluate the findings from that review group.

Thus, as the agency entered the 1980s, the climate was right to create a new long-range plan and set new directions for the agency. As it turned out, it was beneficial to get an early start because the 1980s presented a number of budget and weather-related challenges.

Chapter 5: Developments in the 1980s

Redesigning the Estimating Program Over a Weekend

The FY 1982 budget year was extremely challenging. Agency budget levels had been determined, but there were concerns and rumors about a possible funding rescission. A final decision was presented to agencies March 5, 1982, nearly half way through the budget year. The 4-percent rescission amounted to more than $2 million (more than $4 million in 2007 dollars) for SRS.

Administrator Kibler and other agency officials had reviewed and evaluated all estimating program aspects in preparing earlier years' budget submissions and had anticipated that rescissions might be made. However, most scenarios assumed that cuts and adjustments would be made at the start of a fiscal year and not at a time when much of the budget had already been spent.

Kibler and Estimates Division Director Don Barrowman reviewed and reshaped the agency's estimates program over the weekend. The emphasis was on "… maintaining timely and reliable data series judged to be the most important in monitoring changes in the agriculture sector." Thus, many changes were made that individually conserved relatively small resources, instead of taking out large programs that would have saved more enumerator salaries and travel costs, but would have had critical impacts on major estimating series. Also, much of the savings would come from reducing hiring and not filling vacancies, so it was beneficial to remove programs and activities that required considerable office time. At a national program review meeting held in June 1982 to discuss the budget realities with all agency managers, Kibler pointed out that the number of permanent, full-time staff members had declined from 1,061 at the start of FY 1982 in October 1981, to 1,030 in mid-May 1982. He expected that figure to drop to approximately 1,000 members by the end of September and to be about 990 for most of FY 1983.

A typical budget adjustment process is to announce proposed changes and allow public comment before making final changes. However, delaying changes meant more money would be spent and even larger program cuts would be needed. Thus, a press release was issued March 10, 1982, which specified changes to be made immediately. All changes were announced as permanent—not just for the 1982 budget year—because the reduced funding level would be the new base for future agency operations.

A total of 26 reports were eliminated. Some like "Floriculture Crops," "Honey," "Maple Syrup," "Mink," "Popcorn," "Sheep and Lambs on Feed," "Sugar Market Statistics," "Catfish," "Trout," and eight different seed reports provided the only information for specific commodities. Other eliminated reports such as the weekly "Butter and American Cheese Production" and "Field Crops Production, Disposition, and Value" had provided additional breakouts for commodities about which some information would still be available.

Some data series were removed from ongoing reports. Those included forecasts of winter wheat yield and production for the following year from the December "Small Grains Report;" July 1 forecasts of corn, durum wheat, and other spring wheat yields; and estimates of 13 fresh market vegetables and six processing vegetables from upcoming "Vegetables" reports. Information that was not to be published would not be collected.

Perhaps the biggest impact on most agricultural data users came from cutting back the frequency of a number of reports. Report series that changed from monthly to quarterly included "Cold Storage," "Dairy Products," "Livestock Slaughter," "Milk Production," and "Eggs, Chickens, and Turkeys." The "Peanut Stocks and Processing Report" was changed from monthly to twice yearly.

The coverage frequency for some commodities was also reduced. These included cranberries, tobacco, and peppermint and spearmint for oil.

One aspect not mentioned in the press release was the review and trimming of objective yield sample sizes to save enumeration costs. For example, cotton samples were reduced from 2,400 in 1981 to 1,650 in 1982; soybean samples went from 2,400 in 1981 to 1,765 in 1982; and 1,920 corn samples were selected in 1982, compared with 2,000 for 1981.

The press release emphasized that SRS would still publish over 300 reports annually. It also clarified that USDA would be willing to work with commodity groups, local organizations, and State agencies to re-establish curtailed programs if sufficient funding were provided by those groups.

Other Budget and Program Adjustments During the 1980s

Since the rescission impacted the 1982 budget, the agency prepared a revised FY 1983 budget submission that would make most program changes permanent; it offered more than $1 million in budget cuts. However, Congress restored more than $500,000 with the direction that it be used for shifting the "Cold Storage," "Dairy Products," "Livestock Slaughter," "Milk Production," and "Eggs, Chickens, and Turkeys" back to monthly series, and for restoring the "Mink" and "Catfish" reports.

The Gramm-Rudman-Hollings Balanced Budget and Emergency Deficit Control Act of 1985 provided "binding constraint of Federal spending" and set spending caps on subsequent U.S. budgets. The FY 1986 SRS budget received a Gramm-Rudman reduction of nearly $2.53 million (more than $4.66 million in 2007 dollars), in addition to an already imposed 0.6-percent Congressional cut of $354,000. Many estimating program adjustments were made for FY 1986, such as removing stock estimates for barley, oats, sorghum, sunflower, and rye; reducing the number of States covered monthly in the "Milk Production" and "Egg Production" reports; and reducing the number of States included in the "Weekly Broiler Hatchery Report." In addition, the December Enumerative Survey was discontinued in 1987. Gramm-Rudman provisions also reduced the FY 1990 funding by $925,000. One budget adjustment at that time was sample-size reductions for objective yield crops. Gramm-Rudman was supplanted after 1990 by the Budget Enforcement Act of 1990.

There were a number of other SRS estimating program and services changes in the 1980s. The FY 1983 budget was reduced by a little more than $1.21 million (more than $2.46 million in 2007 dollars) because of a new Federal Government Pay for Publications policy. Up to that point, anyone could request free copies of any or all SRS publications. Providing all the requested publications resulted in large postage, printing, handling, and storage expenses. Pay for Publications was not designed for SRS to make a profit, but created to avoid costs. However, the USDA director of agricultural economics was able to insert a provision in the Farm Bill legislation that allowed SRS to retain the publication subscriptions to offset printing and mailing costs, instead of forwarding that money to the general treasury. Postage costs did drop by more than $1 million, and paper and printing costs were greatly reduced. Procedures were quickly put in place to advertise how to order reports, and prices were set to recover the printing, paper, ink, and mailing costs. Survey respondents would still receive free copies of State publications by request.

Another reduction in the FY 1983 budget was funding for the Farmline publication. That had been started by the ESCS Information Staff when that organizational structure was in place.

Creating the New Long-Range Plan

Once SRS was again constituted as a separate organization, Administrator Kibler started action on a new long-range plan for the agency. In doing so, he chose an unconventional approach. Instead of establishing a team of senior agency members, he selected five people, who had about 15 years or so of professional experience, as the planning group. Kibler wanted the plan prepared by people who could be expected to spend the next 15 years or so with the plan, instead of by individuals who were ready to retire. His charge memo was dated July 21, 1982; the new plan was to be presented at the March 1983 meeting of the agency's Program Planning Committee.

Administrator Kibler, in naming the Long-Range Planning Group, did not place restrictions or conditions on the new plan's format or contents. Group members attempted to take a broad view of the charge it had been given and not be restricted to approaches in other planning documents. The group made two important early decisions. First, they kept detailed notes of all discussions and fact-finding efforts, but they did not write anything in recommendation form during early deliberations. The concern was that documenting any recommendations too early could be a barrier to open thinking and innovation. The second decision was to collect new planning process input. The country was divided into five geographic areas, and each group member concentrated on interviews with agricultural producers, university economists,

and data users in their assigned area. Core questions were used as well as questions meant to expound on personal viewpoints. Interviews included some major agricultural producers and businesses that had been reluctant survey participants or had refused the surveys.

Some respondent questions asked about future U.S. agriculture structure and technologies. Although this was interesting, the answers were quite diverse. After summarizing interview impressions, group members decided not to base the plan on one specific future view for the United States, agriculture, and SRS. Instead, the emphasis was on steps and activities the agency should take that would allow it to properly adjust to whatever the future held.

A number of different types of contacts were made with agency staff members. Questionnaires were sent to all State statisticians in charge and headquarters' branch chiefs. During regional meetings of assistant State statisticians in charge, small group brainstorming exercises were successful in gaining new office structure perspectives. A similar approach was then utilized for headquarters section heads, and input was received from supervisory enumerators.

The 1957 Long-Range Plan had been essentially a technology prescription—it had outlined advances to be made in sampling, surveys, and communications. The new plan was an organization strengthening formula and was named "Framework for the Future." The key approach was to develop and maintain standards for all agency operations.

The plan was presented to the March 1983 Program Planning Committee meeting, as requested. No copies were made available ahead of time, and group members made presentations on each section of the plan before handing out printed copies. The plan was overwhelmingly accepted by Administrator Kibler and the Program Planning Committee.

Developing Agency Standards

Standards were described in the "Framework" as the first building block for all future SRS activities. A two-step process was described for defining proper standards for each aspect and then organizing efforts to meet the standards. One main reason for establishing standards was because the agency was working under a dichotomy of approaches. The probability surveys created after the 1957 Long-Range Plan were based on optimal sampling procedures and fairly well-defined edit and summary procedures. However, the agency still depended on a number of nonprobability surveys with little coordination and consistency of variables such as sampling, data collection, and edit and summary procedures.

The plan specifically honed in on standards for nine essential objectives for providing consistent, statistically defensible results. The nine, which were enumerated and for which goals were set, consisted of: sample design, sample frame maintenance, data collection, data editing, survey summary, analysis, quality control, CRB, and documentation and publication.

One of the most diligent efforts to develop and document standards was for the CRB. SRS and the World Agricultural Outlook Board (WAOB) received severe criticism in January 1984 because of apparent inconsistencies between stocks and crop-production reports. A Crop Reporting Procedures Task Group was immediately established, which reviewed past estimates and procedures, and presented general recommendations at an SRS National Conference later in 1984. Those recommendations included concurrently releasing end-of-year crop production and grain-stocks figures, and having a working group develop and document CRB operational standards. The CRB Policy and Procedures Working Group was formed and issued its "CRB Standards Report" in July 1985.

The working group took a very broad view of its charge, including examining the review, security, and release procedures of other Federal statistical organizations; conducting a literature review; and visiting with commodity analysts. One beginning tenet for the working group was to determine statistically defensible review procedures, if survey indications were to be adjusted.

The group divided its report summary and recommendations into seven parts. It also provided full-color examples of improved graphic analyses that would assist the CRB.

Under Board Identity, Definition, and Membership it recommended specific roles and scopes for National Commodity Boards versus State Commodity Review Boards (for non-speculative commodities),

and recommended a formal training program for commodity statisticians. One striking recommendation was to select the most knowledgeable State analysts for national commodity boards and have them serve for a year for their assigned commodities. This would provide additional consistency and strength to Board reviews.

Under Standards for CRB Data and Indications, it was recommended that a national probability-based crop-estimation program be implemented. It was also recommended that characteristics of external survey and administrative data used by the CRB be documented and standards for data collection be enforced. Additional review of the grain stocks program and indication levels was recommended.

Under Standards for Analysis it was recommended that new edit, analysis, and summary systems be designed and developed for assisting the CRB. Some of the components would retain all original-reported data for later study of edit impacts, build in frequency distribution displays, and examine the impact of outliers.

The Standards for Estimation recommendations were to rely upon composite estimation with confidence bands if multiple indications were available and statistical analyses principles for interpreting balance sheets. The CRB should also determine the maximum balance sheet residuals size allowed.

Several CRB Database Standards recommendations were made. The key was to have all indications, estimates, and supporting data available for immediate board analyses. Board members needed training on both the database and its strong graphics capability. The CRB database should be created as soon as possible, but become part of the agency data management system.

Under Standards for Published Data, the emphases were to enhance the usefulness of reports, and publish periodic reports of auxiliary survey data and balance sheet components as one way of educating data users. The CRB Secretary of Agriculture briefings were addressed by having the most qualified staff members present the briefings, by having the CRB chairperson remain in the briefings instead of carrying reports to the release room, and by strengthening the briefing contents.

Key CRB Operating Procedures recommendations were to formalize the national commodity board preboard briefings and improve the comments available for board review. A controversial recommendation was to drop the speculative commodity designation so the Crops Branch would have more time to review commodity data and to review all States at the same time.

Nearly all working group recommendations were accepted and many improvements resulted. The speculative designation was not changed but more security procedures, such as electronic decryption of State recommendations and comments, were added. The concept of naming State members of national commodity boards was implemented, but it was found to limit training career opportunities for other State office commodity statisticians (particularly since database and other improvements meant fewer total state office representatives were needed for board calls). Therefore, it was modified to select the most experienced commodity statisticians only for key reports such as the August "Crop Production Report."

Reviewing Agency Structure

Also in 1984, a task group on Structure and Identification was formed to review agency structure. It included Professor Jim Bonnen of Michigan State University and Professor Simon Goldberg, who represented the American Statistical Association Committee on Federal Statistics. Their report ("Structure for Service") issued in July 1985 made many recommendations for changes and improvements.

The report's key recommendations included a new name for the agency. One of the long-range plan recommendations was to address the agency identity crisis. The name Statistical Reporting Service (SRS) did not signify what type of statistics were reported, did not imply the broad services of the agency, and did not match with operating names, such as (State) Crop Reporting Service or (State) Crop and Livestock Reporting Service, which were being used by field offices. Renaming the agency as the National Agricultural Statistics Service (NASS) would clarify the scope and type of statistics.

Part of the new standards was to designate each field office as the (State) Agricultural Statistics Service—providing a logical link with the NASS name. In keeping with the new agency name, the CRB be-

came the Agricultural Statistics Board (ASB), and the CRDs in each State were now referred to as Agricultural Statistics Districts (ASDs).

The recommended reorganization structure established two deputy administrator positions. This part of the recommendation was accepted, but the suggested titles of deputy administrator for operations and methodology, and the deputy for estimates and analysis, were changed before implementing a new organizational structure. The recommendation to separate the Estimates Division into two divisions was not accepted.

In the adopted organization structure, the deputy administrator for operations coordinated the State Statistical and Research and Applications Divisions and chaired the Agency Personnel Selection and Training Committees. The deputy administrator for programs coordinated the work of the Estimates and Data Management Divisions, and chaired the ASB and the Program Planning Committee. One important new addition was a small Statistical Standards staff assigned to the deputy for programs. That staff took the lead in working with agency units to document standards for various aspects of operations. The standards officer served as the secretary of the Program Planning Committee. The new organizational structure and agency name were effective as of September 29, 1986, but the Data Management Division was renamed the Systems and Information Division in 1987.

Implementing the Integrated Survey Program

The one significant methodology innovation recommended in the "Framework" publication was to develop an integrated survey program. The major reason was to place the major crop acreage and production surveys (prospective plantings, midyear acreage, small grains acreage and production, and fall acreage and production) on a probability sampling basis. By combining the samples for the present nonprobability surveys into one coordinated survey program with the hogs and pigs surveys, it appeared that sufficient sample size would be available for probability crop surveys.

The original proposal was for an annual, extremely large "omnibus" survey that would provide data for all midyear crop and livestock estimates. All other major survey contacts for the year would be subsamples of operations in the omnibus list and area samples. It would be necessary to shift the timing of some data series (most notably the reference dates for the quarterly hogs and pigs surveys and some grain stocks surveys). The proposal would also select samples for surveys, such as farm production expenditures, farm labor, prices paid, and egg production, from the larger omnibus survey. Most re-contacts during the year could be made by mail or by telephone, but an operation would be visited in person for the first contact after the omnibus survey. This visit would explain what surveys the operation had been selected for and when they would be contacted.

Since the proposed integrated concept was such a major operational departure, thorough testing was needed. A full-time Integrated Survey Program (ISP) coordinator position was created and filled by a statistician with extensive survey and estimates experience to be sure all details were built into the testing and analysis program. The coordinator identified the special analyses needed, such as an analysis of how well farm acreage data were reported on the base survey and one for detailed enumerator time and mileage costs. Testing of the ISP concept started in 1984 in three States (Arizona, Illinois, and Tennessee), and the ISP was a major topic at the May 1984 and October 1985 SRS National Conferences.

Many operational questions arose from the testing. There were concerns about an acceptable length and format for the omnibus questionnaire. Would every State need its own questionnaire version because of variations in important commodities? Would some later questionnaires be integrated if an operation was selected for two contacts, such as hogs and grain stocks, in the same month? Could the monthly "Farm Report" be replaced as part of the ISP?

Two factors were important in shaping the final ISP design. First, the concept of the omnibus crop and livestock base survey was replaced with a coordinated, replicated sample design. The omnibus survey had much larger sample sizes than were needed for midyear estimates as well as greatly increased costs. Also, research studies indicated that a balance of repeat samples and new replicates for livestock surveys helped avoid biases.

The second factor was new thinking regarding survey dates for crop-related estimates following the release of 1983 end-of-year reports in January 1984.

Because of large Government-owned grain stocks, a Payment in Kind (PIK) program was announced for 1983. The program encouraged producers to reduce their corn-planted acreage in exchange for PIK certificates equal to 80 percent of the grain they normally would have produced. The PIK program was very successful—total acreage planted to corn was reduced from 81.9 million acres in 1982 to 60.2 million acres in 1983. (Officially, the PIK program removed 78 million acres of all crops from production.) Unfortunately, 1983 was an extremely poor weather year; it had the lowest U.S. average corn-for-grain yield since 1974. The total U.S. 1983 corn production of 4.2 billion bushels was essentially half the 1982 production of 8.2 billion. Thus, concerns about excessive supplies shifted to concerns about a fairly tight supply situation in just one year.

Soybean acreage and yields were also down in 1983 from 1982, and the 1.6-billion-bushels crop was the smallest since 1976. When the annual "Crop Production Summary" was issued January 12, soybean totals were somewhat of a surprise to many industry sources. There was confusion in the interpretation of that report as soon as the WAOB issued their evaluation of probable ending supplies in the "World Agricultural Supply and Demand Estimates Report" ("WASDE") for January 16. Unfortunately, when the January 1 "Grain Stocks Report" was released January 23, and a new "WASDE" was released the next day, the implications changed quite a bit. Now there were many complaints about mixed USDA messages. One theme from data users, who were trying to be positive about USDA information, was that there were not too many reports necessarily, but too many release dates.

Based on the January 1984 outcry and the fact that cropping and marketing practices had been changing to earlier planting and harvest, SRS and WAOB developed a new crop estimates calendar. The start of the corn marketing year was now defined as September 1 (the same as for soybeans), and it was now logical to establish grain-stocks reports on a true quarterly basis (i.e., September 1, December 1, March 1, and June 1). This schedule fit well with a March 1 Prospective Plantings Survey, plantings information as of early June, small grains acreage and production surveys in early September, and the fall grains acreage and production surveys in early December. Thus, the major crop surveys could be integrated with the ongoing hogs-and-pigs survey schedule.

The new schedule of reports was announced by USDA, along with the change that only one "WASDE Report" would be issued each month. That report would be coordinated with the release of SRS's "Crop Production Report"; in effect, both reports would be released at the same time from the SRS CRB lock-up facility. The WAOB had been co-located with SRS as of 1982, and SRS now coordinated security, printing, and release of the "WASDE".

There were some key decisions made in implementing the new crops survey and release schedules. Data collection was not to start until the first of the month, so a true first-of-the-month reference date approach could be used for grain stocks, and hogs and pigs inventories. Data collection was to occur during the first two weeks of the month, and the release of the relevant crops, stocks, and hogs-and-pigs reports would occur by the end of the month. An exception was made for December. Because of holiday schedules when markets were not open, the original plan was to release December "Hogs and Pigs Report" in early January, and the "Annual Crop Production Report" with the January "Crop Production Report" on or about January 10. The January "WASDE Report" would be released at the same time. Based on strong livestock industry appeals, the December "Hogs and Pigs Report" was eventually timed to be released no later than the next-to-last full December business day.

Thus, the integrated survey program was put in place relatively quickly but without the omnibus survey approach and without coordinating all livestock survey reference dates on the same months. By 1985, the quarterly Agricultural Survey had expanded into the 27 major hog, cattle, crops, and grain stocks states and was fully operational by December 1986.

[Historic Clarification: One response to the January 1984 crop and grain- stocks estimates concerns was the establishment, by Secretary of Agriculture John R. Block, of a Blue Ribbon Panel to review USDA statistical and economic-reporting procedures. That panel was formed in December 1984 and it began its review in late January 1985. The panel's report, issued in late June 1985, was likely credited for consolidating crop-acreage and stocks report releases, and for establishing the joint releases of "WASDE" and "Crop Production" reports. However, NASS and WAOB had announced those decisions before the Blue Ribbon Panel began operations, so the panel

focused on other aspects. For example, one recommendation was to develop a monthly "Hog Farrowings Intentions" report.]

The "Other" Integrated Survey Program

The Framework publication suggested that an annual farm labor survey be integrated with the farm production expenditure survey (FPES). That was never done as such, but the SRS and Economic Research Service (ERS) branch chiefs responsible for the specifications of the FPES and the cost of production surveys (COPS) conducted each year for ERS saw the opportunity to enhance the two survey programs by integration.

The FPES collected total farm expenditure data while the COPS zeroed in on the expenses for specific farm enterprises (such as corn or cattle production). If global expenditure questions were added to the COPS, the effective sample size would be increased for FPES-type data. Adding some commodity questions to FPES would allow better cross-classification and analyses of different types of operations (e.g., crops only operations and crops and livestock operations). Another integration advantage was that coordinating sample selection would avoid selecting any operations for both surveys.

The branch chiefs worked out the basic details for integrating the basic sampling design and the necessary questionnaire changes. While testing was being implemented for the crops/livestock ISP, the two economic surveys were already integrated as the new farm costs and returns survey (FCRS). The first FCRS was for 1985, with data collected in early 1986.

ERS and NASS did create data summaries (not estimates) at the State and regional levels from the 1987 FCRS that were published and mailed to survey respondents. The summaries were broken out by financial conditions (positive or negative income) and debt levels (low or high). Those four income/debt categories were then used to provide breakouts of farms in the State (or region) for characteristics such as economic class, type of farm, ownership, and age. Financial characteristics, such as average crop and livestock sales, non-farm income, total assets, and total debt were also presented for each of the four income/debt categories, along with ratios such as average debt to asset level. These summaries were created if a State had 300 usable survey reports. Data items were included if there were at least 30 observations, with a coefficient of variation less than 50 percent for the specific data item.

Since the target population was only 24,000 operations, many States could not be summarized separately. The new summaries were of particular interest to economists, farm organizations, and probably farm lenders. However, since some NASS State statisticians were concerned the summary details might be confusing to many individual respondents, the summaries were not sent in the future.

The Ebb and Flow of Objective Yield Surveys

Research on objective yield models for rice, grain sorghum, and sunflower crops had begun in the late 1970s. Early research was promising and actually led to a re-evaluation of sorghum yield levels. A crop-data improvement initiative in the FY 1984 budget provided funding to start operational objective yield surveys for the three crops. There had been pilot studies the year before in two rice and sorghum States and one sunflower State. Objective yield data were collected in 1984 in five rice and sorghum States and three sunflower States. The new programs' performance was not as helpful and consistent as had been hoped and, under continued budget pressure, sorghum and sunflower surveys were discontinued after 1987. Rice surveys continued until 1992, but they involved only two States in those last three years.

Other objective yield program adjustments were made in the late 1970s and early 1980s. Operational corn objective yield surveys were conducted for as many as 24 States in the early 1970s, but some States were dropped as their portion of the national corn production declined. Surveys were conducted in 19 or 20 States in the mid-1970s, and the total later declined to 18. The number of States covered was reduced to 16 for 1980 and then to 10 States for 1981. Coverage of 10 States remained until 1996, when it was reduced to seven. In 1980, the top-10 corn States accounted for 81 percent of production. The next eight States accounted for another 14.7 percent of production, but no State had more than 2 percent of the national production.

Cotton objective yield coverage also changed over time as production declined greatly in some States, mainly those in the south east. Fourteen States were covered starting in 1963; this number was reduced to

12 by 1977. The total number of States with cotton objective yield surveys was cut to six in 1979, and it remained at that level through 1995.

Soybean objective yield coverage peaked at 17 States by the mid-1970s, but fell to 15 States in 1982, 14 States in 1988, and 11 States in 1990. Reductions were made as relative production levels of some Southeast States declined.

Once wheat objective yield surveys were fully operational in 1972 for winter, durum, and other spring wheat, the number of total States stayed at 17 until 1984. The number of States declined in 1984, including reducing durum wheat collection to only North Dakota. Some increases in coverage were made for 1985 and stayed at that level for most years until 1993. Since 1993, there have been fluctuations in the States included as wheat acreages changed.

Once fall potato objective yield surveys were established in 11 States sometime in 1978, the program stayed stable until 1996, when it was reduced to seven States. However, some additional functions such as size and grade evaluation of the samples have been added to the program.

Remote Sensing Developments in the 1980s

During the late 1970s and the 1980s, SRS continued to develop and enhance its ability to utilize full LANDSAT scenes to improve estimates of acreages of major crops in important producing States. The Center for Advanced Computation at the University of Illinois closed in 1978 and SRS was fortunate to hire the lead programmer working on SRS applications. He took the lead in creating the EDITOR software system, which incorporates all routines for processing both SRS segment-level training data and LANDSAT data. Routines for properly registering and overlaying the training data on the satellite data were written and revised as the satellite data registration and recertification improved over time. EDITOR also contained clustering and classification software, as well as routines to create the regression estimate of crop acreages.

The regression estimator was one feature which set the EDITOR system apart from other remote sensing efforts, as only one other research center attempted a regression approach. EDITOR was based on inputting probability-sample ground data for training. However, when the EDITOR system was later adapted for use in France and Italy, those countries used systematically selected ground data as if they had been probability selected.

In the early 1980s, a number of technical improvements were made. An improved clustering algorithm called CLASSY was tested and incorporated into EDITOR. Starting in 1981, a video camera and image processing system were used to capture segment and field boundaries instead of having to manually digitize the boundaries. By the late 1980s, technology had evolved to be able to use a super-microcomputer workstation to overlay crop field boundaries onto a satellite-data graphic representation.

Throughout the 1980s, more States and crops were added to the crop-acreage estimation efforts. From 1985 to 1987, eight States were included. State level crop acreage estimates were completed by mid-December or so each year. From 1985 on, county acreage calculations for major crops were available by February for use in setting official county estimates. The cost per State in 1987 was $129,000 ($230,000 in 2007 dollars), compared to $750,000 (more than $2.82 million) for the 1975 Illinois project and $300,000 ($931,000) for the first 1978 project for Iowa that was finished prior to the end of the estimating season.

In 1983, a multi-temporal approach (which combined a spring satellite scene with a summer scene in order to control for trees and other permanent vegetation) was used for the first time in order to improve late-season crop estimates. Many preprocessing steps could now be done in SRS offices using a combination of mini- and microcomputer components that saved considerably on mainframe computer costs. Another key advancement in 1983 was the start of the conversion of the EDITOR software to a more portable program language. The new version would allow the software to be used on many computer platforms. The new system was referred to as P-EDITOR (for Portable EDITOR). When it was finished by 1986, many routines could be run on personal computers of the era.

During most of the 1980s, the SRS remote sensing efforts were coordinated as part of the Joint Program for Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing Program (AgRISTARS) discussed below. As that formal pro-

gram came to a close, less research funding was available, and there were serious concerns about future availability of satellite multi-spectral scanner (MSS) data. (The P-EDITOR system was specifically based on MSS data but could be adapted to other satellite formats that had different spatial pixel resolutions and wavelengths.) In addition, a number of foreign satellite systems were being developed that would provide higher resolution data—but at higher costs. A decision was made to discontinue (at least temporarily) the full State crop-estimate projects, and to concentrate on evaluating other satellites and sensors in some smaller test areas.

SRS Leadership of the AgRISTARS Program

The most prominent and visible agriculture-related remote sensing research effort of the late 1970s and 1980s was the unprecedented AgRISTARS program. This was a cooperative effort of USDA, NASA, the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, and the U.S. Department of the Interior, along with USAID as an observer and possible future user.

AgRISTARS had its beginnings in 1978 when the USDA Secretary of Agriculture issued an initiative that led to discussions and joint planning by the participating agencies. The initiative identified seven different types of information of interest to USDA for which aerospace remote sensing might be applicable. The seven areas of interest were: early warning of changes affecting production and quality of commodities; commodity production forecasts; land use classification; renewable resources (mostly forest) inventories; land productivity estimates; conservation practices assessments; and pollution detection and evaluation.

Two years of intense and detailed planning were invested in program development. SRS Administrator Kibler and Statistical Research Division Director Caudill led the USDA negotiations and planning efforts. Kibler served as the USDA representative, and chair, of the Interagency Coordinating Committee responsible for establishing priorities, assessing progress, and coordinating resources assigned to the program. There were tremendous program resources; the participating organizations devoted large numbers of full-time personnel and issued contracts for services in many cases. Caudill was the chief USDA negotiator and planner in establishing program structure details, and he chaired the full-time Program Management Group that coordinated all program and project progress, tracked all changes to plans and specifications, and arranged all formal written and symposia documentation. AgRISTARS was originally planned as a six-year effort—it would run October 1, 1979 to September 30, 1985, but was later extended an extra year to September 30, 1986. AgRISTARS used the NASA space-program management model. Some employees and contractors who had worked on space program documentation were included in the Program Management Group and the individual projects. All plans, progress, and individual accomplishments were documented in detail. For example, 1,235 separate program documents were inventoried in the "FY 1983 AgRISTARS Annual Report."

Eight separate AgRISTARS projects were created: Early Warning and Crop Condition Assessment; Inventory Technology Development; Supporting Research; Yield Model Development; Soil Moisture; Domestic Crops and Land Cover; Renewable Resources Inventory; and Conservation and Pollution. SRS was the lead agency and major contributor for the Domestic Crops and Land Cover (DC/LC) project. One SRS benefit was the evaluation of alternative aerospace sensors such as the thematic mapper technology being developed to provide finer spatial resolution on future LANDSAT satellites; synthetic aperture radar; and advanced, very high-resolution radiometer data from weather satellites. The rigor of the AgRISTARS program also resulted in SRS researchers creating more detailed documentation of results than would have normally occurred.

In addition to the DC/LC project, SRS staff members were valuable contributors to the Yield Model Development and Early Warning and Crop Condition Assessment projects. An SRS yield-research unit was temporarily established in Columbia, MO. One of the SRS staff members' key contributions was creating a simplistic "strawman" yield model. If a proposed new model using weather and satellite data inputs could not outperform the strawman, it usually was excluded from future consideration. SRS stationed some employees at the Johnson Space Center in Houston, TX, for work on the Early Warning and Crop Condition Assessment project. They brought a statistical design perspective to that project along with practical experience with use of ground training data and the EDITOR remote sensing system.

There were several agency benefits from AgRISTARS. The program provided extra staff funding to greatly advance development and testing of remote sensing interpretation procedures. It established SRS as the leading organization in the world for agricultural remote sensing applications. Just as earlier studies verified that satellite data could not replace the established acreage reports calendar, yield model development efforts demonstrated that weather/remote sensing models would not replace field-level and farmer-based yield forecasts. The Early Warning and Crop Condition Assessment project led to the establishment of the Production Estimates and Crop Assessment Division (PECAD) in USDA's Foreign Agricultural Service (FAS). PECAD served the interests of FAS and the Agricultural Stabilization and Conservation Service (ASCS). Working with PECAD has enabled agency access to satellite data products at affordable rates.

New Technology in the 1980s

One major data-processing challenge in the late 1970s had been the re-competition of the network data processing contract held by INFONET, which was expiring. That was essentially a two-year effort for an agency task force. Detailed descriptions of all agency operations and processing requirements were prepared along with packages of materials that could be used by bidding vendors to demonstrate the speed and costs of their offerings. The new contract was awarded to Martin Marietta Data Systems on October 19, 1979—thus, the first 1980s technology challenge was the shift to the new processing system. About the same time, the agency was also starting to utilize cluster data-entry operations through a new contract.

In the late 1970s and early 1980s, one line of research and technology interest was to develop the capability for computer-assisted telephone interviewing (CATI) as an improvement to the agency survey program. Some CATI systems were being used by public-opinion and other polling organizations. However, they were designed for questions like "yes or no" or "Which of these candidates do you prefer?" No computer system had yet been created that could perform all of the mathematical operations important to SRS questionnaires. Those operations included verifying numerical breakout of some totals into component parts, checking logical mathematical relationships between questions (such as acreage harvested and total production), and performing internal consistency checks during telephone interviews to avoid errors.

If a CATI system could be developed that was successful for agricultural producers' interviews, it would automatically capture reported data. This would provide time savings and good, non-sampling error control. A cooperative agreement was written in 1981 with the University of California at Berkeley to adapt and modify Berkeley's software system to SRS needs.

The concept of acquiring minicomputers for field offices was once again revisited in the early 1980s. A proposal was presented to the Program Planning Committee in November 1980 to install minicomputers in three field offices, plus one in headquarters for testing and development, in order to demonstrate the capabilities. There were concerns raised about the amount of training needed to support the minicomputers and the compatibility of minicomputers with the network-processing system in place. A new Minicomputer Request for Proposal Task Force was established in 1981.

Some minicomputers were already in field offices, often through State department of agriculture arrangements. They were used for a number of different applications, including data entry, but there was no standardization of machine types or systems being used. Also, remote sensing work underway utilized a wide variety of minicomputers, super-minicomputers, and super-microcomputers for various aspects of the ground-data and segment-boundary digitization operations. One new minicomputer application was testing the use of CATI software in California.

A significant improvement in customer service technology had to do with computer access to SRS reports. Since 1976, the public could access statistical reports through INFONET, but it was not an immediate-release capability—and it was not user-friendly. As more individuals and businesses began using computers, there was increased interest in computer access to reports. In 1980, the Nebraska and Wyoming field offices began to redistribute CRB information through the AgNet electronic network at the University of Nebraska. In 1982, some CRB summaries and a few full reports were placed on the Dialcom electronic mail system that the USDA News Center was using, and the Cooperative Extension Service (CES) created a network that also redistributed some

CRB reports. A number of new agricultural information services, similar to AgNet, were popping up, and they were all interested in CRB reports. SRS decided not to enter into an agreement with any such service. Providing reports to one service meant SRS would be obliged to treat the others equally. This would require considerable resources because each organization preferred different formats.

The distribution of electronic reports to the public seemed to be solved in 1984 when USDA issued an Electronic Dissemination of Information (EDI) contract. The winning vendor had to establish two levels of customers. "Level-one" customers were other electronic information vendors; "level two" were all other parties paying the winning vendor for new electronic releases. The contract required that all new electronic releases had to be provided to level-one users before (or at the same time) they were released to level-two customers.

SRS was pleased to have one standard for electronic releases, but it was not user-friendly. Most customer printers were slow and were restricted to printing no more than 79 characters without wrapping the text over to the next line. The original EDI contract did not allow the vendor to offer any value-added features, such as dividing the "Crop Production Report" into segments so users could select and print only what they were interested in. Because of user complaints, SRS restructured the printed "Crop Production Report" format. All data and narrative lines were restricted to no more than 79 characters. In addition, the report was rearranged to place detailed narratives at the end instead of the front. Printed and electronic reports now started with a page of narrative highlights followed by individual crop-data tables showing the major crops first, then the crops summary tables, which formerly preceded the individual crops. The back of the reports contained the narratives and all related boilerplate information.

Data users were pleased with SRS efforts to provide quicker access to the most requested "Crop Production Report" information, and to minimize the number of pages that users had to print. After the first year, the EDI contract was modified to allow SRS to segment electronic report offerings so users could select just major crop tables or narratives without downloading entire reports.

In the 1980s the SAS software system, which started for research applications in the early 1970s, became a key fixture of SRS operational programs. SAS analysis programs were developed for grain stocks, hogs, and other survey data. Objective yield summaries were written in SAS, and in 1986, a SAS edit replaced the former generalized edit routines for national surveys. It became known as the SPS Edit.

Training in the 1980s

There were a number of changes in agency training during the 1980s, mostly after the "Framework" report was released with its emphasis on standards. In the 1986 agency reorganization, a Survey Training Section was identified for the first time.

As in the two previous decades, much training was needed on data- processing skills. The concept of upward mobility was revisited to identify field office support staff individuals who would take additional data-processing training, but who would not be subject to transfers to other offices. In 1982, an advanced data-processing training graduate program was announced, and the first two individuals were selected.

The "Framework" report had a goal of providing additional training for survey statisticians. One person was selected for a full year at the University of Michigan survey program in 1985, and other individuals later took part in University of Michigan summer programs. Another individual was selected for full-time training in 1989–90.

One emphasis of the "Framework" report was to justify the content of the estimating program. The individual in charge of cotton estimates tied content justification and survey-training goals together at a national objective yield training school. At the time, he presented a question-by-question justification of every cotton question in the survey. That provided an excellent example for survey designers and trainers at both the headquarters and field-office levels.

By 1988, a NASS Survey Training Program Proposal had been prepared. The study identified significant problems with present agency training approaches such as: too many topics covered in each school; the backgrounds of participants were too variable for a one-size-fits-all approach; almost all training was by lecture; and the instructors for field-office training

schools were not selected on training ability. Training staffs in headquarters started to address those agenda and presentation style concerns.

To further aid in the training improvement efforts, the University of Maryland Center for Instruction Development and Evaluation was contracted to do a program needs assessment. The center's assessment and recommendations were received in mid-1990, and it formed the basis for many training changes and improvements.

Because of the work underway to develop CATI capability, some new types of training were needed in field offices. Many individuals hired to make the telephone calls did not have the agricultural background of most personal interview enumerators. Thus, new individuals not only needed training on the questionnaires being used and the computer systems, but also needed to understand the meaning and pronunciation of agricultural terms like barrows, gilts, ewes, and others.

Research in the 1980s

This chapter has already mentioned some major research efforts of the 1980s: remote sensing, CATI, and testing the integrated survey program. However, there was a wide variety of other research efforts conducted by the Survey Research Branch.

One notable addition to the agency's research capabilities was establishment of joint American Statistical Association (ASA)/ NASS Fellowship and Associate programs. The Fellowship program was an opportunity for experienced academics to spend a sabbatical year with NASS working on research of mutual interest. Linking with ASA provided broad publicity of the program, and the association handled the administrative and financial details. However, NASS provided most of the funding for the program. To apply, applicants needed to submit a research proposal for review and consideration. The Associate program was intended for more junior academics looking for experience and exposure to new statistical research areas.

To date, the new program has not received an overwhelming number of applicants, but many talented academics have participated. Many found it quite beneficial because the NASS quarterly and monthly surveys provided opportunities to not only propose a line of research, but actually do some testing during a year's period of time. Several fellows did continue their research connections with the agency after returning to their universities.

One outgrowth of the ASA/NASS Fellows Program was organization of a special two-and-a-half-day conference on survey research methods in agriculture. The 1986 Conference on Survey Research Methods in Agriculture, held in an offsite training facility in the Washington, DC area, was designed to bring together leading researchers in advanced-survey methodology topics that could be valuable in improving agricultural statistics. Five conference topics (Small Area Estimation, Cognitive Aspects of Surveys, the Influence of Computers on Survey Methods, Experimental Design and Survey Sampling, and Costs and Errors in Surveys) each were considered for half a day.

The conference used a unique format: one speaker gave a general, overview presentation of a designated topic area, which was followed by another person's specific, current research presentation. This was followed by comments from a NASS discussant. A fair amount of time was available for comments and discussion. The audience of 70 people was comprised of nearly half academics, with government and survey organizations from the United States, Canada, Australia, Yemen, and the U.N. Food and Agriculture Organization (FAO) in Rome, Italy. NASS and ASA were successful in obtaining funding for most of the conference costs.

Being able to attract notable speakers and other research conference participants proved that NASS was a major statistical organization. Presentations and discussions at the conference led to additional applied research on the conference topics and some future working relationships.

Some of the early ASA/NASS Fellows Program research studies focused on re-interview surveys to provide measures of response bias, and robust estimation techniques to smooth the impact of survey outliers. Another area of particular research interest to NASS was additional study of composite estimation, which would provide the best statistical weighting of multiple indications.

One research effort quickly put into operation was the development of a profile edit for "Livestock

Slaughter" reports. For quite some time, NASS had received the weekly, federally inspected livestock-slaughter plant reports. NASS key-entered those data, ran basic consistency edits, summarized the edited data, and published the results. Because of the large number of plants and delays in receiving data by mail, the summary was published two weeks after each reference week.

Livestock slaughter lent itself very well to a profile approach. Nearly every plant specialized in the slaughter of a particular species (e.g., cattle, hogs, or sheep) and normally focused on animals of specific weight ranges. Because extensive past-performance data were available from the weekly reports, the number of animals slaughtered in a particular week and the total weight could be predicted with a fair level of accuracy. The new livestock slaughter publication system focused on getting responses from all large slaughter plants (via telephone or fax, if a mailed copy was not received) by the Tuesday following the end of the reporting week. Data for those large plants were combined with reports of all smaller plants received by mail in time for a midweek edit. Reports not received in time were added in based on their profile, and a preliminary summary was run and published on Friday—one week after the close of the reporting week. The following Friday, a final summary was published that included late reports, but those totals were almost always within a fraction of a percent of the preliminary.

Objective yield validation studies were conducted again in the 1980s—with one change in procedures. By the mid-1980s, most corn was harvested by grain combines that shelled the kernels as harvest proceeded, instead of harvesting whole ears that were stored in corn cribs. Arrangements for validation test fields were made, through each farmer, to have the crop from the field harvested separately and to have each wagon or truckload weighed at a grain elevator. The farmer was reimbursed for the extra time and expense of the weighing.

Other types of research studies in the 1980s included computer-assisted area frame stratification and sampling, computer-assisted personal interviewing, and small-area estimation. In a joint technology/research effort between SRS and Netherlands Central Bureau of Statistics (NCBS), the use of the Blaise software system developed by NCBS was explored for interactive survey editing.

Data Users Meetings

Before the mid-1980s, the agency often hosted listening meetings with producers and data users around the country. Each meeting attendee was given the opportunity to describe their experiences with USDA statistical data and present suggestions for additions or changes to programs. Sessions had been held in a variety of locations. All sessions were widely announced, and some major agricultural organizations usually attended the sessions regardless of the location.

During work on the 1982 Long-Range Plan, it became obvious that even individuals and organizations regularly using agricultural statistics reports often had misconceptions about survey and estimation procedures. This was particularly brought to light when one of the Long-Range Planning Group members had a lengthy meeting with about 30 analysts from a major, diversified agricultural company. One of that company's analysts, responsible for hog industry analyses, knew of the agency's enumerative survey program and falsely assumed that all statistics were based on area- frame interviews. He went on to describe what he thought would be an improved procedure of developing as complete a list of producers as possible to provide the bulk of the data, and then using the area frame mainly for completeness. The analyst did an excellent job of outlining his proposal, not realizing that was exactly what the agency had put into operation 10 years earlier.

The Long-Range Planning Group's interviews also indicated that an agricultural- or economic research-analyst position in many large agricultural organizations was only a temporary assignment; often that person was training for other opportunities. Thus, many analysts (other than senior research analysts) were not in their jobs long enough to really get to know how data series were compiled.

Uncovering the lack of knowledge about survey and estimation procedures led to three responses. Most quarterly and annual reports would now include some information on sample sizes and survey procedures. In addition, most reports would also include summaries of past performance results (numbers and sizes of revised estimates or changes from forecasts to final estimates). The third response was would be a new approach to meetings with producers and data analysts.

The agency started a series of data users meetings. The original concept was to have four or more meetings a year at different locations around the country. Meetings would serve two purposes. The first afternoon was designed for new or recent analysts and data users, and it focused on survey and estimation procedures. The next morning was the more traditional listening session, and it was hoped that senior analysts would take part. Thus, junior analysts attending would learn both from agency presentations and from comments made by more experienced data users.

The new plan also set up a four-year rotation of topics with presentations on field crops, livestock, fruits and vegetables, and economic surveys in specific years, rather than a presentation of all of the reports for each year. NASS made the meeting arrangements, but representatives from the WAOB, ERS, AMS, and FAS usually participated, as many of the questions and comments related to data series or programs of other agencies. NASS summarized the major issues discussed at each session and distributed the summary to all participants.

The new format was tried for the first four-year cycle but altered after that. The first day's instructional session was usually not well-attended; if a company needed to travel for the meeting, they would often send only one person—the senior analyst. Even organizations in the same city often did not avail themselves of the learning opportunity. Thus, the typical format for the meetings shifted from being split across two days to one day only. Short instructional sessions open to all participants were held in the morning. After an early lunch, the afternoon session would invite comments from all participants.

The listening format was also improved. Instead of just proceeding around the room from person to person, the moderator would ask for other comments on the same topic each time someone finished raising a new topic. Once all discussion on that topic had been exhausted, the next person in order would be asked for comments on other topics. The new format resulted in a shorter session and one that avoided repetition. It created a better-focused discussion of specific topics. The four-year cycle approach was still basically in play, but participants could comment on any and all data series, regardless.

Various locations and times of the year were tried for data user meetings, but participation declined over time. However, meetings on fruit, vegetable, and specialty commodities normally were very well-attended, particularly if they were held in a State such as Michigan, which had many specific commodity production associations.

Typical requests at data users meetings were pleas for more and more data for specific commodities. Rarely were there suggestions of data series that were not useful or could be dropped. Occasionally, there were some profound comments, such as from the grain elevator operator who pointed out that NASS did him and producers disservice whenever it released a "Crop Production" report at 3 p.m. eastern time on a Friday during harvest season. Because he did not know how the markets would react on Monday morning, he would take protection all weekend and pay less for grain than he might have, if he had known the market reaction. That was an extremely insightful, simple observation, but no one had ever raised it. The "Crop Production" report guidelines were to release the report between the 8th and the 12th of each month. NASS added a guideline to avoid Friday afternoons during harvest to the planning considerations for future years. When "Crop Production" reports were later shifted to 8:30 a.m., Fridays were once again available as potential release days.

Avoiding crop-related Friday releases led NASS to ask if livestock industry officials had similar concerns. As it turned out, the preferences were essentially the opposite. Most of the live livestock marketings are referred to as "frontloaded." That is, decisions are made late in the week or over the weekend on how many animals to market the next week and when. Many livestock industry representatives felt the best service would be to release major livestock-related reports (such as "Cattle," "Hogs and Pigs," "Livestock Slaughter," and "Cattle on Feed") on Fridays—even if reports could have been released a day or two earlier. Some even claimed that prices suffered when NASS livestock reports were issued midweek. ERS analyzed that claim and found no price impact. However, they did find that typical daily marketing patterns of slaughter livestock were affected when a major livestock report was issued midweek.

Those who dissented from the call to release major livestock reports on Friday afternoons were largely analysts who traditionally published their updated

interpretations and recommendations on Fridays. The change would not allow them to meet their usual schedule. However, NASS did go to the Friday schedule for most livestock marketing-related reports. Due to a later modification, monthly "Livestock Slaughter" reports are now released at 8:30 a.m. on Fridays, so there are not so many pieces of information to be analyzed at 3 p.m.

With lower participation and tight budgets, NASS discontinued the multiple annual meetings pattern. Specific data users meetings have been held in recent years to discuss environmental data needs and to gather information in preparation for upcoming censuses of agriculture.

However, an annual USDA Data Users Session meeting continues to this day. It is held in conjunction with the annual Industry Outlook meeting in Chicago, which is organized by professional agricultural market analysts. Many participants make their living by analyzing commodity and futures markets, as well as Federal Government reports, to advise their clients of what actions to take. Other participants are from the commodity futures and mercantile markets.

The USDA Data Users Session is held the afternoon before the Industry Outlook meeting. The meeting starts with short "what's new or will be changing" presentations from NASS, WAOB, FAS, AMS, ERS, and staff members from the Bureau of the Census responsible for import- and export-data reports. The rest of the afternoon is spent fielding comments from the industry participants by using the topic-focused approach. The industry participants have sometimes been referred to as "power" users because quick analyses are particularly important. This group has been instrumental in encouraging NASS and the other Federal agencies to expand format offerings, such as spread sheet-ready electronic files and historic databases.

Lock-Up Briefings

One type of data users meetings that has been extremely successful is when producer groups attend the briefing for the Secretary of Agriculture in conjunction with "Crop Production" or other major reports. The first group of agricultural producers known to participate was from North Carolina in the late 1970s. In August 1982, the Illinois Farm Bureau Federation (IFBF) brought a group of producers to the release of the August "Crop Production Report," and IFBF has returned every August since. Groups from Iowa and Mississippi normally visit for each September "Crop Production Report," and many other groups have visited on occasion. A number of international visitors and other groups have also taken part.

Visitors for "Crop Production" and other 8:30 a.m. report releases check in with the NASS associate administrator's office about an hour before the release. They are briefed on the security procedures and the rules for attending the lock-up briefing. This includes leaving all electronic devices outside the lock-up, staying with the group, refraining from photography unless approved in advance, and not asking questions while the Secretary (or Acting Secretary) is being briefed. They must sign that they have read the rules and will abide by them before receiving a pass to enter lock-up.

Once inside, visitors are permitted to visit the room where the reporters are working on their reports and preparing for outside communications to be activated at 8:30 a.m. They also visit the Agricultural Statistics Board (ASB) analysis room for a discussion of final report preparation activities that occurred overnight.

Once the report is released and the Secretary leaves, visitors often spend the rest of the morning with NASS staff members to learn more about reports and survey procedures. The session normally concludes at lunchtime. One usual activity included before lunch is to have someone bring in the opening futures market numbers to see what impact interpretations of the "Crop Production" and the "World Agricultural Supply and Demand Estimates" reports have had on the markets.

Visitors waiting to attend a 3 p.m. release for reports such as "Cattle" or "Hogs and Pigs" will meet with agency staff members outside of the secured work area in the morning. After lunch, they will go through the same clearance procedures required for morning releases and then receive similar briefings while they wait for the Secretary to arrive.

Customer-Driven Quality

The examples of listening to data users and setting new policies on the days of the week for report re-

leases are typical of the types of improvements that were made based on input from customers. NASS seriously considers all suggestions for changes in data collection, survey and release timing, and the amount of detail included in publications. Some changes, such as adding reliability write-ups to most major reports, have already been mentioned.

There must be enough consistent, underlying data available for NASS to make a change or add new features to their reports. NASS will not make changes based on requests from some data users that will disadvantage others. For example, one State-level peach producers' organization requested a later production forecast date for their State. It was not clear whether the change would unfairly benefit that State in marketing their crop compared to other neighboring States, but NASS would not make a change until the other State organizations had the chance to consider the proposal and comment on it.

Customer-driven quality is one term that has been used to describe the willingness to make changes in content, timing, and other variables without new funding. Below are some other examples of changes from the 1980s.

One of the best examples of improving report contents was for "Crop Progress" reports. Throughout the growing season, each State conducts a weekly survey that measures not only crop maturity information (e.g., percent planted, corn tasseling, and soybean blooming), but also the conditions of major crops. Until the 1980s, State field offices basically set their own weekly questionnaires. Often, adjoining States would not start asking specific progress questions at the same time. States varied as to whether they asked for four or five condition descriptors ("excellent," "good," "fair," "poor," and "very poor") and whether they listed the adjectives from best to worse or worse to best. Thus, it was difficult for data users to draw conclusions about the progress of and conditions in different regions of the country. Progress question timing and the format for condition questions are now coordinated. As a further service to data users, State data for each crop are now presented in data tables, which provide comparisons with last week, last year, and average progress to a specific date. Those tables in the "Crop Progress Report" issued every Monday afternoon also include weighted averages.

NASS has often been able to improve report usability by providing finer breakouts, such as splitting hired farm-worker estimates into field and livestock workers. Finer breakouts of "Cold Storage Report" categories, such as pork, cherries, and caneberries, were provided when it was determined that there were sufficient data for consistent publication. As other examples, new, larger-size groups for farms, hog inventories, and milk-cow inventories were added.

Sometimes data tradeoffs have been made with specific industry groups. For example, Congressional funding for the "Commercial Floriculture Report" was sufficient at one period in time to cover all operations in only 28 States with $10,000 or more in sales. Some industry groups wanted the survey expanded to 36 States. The compromise was to add more States, but also to collect fully detailed data for only operations with $100,000 in sales. For operations with sales between $10,000 and $100,000, the survey would ask just a few classification questions.

Passing the Torch: a New Agency Administrator

Bill Kibler retired as NASS administrator in May 1987. The USDA Assistant Secretary for Economics interviewed only in-house candidates to select Charles E. (Charlie) Caudill as the third agency administrator. The process was very orderly; the interview and selection process was completed early enough so that Kibler left the office one day, and Caudill was in place the next day.

Caudill received a B.S. degree in agricultural economics in 1957 from North Carolina State College (now University). He worked as a student trainee in the North Carolina field office, and started his full-time career there before transferring to the Maryland-Delaware office in 1959. Caudill was part of the second group of agency personnel in the full-time, mathematical statistics training program. He spent the 1961–62 academic year at Iowa State University. After Iowa State, he transferred to agency headquarters where he worked on research and methodology issues.

In 1967, Caudill became the chief of the Statistical Methods Staff responsible for the ongoing probability surveys' sampling and estimation procedures. He was one of the visionaries who proposed the creation of the generalized edit and generalized summary data-processing systems; he also led the development

efforts. He was the statistician in charge of the Texas State statistical office from 1972–75. Caudill then returned to headquarters as the statistical research division director.

As mentioned earlier, one major responsibility for the director was the development and management of AgRISTARS (the Joint Program for Agriculture and Resources Inventory Surveys Through Aerospace Remote- Sensing). While still carrying out his AgRISTARS functions, Caudill shifted to the director of the State Statistical Division position in April 1984 and then to the deputy administrator for programs position in October 1986.

Caudill brought broad agency experience and technical training to the administrator position. However, he is particularly remembered by agency personnel for his emphasis on balancing family and faith with a person's career. One of his signature activities was personally hosting a discussion session with family members who attended agency national conferences.

U.S. Agriculture, Circa 1987

The 1980s will be remembered for the Farm Crisis. Many farmers had purchased additional farmland and greatly expanded their production due to the high commodity prices and expanded exports of the 1970s. Net farm income was $27.4 billion in 1979, and farmland values were extremely high (recall chapter 4). However, the U.S. economy changed in the 1980s to extremely high interest rates and lower exports. Farmland values increased to a U.S. average of $823 per acre in 1982, and some States saw further increases for the next two years. However, U.S. average farmland value decreased 25 percent from 1984 to 1987 (from $801 to $599), with the biggest declines in top crop-producing States. The average farmland value in Iowa dropped almost 50 percent, and values declined by about 40 percent in Illinois, Indiana, Kansas, and Nebraska. The value per acre of California farmland declined 22 percent, while that for Texas dropped 11 percent.

The large debt load and extremely high interest rates led to unprecedented rates of farm bankruptcies—higher than during the economic Depression of the late 1920s and the Dust Bowl years of the 1930s. The U.S. rate of bankruptcies in 1987 was 23.05 per 10,000 farms, which was artificially high because many farmers had waited for new legislation that established Chapter 12 bankruptcy provisions. Those provisions encouraged lenders to write down part of the farm debt and allowed up to five years to pay off the present debts. Chapter 12 only applied if 80 percent of the debt was farm-related, and if 50 percent of gross household income came from farming. Given this, there were still some other bankruptcy proceedings. The highest rate of 1987 Chapter 12 bankruptcies was in the Northern Plains States (78.43 per 10,000 farms). Rates in the Delta States (43.24) and in the Corn Belt (27.73) were also above the U.S. average.

U.S. Farm Program changes and weather impacts resulted in extreme variations in crop acreages and yields during the 1980s. For example, the corn-for-grain harvested acreage varied 8 percent or more (up or down) from year to year for a total of five times between 1982 and 1989. U.S. average corn yields fell below 100 bushels per acre three times in the 1980s (with a low of 81.1 in 1983), but they rose above 115 bushels per acre four times, with a record high of 119.8 in 1987. The average corn yield for 1985–89 was 111.6 bushels per acre, up 17.3 percent from 10 years earlier. (The 84.6 bushels-per-acre average for corn in 1988 had reduced the 1985–89 period average by 6.8 bushels.) The average acreage harvested during that period was 65.3 million acres, which fell 8 percent from 10 years earlier.

Soybean acreage harvested in the 1980s did not fluctuate as much as corn, but it did decline 10 percent in 1983 during the corn Payment in Kind Program (PIK). However, it rebounded 5.7 percent in the next year. During 1985–89, the average acreage harvested was 58.8 million acres—almost the same as 10 years prior. The average yield per harvested acre was 32.1 bushels per acre, an increase of 9.2 percent in 10 years.

Cotton acreage harvested averaged 10 million acres during 1985–89 (down 14 percent from 10 years earlier), but the five-year period included a low of 8.5 million in 1986 and a high of 11.9 million in 1988. Yield per acre during 1985–89 averaged 624.2 pounds per acre, an increase of 29.8 percent in 10 years.

Acres of all wheat harvested averaged 42.3 million acres during 1985–89, with an average yield per harvested acre of 37.5 bushels. The average harvested acreage fell 4 million acres (8.6 percent), but the

average yield was up 14.3 percent in 10 years from the 1975–79 average. The resultant average wheat crop of nearly 1.59 billion bushels rose 4.8 percent over the average crop size of 1.51 billion bushels during 1975–79.

Utilization of corn for high-fructose corn syrup more than doubled from 1980 to 1987 (from the equivalent of 165 million bushels of corn to 358 million). In addition, the first efforts to convert corn to ethanol for use as a fuel additive were underway. Some 35 million bushels of corn were used in 1980, which rose to 279 million bushels by 1987. Corn exports dropped from 30.5 percent of total utilization in 1977 to 22.1 percent in 1987.

There were slightly more than 2.21 million farms in the United States in 1987—a reduction of 332,870 farms (or 13.6 percent) from 1977. From 1977 to 1987, the number of farms with cattle declined by 375,470 (a 21-percent drop). Farms with hogs in 1987 fell to 328,640, and had declined 49.2 percent in 10 years. Farms with milk cows in 1987 numbered at 227,880 (a 42-percent drop). The number of cattle in 1987 fell 23 percent because of the cattle cycle. However, the number of hogs decreased only 3.8 percent, and the number of milk cows fell only by 5.6 percent (though the total milk produced actually rose by 16.4 percent).

Table 7. Per Capita Consumption of Meat, Poultry, and Fish, United States 1987

Total Population	242,804,000	
Category	Total Consumption (Pounds/person)	Percent of Total
Beef	73.7	34.6
Veal	1.5	0.7
Lamb	1.3	0.6
Pork	48.8	22.9
Chicken	56.6	26.6
Turkey	14.7	6.9
Total Fish	16.1	7.6
Total Meat, Poultry & Fish	212.7	100.0

Table 7 documents major changes in meat-, poultry-, and fish-consumption patterns in the United States between 1977 and 1987. In the early 1980s, there was considerable progress in broiler genetics, and a larger, more easily deboned bird with more breast meat was developed. Consumption of chicken increased from 42.7 pounds per capita in 1977 to 56.6 pounds in 1987. Beef consumption per capita dropped during the same period from 91.5 pounds to 73.7 pounds. Veal consumption dropped from 3.2 pounds per person to 1.5 pounds, and lamb continued its decline from 1.5 to 1.3 pounds. Both turkey consumption (8.7 to 14.7 pounds per person) and fish consumption (12.6 to 16.1 pounds) increased during the same 10-year period of 1977–87.

Pork consumption was now lower than chicken, even though it increased slightly from 1977 to 1987 (from 46.7 pounds per person to 48.8). In the 1980s, most hogs were still raised on farrow-to-finish operations, although some early contracts were being written for farmers to feed out hogs that had been farrowed elsewhere.

Table 8. Cash Receipts from Farm Marketings, by Commodity Groups, United States 1987

Category	Total Cash Receipts (Million dollars)	Percent of Total
All Cash Receipts	141,797	100.0
Total Crops	65,801	46.4
Food Grains	5,790	4.1
Feed Grains	14,635	10.3
Cotton	4,189	3.0
Oil-bearing Crops	11,283	8.0
Tobacco	1,816	1.3
Fruits and Tree Nuts	8,056	5.7
Vegetables	9,891	7.0
Nursery, Greenhouse, Flowers	6,737	4.8
Other Crops	3,404	2.4

[table continues on next page]

Total Livestock and Products	75,996	53.6
Cattle and Calves	33,583	23.7
Hogs and Pigs	10,336	7.3
Sheep and Lambs	558	0.4
Dairy Products	17,727	12.5
Eggs	3,208	2.3
Broilers and Farm Chickens	6,289	4.4
Turkeys and Other Poultry	2,018	1.4
Wool	77	0.1
Other Livestock and Products	2,199	1.6

Table 8 indicates that U.S. cash receipts from farm marketings in 1987 returned to the point where livestock and products marketings exceeded crops marketings. Even though the $141.8 million dollars of total cash receipts in 1987 (in 1987 dollars) is nearly 50 percent higher than the $96.2 million in 1977 (in 1977 dollars), the effective level of cash receipts in 2007 equivalent dollars actually decreased from $321.4 million in 1977 to $252.7 in 1987. This reflects impacts on the U.S. economy during the 1980s. All of the major field-crop categories (feed grains, food grains, cotton, tobacco, and oil-bearing crops) accounted for lower percentages of total U.S. cash receipts in 1987 than in the 10 years prior. Cash receipts for fruits and tree nuts, vegetables, and nursery, greenhouse and flowers were all proportionally higher in 1987 than in 1977. The proportion of nursery, greenhouse and flowers cash receipts to total cash receipts more than doubled in the 10-year period.

For the livestock cash-receipts side, the cattle and calves group and the broilers and farm chickens group had significant proportional increases from 1977 to 1987. The proportion of cash receipts for the other livestock and products category more than doubled during the 10-year period, largely from increases in receipts from aquaculture, honey, horses and mules, and goats.

International Assistance in the 1980s

The SRS International Assistance Program was quite active in the early 1980s. More than 20 countries were visited each year between 1980 and 1982, and about $500,000 in reimbursements ($1.1 million in 2007 dollars) was received each year. Ten countries had completed the first two demonstration stages of the Remote Sensing for Agriculture Project (area frame construction and data collection). Three of the countries were planning to move from the demonstration level to countrywide area frames.

Even though most assistance in the 1980s was provided by individuals or teams on a temporary duty (TDY) basis, there were still several resident assignments. Those included Saudi Arabia, Sudan, Peru, Liberia, Morocco, Pakistan, Cameroon, and Honduras. Most assignments were two to three years, but the projects in Morocco and Pakistan were in place for 10 years, which required a rotation of agency resident personnel.

One of the largest TDY activity projects of the 1980s was in Egypt. USAID established an Agricultural Data Collection/Analysis Project that included ERS and some private contractors. Egypt did not want an area frame constructed for the entire country, but it did request a wide variety of pilot surveys for different commodities. Other TDY assignments in the 1980s included Argentina, Brazil, Bolivia, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Peru, the Philippines, Sierra Leone, and Turkey.

In 1984, the agency started offering a six-week Basic Agricultural Statistics and Survey Procedures training course in Washington, DC. The course was taught by headquarters' staff members and included visits to nearby field offices. The course was extremely successful and was modified to be presented in other countries such as Pakistan and Sudan.

Staffing in the 1980s

Because of the budget cuts early in the decade, and the resultant hiring freezes, staffing levels fluctuated quite a bit in the 1980s. By October 1987, staffing levels were lower than the start of the decade.

In October 1987, there were 393 agricultural statisticians on board, compared to the 406 in 1979. Thirty-five were women and 38 were minority employees. At the same time, there were 64 mathematical statisticians, including 10 women and two minority employees. Eighty-six employees were in computer specialist positions in October 1987, including 37 women and 14 minority employees.

The fourth employee series for which detailed breakouts are available is statistical assistants. There were a total of 174 in October 1987, comprised of 163 women and 36 minority employees.

Part 4: Branching Into New Data Series

PROLOGUE

During the 1980s, environmental concerns were growing in the United States. There were concerns about water quality and the effects of chemicals getting into rivers, streams, lakes, and the water supply. Although individual cases of businesses dumping chemicals were brought to light, complaints were often lodged at farmers using herbicides, insecticides, and other pesticides.

There were also increasing food safety concerns. Again the focus was on farming practices. The public wondered what chemicals were being used to produce fruits and vegetables, and what chemical residues were found in the produce. Food safety complaints peaked when it was reported in 1986 that residue traces of Alar detected in apple juice and applesauce might be harmful to people. Alar was a chemical sometimes used as a ripening agent to ensure that red apples would ripen evenly and have the best appearance for fresh market sales.

The Alar reports created a great uproar and many articles called for a ban. Some grocery store chains and apple product manufacturers stopped accepting Alar-treated apples. Much of the attention was based on the compelling thought that Alar residues might be found in applesauce for babies. Those claims carried a lot of weight and led to a halt in the use of Alar. Articles that pointed out there were no reasons to apply a ripening agent to apples harvested for processing didn't receive much media attention. Because of the publicity, the manufacturer of Alar halted all domestic sales of the chemical in 1989. Tests for Alar exposure on laboratory animals showed a possible connection to cancer, but only at rates equivalent to a person consuming a boxcar of apples each day.

The environmental complaints and health concerns of the time led to a Presidential water quality initiative and a Secretary of Agriculture's food safety initiative. The Secretary announced a $25 million data initiative that would include measuring chemical residues in food as well as collecting information on farm-level chemical usage. Both initiatives needed valid data on what chemicals were being used by American farmers, and which residues were present in food being produced. NASS had conducted only a few general purpose chemical-use surveys, so the main agricultural chemicals data available were ambiguous reports of chemical production and sales. To answer both food safety and water quality concerns, new and targeted surveys were needed along with detailed analyses of all other related data. These tasks would become the responsibility of NASS and its sister agency, ERS.

ERS requested water-quality funding largely for field-crops surveys. NASS took the lead in requesting food safety funding, largely for fruit and vegetables surveys. The agency developed a three-year survey plan that would cover 90 percent of the U.S. production of 30 commodities and create State-level estimates. NASS first requested food safety funding of $7.0 million in the FY 1990 budget, but no money was received. When the request was repeated for FY 1991, $3.5 million was received. That enabled NASS to begin its survey plan, and with the money available, it was decided to rotate surveys between fruits and vegetables in alternate years.

ERS had a small food-safety analysis program underway and received $2.6 million in FY 1990 for water-quality analyses and some data collection efforts. NASS conducted the first water-quality surveys for ERS in 1990. ERS requested an additional $2.125 million in the FY 1991 budget and planned to concentrate data collection in the Midwestern States.

By the end of calendar year 1990, NASS staffing was at a very low level. The tight 1980s budgets had led to reduced hiring, and many staff members hired before the 1957 Long-Range Plan had now retired. In addition, there was a special Federal employee incentive to retire on or before November 30, 1990. Up to that point, retiring employees covered under the Civil Service Retirement System could request a lump-sum payment of their retirement contributions and still receive 90 percent of their normal retirement annuity. That option was very attractive to many people, but it ended after November 30, 1990. Nineteen NASS employees retired on that date; in total, 20 agricultural and mathematical statisticians

and 25 other employees retired between December 30, 1989, and November 30, 1990.

The funding made available for chemical-use surveys led to broadening NASS survey and reporting efforts. It also created an expansion in statistician staffing similar to the corn/hog program of the 1930s and the hiring effort in the early 1960s to carry out enumerative and objective yield surveys. Hiring started right away, with 96 agricultural statisticians and 18 mathematical statisticians hired between October 1, 1990, and September 30, 1991. In addition, 84 other new employees were hired during that period, including 12 data processing specialists and 30 statistical assistants.

There were two noticeable differences in FY 1991 hiring compared to the 1930s and 1960s. All statisticians in the earlier periods were men, but 37.5 percent of agricultural statisticians and 38.9 percent of mathematical statisticians hired in FY 1991 were women. In addition, many FY 1991 hires (one-third of the agricultural statisticians and all but one mathematical statistician) had master's-level degrees and were hired at GS-9 or higher salaries.

Chapter 6: Applying Agency Strengths to New Statistical Series

Creating the New Environmental Surveys

NASS had previously conducted occasional chemical-use surveys, but now it needed to build an ongoing, detailed data-collection program. In order to achieve the best start, a temporary Environmental Statistics Group, which reported to the Research and Applications Division director, was established in early 1990. The group engaged in many activities to develop the best survey instruments and training for staff members and enumerators.

Group members collected all available agricultural chemical-usage data and publications. They met with officials from the U.S. Environmental Protection Administration (EPA), USDA, and other organizations to summarize applicable agricultural chemical-use laws and regulations. One major effort was compiling a detailed database of insecticides, herbicides, fungicides, and other agricultural chemicals. The database needed to be searchable by technical composition name, brand name, and active ingredient because it was expected that survey respondents might refer to specific chemicals in multiple ways. Group members started by matching available database files and adding new chemical products information in order to create the most useful database for NASS purposes.

The first surveys conducted were field crop chemical-use surveys for ERS in support of the President's Initiative on Water Quality. These surveys requested fertilizers and pesticides used on the fields selected for 1990 objective yield surveys. In order to broaden the coverage, "quasi objective yield" samples were selected in additional corn- and soybean-producing States. Thus, information was collected the first year for 47 corn States, 29 soybean States, six cotton States, 14 wheat States, 11 potato States, and two rice States. A data collection summary was published in March 1991.

The first surveys to support NASS efforts under the Secretary's Food Safety Initiative covered 1990 vegetable and melon production in Arizona, Florida, Michigan, and Texas. These results were issued in June 1991. For the 1991 crop year, surveys shifted to fruits and nuts, thus establishing an alternative year pattern that provided good quality chemical-usage information and avoided annual contact of the largest fruit or vegetable growers.

Section 1491 of the Food, Agriculture, Conservation, and Trade Act of 1990 (commonly referred to as the FACT Act or the 1990 Farm Bill) called for an annual report to Congress on uses of restricted-use pesticides that require specific training and precautions prior to purchase and use. The FACT Act section was all encompassing; it included commodities that NASS was not covering in the food safety and water-quality surveys, as well as usage on livestock, seed treatments, forestry, and non-agriculture categories (e.g., parks and golf courses). NASS requested $1.0 million in the FY 1992 budget as the first of two installments to collect restricted-use chemical information. Congress provided only $100,000 in FY 1992 and did not add any additional funds in FY 1993. With the limited funds, NASS started a series of annual reports that summarized the uses of restricted-use pesticides that had been documented the previous calendar year in surveys that NASS did conduct.

Even though most chemical-use surveys were time consuming, NASS received good cooperation from producers. Producers, in general, had a story they wanted to tell. There was great concern in the press about overuse of agricultural chemicals, and producers wanted to demonstrate how prudent their chemical usage actually was. The EPA approach, in the absence of documented statewide chemical-usage survey data, was to assume that each producer used all authorized chemicals and at maximum rates. This approach assumed that multiple herbicides and insecticides would be used on the same field; however, producers usually applied only one insecticide or herbicide, often at less than the maximum-allowable application rates.

When NASS started chemical-use surveys, counterpart agricultural statistical organizations in Europe were amazed that U.S. farmers would report agricultural chemicals-usage data. Those countries were experiencing very low response rates. However, it was clarified that those countries were using quite complicated mail questionnaires instead of the NASS personal interview system. To gain good cooperation and provide the most complete report, NASS

enumerators often were invited to sit down and tally a producer's records. This was particularly the case for some fruits and vegetables that received a number of different treatments during a growing season.

NASS and ERS did adjust the water-quality survey emphases somewhat from year to year. For the 1991 crop year, in addition to collecting chemical- usage data for all ongoing objective yield surveys, objective yield-style samples were selected in three peanut States and three grain sorghum States. In addition, a special, more inclusive survey of chemical use was conducted in 1991 for the Delmarva (Delaware, Maryland, and Virginia) Peninsula. In 1992, chemical-usage information was collected for some watersheds in Indiana, Nebraska, Pennsylvania, and Washington State.

In addition to the farm-level surveys, agency staff members played an important role in assisting AMS of USDA with their assigned role of testing agricultural products for chemical residues. A valid sampling plan for selecting samples of commodities for testing was designed, and guidelines for proper calculation of testing results were provided.

Other New Surveys in the Early 1990s

Although the chemical-use surveys and reports made the biggest splash in the early 1990s, there were some additional new or expanded surveys. The Immigration Reform and Control Act (IRCA) of 1989 stipulated new information that was needed about seasonal labor, and Congress appropriated funds in the FY 1990 and FY 1991 budgets for survey expansion. The first step was an annual survey for all States, followed by quarterly estimates for all States and monthly data for selected, major States.

In 1990, the monthly crop yield surveys for the 48 contiguous States had all been converted to the probability-based Monthly Agricultural Survey Program. Sorghum and oats grain-stocks were again restored to a quarterly basis and exports were added to the "Catfish" reports.

In 1991, NASS took over the responsibility for collecting and processing the twice-monthly "Cotton Ginnings Report." Information for those reports was formerly collected and summarized by the Bureau of the Census.

Because of changes in Farm Bill provisions, NASS was asked to start production estimates of minor oilseeds (canola, rapeseed, safflower, and mustard) and end-of-marketing-season estimates of stocks on hand. Because of renewed Congressional interest in the U.S. sheep and lamb industry, NASS was asked to create State estimates of sheep operations by size and to publish March and November "Sheep and Lambs on Feed" reports.

State-level wage rates were added to the farm-labor estimating program in 1993, and a series of selected pesticide prices was added to the prices paid program.

In addition to new surveys, two significant estimation procedural changes were made in 1993. Farm production expenditure estimates were now published, by interpreting indications from the farm costs and returns survey, along with information from prices paid surveys, farm-input cost data, and Bureau of Census benchmark data. Grazing fee estimates were now set for 17 Western States, instead of published survey averages.

FY 1993 and 1994 turned out to be particularly tight budget years. NASS made cuts in the forage and commodity statistics estimating programs. The rice objective yield program was dropped for the last two States, the number of soybean objective yield program States fell from 11 to eight, and the winter wheat objective yield program States fell from 15 to 13. Post-harvest surveys for all objective yield crops were eliminated for one year. Other reductions included dropping the June Vegetables Annual Summary and the monthly "Celery Report," along with six monthly "Vegetables" reports and the Fall Maple Syrup Survey. Some planned State-level fruit tree and vine inventory surveys were postponed.

Evaluating the 1993 Floods

NASS crop-survey procedures, forecasts, and estimates received considerable attention in 1993 when a cool, wet spring turned into heavy July rains and flooding in nine Midwestern States. The previous year had been a cool year with slow, early crop progress. However, 1992 was a long crop year, with later-than-normal killing frosts, and U.S. corn and soybean yields both exceeded their previous record yields by 10 percent. Thus, Midwestern farmers likely were not too concerned about the slow 1993

planting season start. Plantings were two weeks behind normal in early May and remained behind by the first of June. At the time producers were interviewed for the June Enumerative Survey, 5 percent of the corn crop and 35 percent of the soybean crop had not been planted.

Weather remained cool and damp during June and there became concerns that the last intended corn and soybean plantings might not materialize. Heavy rains in early July resulted in extensive flooding in North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, and Illinois. Much of the greatest concern was for Iowa and Missouri.

Even in more normal crop seasons, there are often a few States with late plantings. NASS commonly added follow-up survey efforts in July so acreage for harvest totals in the August "Crop Production Report" would be as accurate as possible. For 1993, the follow-up survey work was greatly expanded. All June Enumerative Survey operators in the nine States who had not completed plantings when interviewed were re-contacted, and all operations selected for corn and soybeans objective yield surveys were contacted in late July. The sample size for the August Agricultural Yield Survey was expanded by selecting an extra replicate; operations scheduled to be contacted for chemical-use data later in the season were also contacted in late July. In total, more than 8,000 extra contacts were made in late July to collect information on final plantings and on acreages of corn and soybeans that would be harvested.

The NASS survey procedures provided strong evidence for acreage estimates in the August "Crop Production Report" that indicated 600,000 acres of corn and nearly 2 million acres of soybeans had not been planted in the nine States. In addition, 2.5 million acres of corn and nearly 2 million acres of soybeans that had been planted in the nine States would not be harvested. NASS research staff aided the evaluation efforts by creating weekly weather satellite-produced vegetative index maps, which demonstrated the extent of the flooding and compared the relative healthiness of the crops after the floods with that for 1992.

The objective yield surveys indicated that 1993 corn and soybeans plant populations, and corn ears per acre, were quite high in most States. The first corn yield forecast for Iowa was 32 bushels below its record yield in 1992, but Illinois was expecting a yield within nine bushels of its record. The crop potentials remained mixed throughout the rest of the growing season, with record high soybean pod counts in Illinois and Indiana, but with record low counts in Iowa and Minnesota. Corn pollination was poor in Iowa and Minnesota, which resulted in shorter-than-normal kernel row lengths.

Killing frosts in the northern Corn Belt occurred on October 2 and 3; by mid-month, they had moved across most of the Corn Belt. Corn and soybean harvests started soon after the freezes, and 50 percent of the corn and 80 percent of the soybean acres were harvested by the first of November. Corn kernel weights turned out to be extremely low, and the 7.2-bushel drop in U.S. forecasted corn yield from October to November was the greatest it had been in 20 years.

Soybean yields were not affected as much as corn, and Illinois and Indiana both had good soybean harvests. However, the corn yields and weights per ear for Iowa and Minnesota turned out to be even lower than had been experienced during two years of severe drought in the 1980s.

NASS and WAOB were asked by the Secretary of Agriculture, and by many others, to shed additional light on the low 1993 yields and the impacts of the flooding. Based on the March "Prospective Plantings Report" issued by NASS coupled with early season conditions, WAOB had projected the third- largest U.S. corn crop and fifth-largest soybean crop on record. However, the corn crop ended up 25.4 percent lower (9.1 percent lower acreage harvested and 17.9 percent lower yield) and the soybean crop 11.9 percent lower (3.1 percent lower harvested acreage and 8.9 percent lower yield) than the WAOB projections.

However, all losses could not directly be attributed to the floods. Detailed analyses of weather and weekly crop-progress data indicated that there was not enough time in some States between the 50-percent corn-silking date and the killing frost.

The 1993 frost was not particularly early, but crop progress was late enough that there was not sufficient time for the crop to fully mature. Graphs for Iowa demonstrated that there were only 60 days between

the 50-percent silking date and the frost in 1993, compared with the 1992 record crop that had 87 days.

Modernizing Prices Indexes

One of the most significant agency advances in the early 1990s was reconstructing the indexes of prices paid and prices received by farmers. The last previous revision to these index series had been in 1976, and it was more of a minor update. The new effort improved the index weighting procedure and established a new technique that would keep the relative weights of index items current, as the mix of commodities produced and inputs purchased change over time.

The new indexes are based on a 1990–92 reference period, which had relatively stable levels of prices paid and prices received. Because of a legal requirement that parity prices be computed with a base period of 1910–14, calculations continue to be made and published each month for that reference period. Perhaps the greatest advance in the new index procedures was shifting from a fixed set of annual weights for the prices received indexes to monthly weights, which were based on relative marketings of each commodity for the previous five years. The former fixed-weight approach, though an unbiased procedure, often created prices received index-calculation anomalies. For example, oranges had a fixed weight of 1.5 out of 100 in the former system, which fairly well-represented its proper share of annual cash receipts. However, late in the marketing year, few sales of oranges occurred, and they were often at an extremely high price for export. Because those late-season sales were overweighted in the old index series, the price increase for oranges might have raised the U.S. monthly prices received index calculation a few points higher than it should have been with better weighting. The new system provides an appropriate marketing weight for oranges each month, which is important when January marketings are normally 10 times higher than August marketings.

In addition to instituting monthly weights, the weights are now recalculated each year based on relative marketings for the previous five years. Thus, if production and sales of a particular commodity increase and remain stable, marketing weights will reflect the change. There will be a bit of a lag as the weights adjust, which is preferable to having significant year-to-year changes in the index calculations based on short-term weather or other production anomalies.

For the prices paid index reconstruction, expenditure data from the annual farm costs and returns survey (FCRS) were used to create moving average weights. Annual weights are used for prices paid instead of monthly weights. The major component weights are now updated annually, based on purchases the previous five years. However, subcomponent weights, such as types of seeds purchased, are updated only every five years.

The biggest change in the prices paid index calculations, when the shift was made from the 1971–73 base to the 1990–92 base, was the reduction of weight for the family-living component. Again, the FCRS provided information on household expenditures, as well as all other expenditures. The relative weight for the family-living expenditures declined from 30.4 percent for 1971–73 to 19.0 for 1990–92. This was due to the decline in the number of farm households and the corresponding increase in proportion of production expenditures.

A great amount of thought, planning, and hard work went into the index reconstruction effort. Much of the work was performed by a statistician from Statistics Canada, who was on a two-year exchange program with NASS. Assistance was also received from staff members from the U.S. Bureau of Labor Statistics, the University of Maryland, and ERS. The new procedures and approaches are well-outlined in the publication, "Reweighting and Reconstructing USDA's Indexes of Prices Received and Paid by Farmers," which was issued by NASS in January 1995.

Continuing to Document Agency Standards

By 1991, much of the early work on defining agency standards had been completed. A total of 52 "Policy and Standards Memoranda" (PSMs) had been completed and issued. Twenty had been revised and reissued, as staff members continued to evaluate the best standards for the agency.

Technical Review Teams (TRTs) were reviewing the operations of eight or nine field offices a year. The first cycle of all State field offices, except Alaska, was completed in 1992. The first edition of "Common

Threads," which summarized the findings and suggested improvements from the first 26 TRTs, was published in April 1991. The TRT approach was expanded to review selected headquarters' units starting in 1992.

The PSM and TRT approaches fit in well with the agency's emphasis on "Total Quality Management" (TQM) in the late 1980s and early 1990s. One TQM approach was establishing Survey Quality Teams (SQT) to identify statistical-process control methods, which could improve agency operations. The most challenging SQT analyzed all aspects of the agricultural survey program. That team's draft report, with its baseline quality measures, formed one of the key discussion topics at an agency national conference in April 1990. Many recommendations had to do with establishing and defining additional operational standards.

Among the quality/standards accomplishments of the early 1990s were the creation of a 10-volume commodity-estimation manual; the addition of reliability statements to all major releases; and the selection of a Report Survey Quality Team (RSQT) that implemented almost all recommended improvements in the course of completing its review.

Expanding Customer Service Efforts

When most Federal Government agencies discovered customer service in the 1990s, the typical reaction from NASS staff members (particularly State statisticians) was, "We have always provided good customer service." That attitude was correct—NASS had been a leader in customer service. The previous chapter highlighted some examples of customer-driven quality improvements that the agency had implemented. However, even NASS could enhance its level of customer service at that time.

One change in the May 1995 agency reorganization was the creation of a customer service office—and a customer service pledge. The most prominent feature of the office was a well-functioning, toll-free information number. Every call during business hours was answered in person, instead of by an answering machine. People assisting with the toll-free service received customer service training, which included extensive training on NASS reports and data products. Commodity specialists were available to answer particularly challenging questions.

Customers using the service were often shocked that they had reached a "real person." The quality of service was high, even when requests did not involve NASS data products. In fact, about half of the calls were not about NASS data—this included an estimated 20 percent of calls requesting data that probably had never been collected by any organization. Many other Federal agencies were not willing to provide toll-free service, and some data users called NASS and asked that their calls be transferred to those agencies. Staff members assisting with the toll-free service kept track of the types of calls and, in particular, the detailed references they uncovered as they pursued requests for non-NASS-related data.

The toll-free service was established before many people had electronic transmission and Internet access. As technology and customer access preferences changed, individuals helping with the toll-free service received training on electronic searches and Internet-access techniques. Early on, when customers acquired Internet connections, they often could not be on the telephone and connected to their computer at the same time. Staff members had to provide detailed descriptions of what choices the customer should take and what online screens would come up. The toll-free service was quickly expanded to include e-mail requests and an auto-fax capability for sending short NASS reports available in electronic formats.

Remote Sensing Developments in the Early to Mid-1990s

As mentioned in chapter 5, the main remote sensing efforts of the late 1980s had retracted from State-level and county estimates for multiple States to basic research and evaluation of new sensors and satellites. Research in 1991 focused on Arkansas and Mississippi; Louisiana was added in 1992. However, when the NASS budget became even tighter and Landsat data costs skyrocketed (due to the Government's decision to privatize sales of Landsat data), NASS reduced the research efforts to concentrate mainly on Craighead County, Arkansas. This is a fairly large county that has extensive acreages of cotton, soybeans, and rice.

A new, non-Landsat research effort was the evaluation of vegetative index data being produced from NOAA weather satellites. The Advanced Very High-Resolution Radiometer (AVHRR) sensor measured chlorophyll activity (or "greenness"), as the weather

satellites orbited the earth 14 times a day. The term "very high resolution" seemed a misnomer because individual AVHRR readings represented pixel sizes of 1.1 kilometers at best, compared with 30- to 60-meter resolutions that NASS had worked with for crop-acreage research efforts. However, the daily, high-frequency coverage of the weather satellites did provide a potentially useful data source.

The main data product created from the AVHRR sensor was referred to as the Normalized Difference Vegetation Index (NDVI). Various types of data sets could be created, but the most common was a file that recorded the highest reading every two weeks for each ground location. The product was usually presented as a color map of the United States that showed various shades of green depicting the relative healthiness of vegetation.

The NASS AVHRR research approach was to convert the photo-type product into a statistical product. Once multiple years of AVHRR data (with basically comparable data quality) were available, NASS staff members created side-by-side displays for the current year and the preceding year at the same time of the season. Additionally, instead of just national maps, it was possible to showcase particular States or regions and provide more detailed displays. NASS staff members also created maps that presented the greenness changes, both positive and negative, from one year to the next.

The year-to-year comparisons were appropriate, but it would not be reasonable to make many comparisons within a season, as the vegetation index declines later in each growing season as crops mature and go into normal senescence. In addition to visually evaluating drought impacts, the AVHRR products were of great interest in 1993, when early July floods impacted much of the Corn Belt, as mentioned earlier.

Another emphasis in the early 1990s was to explore uses of remote sensing classifications in conjunction with other Geographic Information System (GIS) data layers. When Landsat data costs declined and it became possible to return to analysis of data for entire States, NASS researchers started creating a Cropland Data Layer (CDL) product. The CDL was a complete, geographically referenced classification of all satellite data pixels within a State by crop or land use. By using Landsat scenes from multiple times of the year, the CDL did an excellent job of classifying pastures, trees, and other permanent vegetation separately from annual crops.

The CDL product would be valuable to a wide variety of researchers and policy officials looking at land-use planning, water quality, environmental issues, and other conditions. Before NASS released any CDL products, it carefully considered whether any confidentiality or proprietary data relationships were being compromised. NASS did use field-by-field data from the June Enumerative Survey, with the current crop type identified, as training data for the P-EDITOR classifier. However, once training was completed, the CDL product became a classification interpretation for every data pixel in the State, and it did not display any originally reported data. Thus, the confidentiality concerns were satisfied and CDL products could be released.

Another key policy decision was implemented in regards to the CDL. Since a person purchasing a CDL product for a State could summarize all pixels and essentially create crop county estimates, NASS decided to not release any CDL products until official crop county estimates were released for that crop season. (Those estimates are normally issued in February following the end of the crop season).

A continuing research emphasis throughout the early 1990s was to improve the functionality of the P-EDITOR system. Specifically, P-EDITOR was further automated when it was enhanced by some expert systems, which enabled it to be used by less-skilled analysts. By 1995, NASS had created an extremely powerful remote sensing land-use classification system, but it hadn't the staffing, budget, or mandate to produce many State-level GIS data products. Instead, because of the great interest from State cooperators and others, NASS developed the concept of GIS partnerships.

The partnership approach established agreements with non-private entities, such as State Government agencies or public universities, to create CDL data products. The partner organization needed to obtain the basic computer workstation with appropriate processing power and to provide a data analyst who could be trained to use the P-EDITOR system. NASS would provide the training, the data system, and the Landsat data.

New Technology in the Early to Mid-1990s

The technology emphases in the late 1980s and early 1990s were to provide all offices with enhanced, standardized data-processing capabilities. In 1989, a new eight-year teleprocessing contract was finalized, and a contract was awarded for the installation of microcomputers and local area networks for all field offices. Microcomputers were installed in the first 11 States in 1990 and in 24 more States in 1991. All State field offices were equipped by the end of 1992. In 1990, satellite dishes were installed in 32 offices for remote job-entry communications.

An improved Survey Processing System (SPS) Summary was implemented in 1991 to enhance the analysis of probability-survey data and to expand the capability of generating complex survey estimators. The SPS Summary replaced the Enumerative Summary System (ESS) and could handle the summarization of all agency probability surveys, including the new Agricultural Chemical-Use Surveys. The SPS Summary and the SPS Edit (implemented in 1986) have served the agency's national survey processing needs throughout the 1990s and 2000s.

Efforts were well underway for an online database system that would eventually contain all historical estimates. One early database module, which would greatly help the ASB, contained all grain-stocks estimates. The last 17 field offices received real-time access to the operational database in 1992. NASS was now making all regular statistical reports, including "Agricultural Chemical Use" and special reports such as "Farm Employment & Wage Rates, 1910-1990," available through the USDA Computerized Information Delivery System (CIDS).

Diligent data-retrieval and verification efforts on the part of headquarters units and all field offices resulted in the upload of an 18-year history of county estimates into the Published Estimates Database (PEDB). It would now be a simpler procedure to add new and revised county estimates each year.

CATI capabilities were increased from 21 to 34 field offices in 1991. The offices had approximately 600 calling stations that were used for more than 200,000 interviews.

One significant agency structure change in 1992 was the creation of the Field Services Section in the Colorado field office. This office, staffed with data-processing staff members and supervisors, provided several benefits. Field offices in the most western of time zones could contact the new office if there were data-processing problems late in the day when most headquarters staff were off duty. The section was attached to the State Statistical Division and worked to create new data-processing systems, which would specifically benefit the field offices. Among the major projects for the section were improvements to the County Estimates Processing System and the development of a microcomputer-based Off-Farm Grain-Stocks System, an agency Time and Attendance Recording System, an improved Crop Progress and Condition Estimation System, and an improved Survey Management System.

Another change in 1992 was utilizing the new Federal Governmentwide FTS 2000 Communication System to standardize all Wide Area Network communications to Martin Marietta Data Systems, the agency's contract data-processing vendor. Also in that year, the PEDB was enhanced by the addition of prices estimates for most major commodities.

A new business-processing reengineering approach was adopted by the agency in 1993. One project was improving the list sampling frame (LSF) by shifting access and operations to the local area networks (LANs). The most significant aspect of the change was to place all LSF records in one accessible database. Two studies were underway to consider shifting operations such as manual review, editing, analysis, and summary to the LANs. In addition, the Wide Area Network, which connected to all LANs, provided electronic mail capability for the agency. In a forerunner of things to come, the agency explored loading "Crop Production Reports" to the Internet.

The first NASS Internet homepage was created between the fall of 1994 and June of 1995. One person took the lead for the agency in deciding on initial features and formats. Advice and consultation was received from the Cornell University Mann Library staff and a staff member at ERS. Some NASS staff members began other construction projects, including a team of four or five people who created default field office homepages to help develop an Internet presence for special State reports and features.

Training in the Early to Mid-1990s

The "Program Needs Assessment Report" from the University of Maryland Center for Instructional Development and Education, mentioned in chapter 5, was received in June 1990. It verified concerns about and weaknesses in agency training approaches that had been identified in 1988, and it also recommended some practical approaches to improve future training. A follow-up activity was the selection of one agency trainer for a full-time training program at the University.

The University of Maryland report provided the survey training group additional leverage to strengthen agency training. One key approach was to conduct annual training needs assessments, which focused on all-agency training. This broad look at needs led to a shift in training from being primarily devoted to specific survey programs, such as an annual June Enumerative Survey training school, to concentrating on providing workshop-type training for all professional staff members on survey and estimation principles. The emphasis on training was strengthened further by the establishment of the Training and Career Development Office (TCDO) in mid-1992.

More training emphasis needed to be given to the large number of new employees being hired for the new environmental surveys. This was particularly true, as many were hired at higher grade levels and had less agency training than their counterparts, who had been hired earlier. The new employees were prime candidates to receive the basic survey and basic estimation training workshops.

The NASS role as a Federal Government statistical agency leader in employee training was demonstrated in 1992 and 1993 when a new training program for Government statistics was developed. The Joint Program in Survey Methodology (JPSM) was established with start-up funding from the National Science Foundation (NSF). It would offer graduate-level courses and degrees in statistics and survey methodology, which were aimed at improving the level of statistical methodology in Federal statistical agencies. The winning proposal was from a colloquium that included the University of Maryland, the University of Michigan, and the Westat statistical organization.

The JPSM directors started visiting major Federal statistical agencies to encourage agency officials to send staff members for training on a full-time basis. The directors were met with concerns and reservations from some of their first contacts. When they presented to NASS, they started to sell the benefits of full-time training. NASS officials quickly stopped the presentation and pointed out that the agency had been investing in full-time training for more than 30 years. The rest of the discussion turned to how NASS could help encourage other Federal statistical agencies to develop criteria for selecting individuals for full-time training and for handling their assignments once they completed full-time programs. Because of this NASS assistance, the program directors selected a NASS employee as the first official JPSM student.

By 1995, TCDO published a survey training program document that summarized agency employee-development principles. This document emphasized that survey populations and types of surveys that NASS would conduct were expanding. Employees had the opportunity—through annual, individual development plans—to work with supervisors to plan and develop their careers. The document also presented the different types of training that would be planned and presented by the agency.

Research in the Early to Mid-1990s

Remote sensing research efforts were highlighted earlier in this chapter, but there were many other significant research efforts underway in the early 1990s. Many had to do with improving quality and consistency of basic agency procedures. Microcomputers were evaluated for interactive editing and detection of suspicious reported data. Specific statistical methodologies were created for improved review of livestock-slaughter data. Cooperative research was established with Oregon State University to develop improved estimators for hogs, soybeans, and evaluation of time-series estimates.

One new, key approach was the establishment of a Quality Assurance Team comprised of research and operational program members. The goals were to develop error profiles and to improve the use of graphic methods for analyzing agency survey data.

Continued research and development efforts resulted in a computer-assisted area-sampling frame construction technician capability. This approach

reduced the time requirements for many area frame construction operations and, at the same time, reduced the human analyst efforts.

A significant development of the statistical researchers approach started in 1991 with the creation of a new research unit in the Ohio field office. The agency had always benefited from having researchers, who had started in field offices and later had taken additional statistical training, matched with direct hires with more statistical training, but who lacked the agency background. With the high cost of living in the Washington, DC area, it was difficult for individuals with new master's or Ph.D. degrees in statistics to move directly to the agency's research offices. However, those who had devoted so much effort to their academic training did not want to take what they regarded as a "side trip" to a typical field office for three or four years before coming to headquarters. The Ohio unit was designed as a compromise. Individuals would be engaged in agency research projects, but they'd also have operational responsibilities for the regular statistical program. Thus, they would gain firsthand knowledge of the strengths and weaknesses of operational procedures, and should be able to make informed contributions to the research efforts.

One continuing research effort in the early 1990s was the use of microcomputers for computer-assisted survey operations. A small pilot was conducted in 1989 for computer-assisted personal interviewing (CAPI) for the June Enumerative Survey. The approach was also used for objective- yield surveys but, given the devices available at that time, CAPI worked best if one person made the counts and measurements, and another person recorded the results.

In 1991, new CAPI testing for June Enumerative Survey interviews was conducted, followed by testing for farm costs and returns survey (FCRS) in 1992. A pilot study was performed in 1993 involving three enumerators using the electronic equipment for three surveys. Again, the enumerators enjoyed using the approach, but there were too many operational hurdles such as: finding sufficient funding for equipment, creating and maintaining the electronic questionnaire versions, and uploading proper versions to a multitude of different devices.

One landmark research project was the first-ever trial of incentivizing survey respondents. A trial was designed for the FCRS in three States. A subsample of operations was to receive a special pre-survey letter that explained the survey purpose. The letter included a credit card-sized electronic calculator and a small notepaper portfolio that had the FCRS and NASS logos on the front. The survey was carefully planned to ensure all Federal Government incentives regulations were being followed.

The incentive trial was quite controversial. Participating States were allowed to exclude very large operations or ones for which they had special contact arrangements from the sample. The trial was successful, however, and did not create the negative respondent reactions that some had predicted. Response rates for all income-size groups of respondents were higher. One very important finding was that the "screen out" rates were improved. In each FCRS survey, there were expected to be a number of small operations that could never be reached by telephone or in person. It was believed that many were probably not farming operations—and should be removed (or screened out) from sampling lists—but that could not be verified. Because the pre-survey letter calculator got their attention, many of the operations actually read the letter, realized that they did not belong in the survey, and responded to NASS with requests to be deleted from future selection lists.

A number of other research topics were being pursued in the early 1990s. Several of them involved the study of possible biases in the multiple frame acreage surveys and in the FCRS sampling. Other research studied the potential use of expert systems for editing FCRS data and interactively editing CATI data responses. Some of the new techniques considered were a pilot study of Washington State apple objective yield procedures and the use of administrative data to replace many of the monthly Milk Production Survey contacts.

One promising new research effort involved chemical-use data being reported to the California EPA (under a new State law) in lieu of conducting new chemical-use surveys. However, there were many hurdles to overcome because of different definitions, different levels of detail (field-level versus farm-level), and timing differences. That California State law was also creating an enormous amount of data, so there were concerns about capturing and summarizing all of the data on a reasonable schedule.

A New Administrator and the 1995 Reorganization

Administrator Charlie Caudill lost his battle with a brain tumor May 17, 1993. Donald M. (Don) Bay, who had served as Acting Administrator since April 1992, was subsequently named as the fourth SRS/NASS administrator.

Bay grew up on a farm near Springfield, Illinois. He graduated from the University of Illinois in 1957 and joined the agency in the Illinois field office in 1959. He later worked in the Tennessee field office before transferring to headquarters in 1965. His first headquarters' assignments were in the Livestock, Dairy, and Poultry Branch; he later served on the Statistical Clearance Staff before being named as head of the Cotton and Special Crops Section in 1971. Bay was also the Missouri State statistician from 1975 to 1987.

With his strong background in both crop and livestock statistics, Bay was selected as the Estimates Division director in 1987. He became the deputy administrator of operations in 1990. In addition to his regular agency assignments, Bay assisted the agency's international assistance programs in Rwanda, Cameroon, and Thailand. He also led an Economic and Statistics Delegation to the People's Republic of China in 1981.

Administrator Bay did not make any immediate changes in agency structure, but some significant changes were made in 1995. During Caudill's illness, the two deputy administrators worked closely together to handle all the acting administrator's duties. Since the issues coming to the administrator were a combination of internal NASS and external requests, it seemed appropriate to have two people who could fully react to all issues and speak for the agency. Thus, the new 1995 structure removed the deputy for operations and deputy for programs positions; rather, it established one associate administrator position.

There now was a new deputy administrator position—the deputy administrator for field operations, which was responsible for all field offices.

The headquarters' divisions reported to the Office of the Administrator instead of through a deputy administrator.

U.S. Agriculture, Circa 1997

The rapid loss of U.S. farms stalled in the 1990s. There were 2.19 million farms in 1997, down only 0.9 percent from the 2.21 million farms of a decade earlier. However, there were significant differences among the regions of the country. Because of the continued consolidation of farms in the North Central States, the number of farms there declined 7.3 percent from 1987 to 1997. The number of Northeastern farms dropped slightly by 0.5 percent during the period. Farm numbers in the South and the West actually increased between 1987 and 1997, as more people moved to those regions of the country. The number of farms in the South in 1997 was 923,800, a rise of 2.9 percent from 10 years earlier. There were 302,660 farms in the West, an increase of 6.1 percent from 1987.

Farmland values steadily recovered from the low levels of 1987. The U.S. average value climbed from the $599-per-acre level of 1987 to about $700 per acre by 1990. It rose to nearly $800 per acre in 1994. The 1997 U.S. average value per acre was $926 ($1,168 in 2007 dollars). California's value per acre was now $2,500—higher than for any of the pre-1990 years. Illinois, Indiana, and Iowa values were now at $1,980, $1,870, and $1,600 per acre, respectively—up significantly from 1987—but not quite as high as 1981 figures. Similarly, Kansas and Nebraska rose about 50 percent from 1987, which was still lower than the early 1980s. Farmland values in Texas declined from 1987 to 1990, but they recovered to $554 per acre in 1997.

The amount of cultivated cropland in the United States had peaked at about 383 million acres in 1982. That total declined to 331 million acres in 1987 and to 326.8 million in 1997. A sizable portion of the decline is accountable to the Cropland Reserve Program (CRP) that had been authorized by the Food Security Act of 1985 to remove highly erodible cropland from cropping and to maintain that cropland under certain conservation practices. Land was enrolled in 10-year CRP contracts through a bidding procedure. On one hand, some 101 million acres of highly erodible cropland was eligible for the program, but a provision that normally limited the amount of CRP land to no more than 25 percent of the cropland in a county reduced the effective eligibility to about 70 million acres.

The CRP has been opened every year for new bids. The original goal of the CRP was to enroll 45 million acres. Some 25.5 million acres were enrolled by February 1988, and by 1997 the total was 35 million acres. In the late 1990s, the total land in the CRP was holding steady, but some of the cropland originally enrolled had been replaced by new enrollments.

One new crop-production trend was well established by 1997 and another had just started. The change that had occurred was the replacement of conventional tillage, which involved plowing the soil in preparation for new crops, with reduced or conservation tillage practices that leave much of the crop residue on the land to conserve moisture and minimize water and wind erosion. By 1995, the Natural Resources Conservation Service (NRCS) estimated that 25 percent of U.S. cropping was conducted through reduced tillage; 35 percent used conservation tillage; and 40 percent used conventional tillage. Conservation and reduced tillage practices were being used particularly in the North Central and Northern Plains States. However, the Southeast States, the Delta States, and Texas were still using conventional tillage for half or more of their acreage.

In 1996, biotechnology-developed seeds were just becoming commercially available for planting. Two types of seeds were being developed. One type was resistant to insects, and the other was tolerant to chemicals that could be applied to kill weeds. Later, "stacked gene" seeds were developed, which had both features.

Total agricultural productivity in 1997 was 118.5 percent higher than it was in 1957. Productivity had also increased 20 percent from 1987.

Despite the significant Midwest flooding of 1993 and related losses, yields of corn, soybeans, and wheat were quite high in the 1990s. There were few Government program-mandated planting restrictions, and acreages had generally increased.

The U.S. average corn yield for 1995-99 was 127.1 bushels per acre, 13.8 percent higher than the 1985-89 average. In 1994, the first 10-billion-bushel corn crop was produced. Annual average yields topped 125 bushels per acre six times in the 1990s. The previous U.S. record yield had been 119.8 bushels per acre in 1987. Average acreage harvested for grain during 1995-99 was 70.7 million acres, compared with 65.3 million in 1985-89.

Soybean average yield for 1995-99 was 37.5 bushels per acre, an increase of 16.8 percent from 10 years earlier. Average U.S. yields topped 35 bushels per acre seven times in the 1990s, compared with the record yield of 34.1 bushels per acre before 1990. The average acreage harvested for soybeans was 67.4 million acres between 1995 and 1999—an increase of 8.6 million acres (14.6 percent) from 1985–89. A new record was set in 1999 when acreage hit 72.4 million acres.

The big story for winter wheat in the late 1990s was the introduction of a new, higher-yielding variety. The average U.S. yield during 1995–99 was 42.8 bushels per acre, an increase of 14.1 percent from the 37.5 bushels per acre of 10 years earlier. However, average yields in 1995 and 1996 were 37.7 and 37.1 bushels per acre, respectively. Thus, the average was driven by the yields of 44.6, 46.9, and 47.8 bushels per acre for 1997, 1998 and 1999, respectively. Each of those years saw a new record for U.S. average yield per acre. Harvested acreage was around 40 million acres for the period of 1995–98, but that dropped to 35.4 million acres in 1999. For the five-year period, harvested acreage averaged 39.5 million acres, a decrease of 2.8 million acres (6.6 percent) from the 1985–89 average. (The 1985–89 average had been affected greatly by the 47.9 million acres that had been harvested in 1985.)

The last five years of the 1990s might best be described as turbulent for U.S. cotton production. The first five years were marked by relatively stable cotton harvested acres. The average price for the 1994 crop was 72 cents per pound, the highest since 1980. Perhaps due to the high price, cotton planted acreage jumped to 16.9 million acres in 1995, which resulted in 16 million acres harvested. With the larger acreage harvested, yield per acre declined from 708 pounds to 537, but the price was even higher at 76.5 cents per pound. Cotton crop abandonment was higher in 1996, but dipped to a low level in 1997. At that point, a record high 2.7 million acres was planted (but not harvested) for cotton in 1998. Much of the land initially planted to cotton was able to be replanted to sorghum or another crop with a shorter season. The abandonment in 1998 was even higher than the high-abandonment years of 1951–53, when twice as many acres were planted as compared with 1998. On average, acreage harvested for cotton in

1995–99 was 33 percent higher than 10 years earlier. The average yield of 629.4 pounds per acre during that period was 0.8 percent higher than the average in 1985–89.

The percentage of corn utilized for exports in 1997 was down from 1987 in terms of total bushels (1.5 billion) and percent of total utilization (17.1 percent compared with 22.1 percent in 1987 and 30.5 percent in 1977). The big utilization change was due to the amounts of corn going to food, alcohol, and industrial uses—then more than 20 percent of all utilization. High-fructose corn syrup accounted for 5.8 percent of all corn utilized at the time. Corn utilized for ethanol production (for fuel use) had risen to nearly half a billion bushels—only slightly less than that used for producing high-fructose corn syrup.

Table 9. Per Capita Consumption of Meat, Poultry, and Fish, United States 1997

Total Population	272,912,000	
Category	Total Consumption (Pounds/person)	Percent of Total
Beef	65.5	30.0
Veal	1.0	0.5
Lamb	1.1	0.5
Pork	47.6	21.8
Chicken	71.4	32.7
Turkey	17.2	7.9
Total Fish	14.3	6.6
Total Meat, Poultry & Fish	218.1	100.0

As indicated in Table 9, U.S. average diets around 1997 included more total meat (red meat, poultry, and fish) than any time in the previous 40 years. However, the percent of fat in the total diet from meat had dropped from 35 percent in 1979 to 25 percent in 1994. Both beef and pork producers had developed improved genetics and had shifted to leaner, faster-growing animals. The per capita consumption of chicken exceeded that of beef for the first time in 1992, as beef declined and chicken consumption increased each year. In 1997, per capita consumption of chicken was 71.4 pounds (versus 56.6 in 1987) and beef was 65.5 (versus 73.7 in 1987). Pork consumption was down slightly in the 10-year period, from 48.8 pounds in 1987 to 47.6 pounds in 1997. Turkey per capita consumption increased from 14.7 to 17.2 pounds between 1987 and 1997, but total fish consumption declined from 16.1 to 14.3 pounds. Veal and lamb consumption continued to decline to 1 and 1.1 pounds per person, respectively.

The U.S. hog industry changed rapidly between 1987 and 1997. Before 1990, few hog operations had inventories as large as 2,000 head or more. However, those larger operations became common in the early 1990s. In fact, 4,335 operations with inventories of 1,000 to 4,999 head, and 1,825 operations of 5,000 head or more, were in place by 1997. These operations accounted for 60.5 percent of the 1997 hog inventory even though they accounted for only 5.8 percent of the 106,060 hog farms in the country. Concentration in the hog industry differed from that of the broiler industry. The broiler industry was, primarily, a vertically integrated industry where the processors owned the birds. There were a few instances of where hog slaughter operations owned some of the animals they would be slaughtering, but most large hog-producing organizations owned their own hogs and had marketing contracts with processors. Newer, larger hog operations were mainly climate-controlled, and, with improved genetics, were able to yield higher pigs-per-litter rates. By 1997, the industry was achieving 2,500 pounds of pork per sow, compared with about 1,500 pounds in 1970.

Table 10. Cash Receipts from Farm Marketings, by Commodity Groups, United States 1997

Category	Total Cash Receipts (Million dollars)	Percent of Total
All Cash Receipts	207,790	100.0
Total Crops	111,315	53.6
Food Grains	10,411	5.0
Feed Grains	27,087	13.0
Cotton	6,346	3.1
Oil-bearing Crops	19,758	9.5
Tobacco	2,873	1.4
Fruits and Tree Nuts	12,958	6.2
Vegetables	14,669	7.1
Nursery, Greenhouse, Flowers	12,355	5.9
Other Crops	4,858	2.3

[table continues on next page]

Total Livestock and Products	96,475	46.4
Cattle and Calves	36,000	17.3
Hogs and Pigs	13,054	6.3
Sheep and Lambs	633	0.3
Dairy Products	20,940	10.1
Eggs	4,540	2.2
Broilers and Farm Chickens	14,230	6.8
Turkeys and Other Poultry	3,490	1.7
Wool	45	0.0
Other Livestock and Products	3,544	1.7

Table 10 indicates that the 1997 percentage relationship between total crops cash receipts and total livestock and products cash receipts was exactly reversed from 1987. Crops cash receipts now made up 53.6 percent of the total. Because of the increases in crop production and the changes in the livestock industries, crops cash receipts exceeded livestock cash receipts in 1994 for the first time in nine years. This pattern continued until 1999.

Cash receipts from farming in 1997 were $207.8 billion ($262.0 billion in 2007 dollars). The proportions of total cash receipts from fruits and tree nuts (6.2 percent), vegetables (7.1 percent), and nursery, greenhouse and flowers (5.9 percent) were all higher than in the earlier, once-per-decade snapshots. Broilers and farm chickens also now accounted for a higher share (6.8 percent) of total cash receipts than in any of the earlier comparisons. Wool cash receipts made up only 0.02 percent of total cash receipts.

International Assistance in the 1990s

With the fall of the Berlin Wall in 1989 and the collapse of the Soviet Union in 1991, the direction and scope of the agency's international assistance efforts greatly changed. The U.S. State Department was very interested in establishing improved relationships with many of the countries in Eastern Europe, and funding became available for a number of NASS assistance efforts through the Emerging Democracies Program.

Some of the earliest projects were in Poland and Bulgaria. By 1994, a pilot area frame survey had been completed for one state in Poland, and a number of staff members of the Poland central statistical office had received training. Poland was particularly interested in developing farm income surveys. Bulgaria had completed a successful crop area and livestock list frame survey by 1994 with NASS assistance.

There were many interesting survey aspects uncovered by working with the Eastern European countries. Concepts of land ownership and operatorship needed to be worked out in countries that had had mainly large state farms. Also, it was important to conduct household surveys—grain production was viewed as farming, but home production of potatoes accounted for a large amount of the sales for the entire country.

Some of the Eastern European countries interested in agricultural statistics projects included Romania, Russia, Kazakhstan, and Ukraine. Many visitors from those countries came to the United States for training, and NASS employees visited the countries for discussion of possible development projects.

Some of the longer-term NASS assistance projects finished in the early 1990s. The 10-year, USAID-assistance project in Morocco ended in September 1994. It had been considered extremely successful because Morocco had developed and improved agricultural survey programs and established a strong data-processing capability, in addition to implementing an operational area frame. The 10-year USAID project in Pakistan ended at nearly the same time. Area sampling frames had been constructed for most of the country, and pilot objective yield programs had been put in place.

A quite different, but extremely beneficial, activity took place in Nicaragua. This was a joint effort funded by the Central Bank of Nicaragua, the UN Development Program, and USAID. The Nicaragua Ministry of Agricultural and Forestry was vitally interested in obtaining better information on food production and consumption. NASS assistance to this five-year effort included consultation, sample design, enumerator training, data analysis, and the design, summary, and dissemination of results. A point-sample approach was used for area frame construction, instead of normal mapping techniques. Surveys were conducted that produced state-level estimates of corn, beans, sorghum, rice, and coffee production, and cattle, hog, and equine numbers. The Nicaraguan government was extremely pleased with the new statistical system; special, well-publicized ceremonies were held for the first release of survey

data, which also included participation by the NASS administrator.

The Nicaragua survey results were significant. The country had long been regarded as having one of the lowest food supply and food energy consumption levels in all of the Caribbean. The new survey system demonstrated that the country was producing and consuming much more food than had originally been estimated. Actual food energy levels available to Nicaraguans compared well with other countries in the region.

By the mid-1990s, other possible areas of assistance were on the horizon. At the time, USDA was working with South Africa toward a number of development efforts on which NASS could be asked to assist. There was strong interest in sampling from Taiwan in order to reduce their high, complete census data-collection costs. Countries such as Haiti and Albania had also expressed similar interest. One change made in the mid-1990s was to rework the agenda and the agency training program materials for foreign visitors. Also, the training program would be shortened from six weeks to four weeks.

Staffing, Circa 1997

As noted in the preface to this portion of the publication, FY 1991 was an extremely significant year for agency hiring. At the start of FY 1992, 19 percent of the 495 agricultural statisticians and 25 percent of the 71 mathematical statisticians on board had been hired in the previous 12 months. In addition, 12 percent of the 101 data-processing specialists and 17 percent of the 179 statistical assistants were new to the agency. Those total counts were essentially peaks, except for mathematical statisticians.

After FY 1993, budgets became quite tight and Congress approved few program additions; Congress did not usually grant inflation adjustment funding. Administrator Bay became concerned that salaries and benefits had become too large a percentage of the budget. Hiring, travel, and a number of other expenditures were tightly controlled until some budget relief could be found.

By 1997, many staff members hired during the development of the enumerative and objective yield survey programs had either retired or were then eligible for retirement. Thus, staff levels started to decline again as people retired and the hiring of entry-level replacements was slowed.

Part 5: Completing the Agricultural Statistics Package

PROLOGUE

Deputy Administrator Bruce Graham's 1976 admonition, of NASS being prepared to take over the census of agriculture responsibility should the agency be given short notice to do so, certainly seemed prophetic 20 years later when it actually happened. In preparing for the 1997 Economic Censuses, which included the 1997 Census of Agriculture, the Commerce Department and the Bureau of the Census proposed to change the U.S. farm definition from an operation with $1,000 in agricultural sales to one with $10,000 in sales, as a cost savings measure.

Based on the 1992 Census of Agriculture results, such a change in the farm definition would have excluded 47 percent of all U.S. farms. It would have had a great impact on some States. For example, it would have excluded 78 percent of West Virginia's farms and more than 65 percent of the farms in Tennessee, South Carolina, Alaska, and New Hampshire. In addition, the tentative plans of the Bureau of the Census would have discontinued agricultural censuses in U.S. outlying areas (Puerto Rico, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands) as well as follow-on horticultural and irrigation data collections.

The large, potential impacts of such a change led to complaints and protests from farm and rural sociology organizations and from members of Congress. Based on the critical reaction, the Office of Management and Budget transferred the responsibility for the census of agriculture to NASS. Congress followed suit by shifting the census of agriculture funding to NASS.

At the time the controversy about the farm definition, the resulting complaints and OMB action occurred, preparations for the 1997 data collection were three years into the five-year cycle. It would have been impossible to make any major changes in the questionnaire or the basic data collection plan. However, NASS staff members had already worked closely with Ag Census staff members on the 1997 Census of Agriculture content to standardize the detailed definitions used for both the census and for NASS data collection efforts.

The transfer of the census of agriculture to NASS meant that all major collection efforts relating to farms and farming fell under one organization. It paved the way for efforts after 1997 to clarify and eliminate the differences between census of agriculture published totals and official USDA agricultural statistics estimates maintained by NASS.

Chapter 7: Adjustments To Incorporate the Censuses of Agriculture

Smoothing the Transition

As soon as it seemed likely that the census of agriculture transfer was going to occur, several actions were put into place. NASS Administrator Bay met with Bureau of the Census staff members working on 1997 Census of Agriculture preparations to emphasize that NASS welcomed them and their suggestions on how to smooth the transition. NASS had usually named a liaison to work directly with Bureau of the Census staff for the later stages of each census of agriculture. As of April 1996, an experienced NASS statistician was now onsite at the Bureau to help with preparations and to informally answer questions about both the agency and its personnel procedures.

Top NASS staff members had other meetings with Bureau of the Census staff members to answer administrative questions. Meetings included data-processing staff members from the Bureau of the Census because they were to be included in the personnel transfer to NASS. However, they were not currently onsite with other census of agriculture staff members. The intention was a marriage of two organizational cultures, rather than Bureau of the Census staff members being absorbed into NASS culture.

The transfer to NASS would be voluntary, as the Bureau of the Census would find positions for those who chose not to do so. Bureau of the Census had also indicated that people not currently working on the census of agriculture could be part of the transfer if they were able to exchange positions with someone on the current census staff. The "even swap" requirement meant that only a few people who wanted a transfer could take advantage. There were some early predictions that perhaps only half of eligible Bureau of the Census staff members would transfer due to established commuting arrangements, concerns about joining a new organization, and other factors. However, 70 staff members (85 percent of the staff designated for the changeover) transferred to NASS on February 2, 1997, to form the temporary Census Division. Most employees did not actually change locations because arrangements had been made for them to remain at the former location in Suitland, MD, through the 1997 Census of Agriculture processing cycle. NASS was able to hire 15 additional people, including some former agricultural census employees who had left Federal service. As there were still many vacancies, additional NASS staff members were detailed to Suitland for the census of agriculture operations.

What Should Be the Farm Definition?

The very first U.S. Census of Agriculture in 1840 did not include a specific farm definition. However, the United States was such an agrarian society at the time that everyone would likely have agreed on what constituted a farm. During 1850–60, a farm was defined as an operation with agricultural production worth $100 or more per year. A modification for 1870, 1880, and 1890 was to define any agricultural operation on three or more acres as a farm, and to define operations smaller than three acres as farms if they sold $500 or more of agricultural products per year.

An interesting definition revised for 1900 removed both acreage and dollar values. According to the new definition, a farm was any agricultural operation requiring the continuous services of at least one person. During 1910–20, the definition combined the approaches from 1890 and 1900 to define a farm as any agricultural operation with three or more acres or, if less than three acres, it must produce $250 of agricultural products per year or require the constant services of at least one person. For 1925, 1930, 1935, and 1940, the constant services provision was dropped and the farm definition was revised to an agriculture operation producing $250 or more of agricultural products for sale or home use, or one with three acres or more.

The 1945 farm definition may have been the most complicated of all. An agricultural operation of three or more acres was classified as a farm if it had three or more acres of cropland or pasture, or $150 worth of agricultural production. If an operation was less than three acres, it qualified as a farm if it had $250 or more of agricultural production.

The definition used in 1950 and 1954 defined an operation of three acres or more as a farm if it had $150 or more of agricultural products for home use

or sale. If it was less than three acres, the operation must have had $150 or more of agricultural products produced for sale.

The definition used in 1959, 1964, and 1969 was that an operation of 10 acres or more was a farm if it had $50 or more of agricultural products produced for sale. If it was less than 10 acres, an operation was considered a farm if it had at least $150 of agricultural products produced for sale.

The definition adopted in 1974, and the one used ever since, was "any place from which $1,000 or more of agricultural products were produced and sold or normally would have been sold during the census year." The move away from an acreage definition did two things: it included atypical operations such as herb producers in a city, and it excluded rural residences of considerable size that might sell just a few berries or other sideline produce. The $1,000 value limit was much higher than had been used for the 1950–69 time period.

The wording "normally would have been sold" was intended to avoid the exclusion of small farms, which typically would have had more than $1,000 in sales but had had poor yields in the census year or had delayed their sales until the next year. Because asking what an operation usually would sell might result in inconsistent answers, a point system was created to calculate sales. Points, or dollar values, were assigned to the various land uses and livestock reported on a census of agriculture questionnaire. Some qualifications were built in; for example, no points assigned to pasture if there were no livestock.

Before 1997, there had been some differences in interpretations between NASS and the Bureau of the Census. For example, if a farm enrolled all of its cropland into a long-term program, such as the Cropland Reserve Program, and received an annual payment (of more than $1,000), NASS considered that to still be a farm, but the Bureau of the Census did not. If the only livestock on an operation were equine, NASS did not assign points for pasture, but the Bureau did. NASS extended its farm definition to operations that sold more than $1,000 of Christmas trees as their only cash crop, but the Bureau would not. Thankfully, these differences in definitions between the two organizations were reconciled early in the 1997 Census of Agriculture planning cycle.

When questions about the farm definition arise, people not involved in agriculture generally assume some indexing of the dollar value of sales should be used. The first suggestion is usually that the Consumer Price Index (CPI) be used. However, others suggest that would not be appropriate because prices of individual farm products, such as a bushel of grain, do not increase with the CPI but are determined by the supply and demand situations at a particular point in time.

If a CPI adjustment is applied to the 1974 minimum farm definition of $1,000, the 1997 equivalent would be $3,256. However, if the more appropriate Prices Received by Farmers Index is used with a 1974 base of $1,000, the 1997 calculation would be $1,370. Prices farmers pay for their necessary equipment and supply items do track somewhat with the CPI. Using the Prices Paid by Farmers Index, $1,000 in 1974 would equal $2,860 in 1997.

Efficiency has been the key factor that allowed operations to continue farming when prices paid nearly tripled in a 25-year period and the prices received increased 37 percent. Through advances such as increased crop yields, greater livestock weight-gains, and increased milk production per cow, and by using lower amounts of labor and other inputs, farmers have greatly improved their output. Put another way, because corn prices per bushel averaged about $2.50 in both 1974 and 1997, it took 5.56 acres of corn harvested in 1974 to equal $1,000 in value, but it took only 3.16 acres to do the same in 1997. The comparable calculations for soybeans, at $6.60 per bushel each year, were 6.39 acres in 1974 and 3.89 acres in 1997.

Because indexing the farm definition to the Prices Received by Farmers Index would mean only a relatively small increase from the current $1,000 yearly sales definition, there might not be much savings in the number of contacts to conduct the census of agriculture. Also, the calculated value of production would likely go down from time to time. Thus, keeping the $1,000 value of sales or normal sales does appear to be a reasonable compromise.

Improvements for the 1997 Census of Agriculture

Although the overall agricultural view on the census responsibility transfer was positive, there were some skeptical individuals and organizations. Some felt

that NASS might adopt more sampling methods and depart from the traditional census approach. There also were concerns about the agency's ability to carry out the 1997 Census of Agriculture collection with the transfer of responsibility having occurred so close to the data collection.

One NASS goal for the 1997 Census of Agriculture was to make it as comparable as possible to previous census collections. Although significant changes, such as revising the planned census questionnaires, would not be made, NASS was able to implement a number of quality improvements, in large part because there were additional staff members to devote to census issues. For example, NASS field offices participated in a census mailing list duplication review based on better address linkage and utilization of some telephone follow-up. That exercise removed 500,000 mailing list names, which saved $1 million in mailing costs. A screening questionnaire was mailed to another 500,000 addresses that were unlikely to qualify as farms. This removed another 400,000 addresses from the census mail-out list. Field offices also conducted a special minority farm list-building effort by contacting 1992 Census of Agriculture minority operators for help in improving the mailing list. Plans were also made to request the number of farm operators on each American Indian Reservation, in addition to creating one total Reservation census form.

NASS did restore plans for censuses of agriculture in outlying areas. The agency met with officials from Puerto Rico, Guam, Virgin Islands, and the Northern Mariana Islands to craft memoranda of understanding. There had been a tentative plan to change the farm definition for Puerto Rico from its historic requirement of $500 agricultural sales per year to $1,000. NASS decided to keep the $500 definition and implement an area frame sample to aid in determining census undercoverage.

The mailing of all census of agriculture forms in December 1997, receipt of completed forms, and data entry were all contracted to the Bureau of the Census processing center in Jeffersonville, IN. The center would mail and process the other economic censuses at the same time. NASS contracted to pay for two key entry shifts, six days a week, in order to get the data prepared more quickly for field office review and editing.

NASS field offices met strict security provisions and NASS employees received clearances to access 1992 and 1997 Census of Agriculture files through a special census firewall. Being able to work on files in all field offices was a great time saver, and NASS decided to work towards the goal of releasing all 1997 Census of Agriculture U.S. and State publications on the same date. Previous censuses of agriculture, for which only a small number of analysts were available, were summarized and released a few States at a time.

NASS field offices were able to add local flavor to many of the public service announcements and other publicity vehicles ahead of the mail-out. This appeared helpful because initial responses came in faster than expected. In addition, the total response rate was higher than that for the 1992 Census of Agriculture, and the last follow-up mailing was cancelled.

NASS finalized plans for a toll-free information number that was prominently displayed on the mailing materials. Arrangements were made to control the routing of those calls, which led to a number of efficiencies. When forms were first mailed out, the toll-free number connected callers (during the week) to their respective NASS field offices. On weekends, calls would be connected to the few field offices that handled calls. As the volume of telephone calls decreased, the number of field offices handling calls was again reduced.

Most calls were easy enough to handle. They typically came from small operations that wondered why they received the mailing or from operations that had received multiple forms. Nearly 135,000 toll-free calls were received during the time the service was in operation. Many actions were accomplished while the caller was on the line. One measure of the success of the toll-free number was a reduction in the usual number of Congressional inquiries made on behalf of upset constituents about the census of agriculture.

NASS field offices used their CATI capabilities in several ways during the data collection phase. After the February 1, 1998 due date for forms was exceeded, operations that had not responded at all in 1992 and had not returned the first 1997 mailing were contacted by telephone. Calls to large operators and to counties with low response rates started earlier than

planned because responses came in faster than predicted.

Results From the 1997 Census of Agriculture

Because of the earlier-than-predicted return of census forms and a 2-percent increase in response rates, the processing of the 1997 Census of Agriculture ran ahead of schedule. However, not all of the processing went smoothly. A number of patches had been made to the old census of agriculture processing system, and it was sometimes necessary to wait until a modification was in place. Other times, field offices were ready for a particular task more quickly than expected and earlier than staff members from headquarters had planned to travel. There were several phases to the data review and editing process that differed from typical NASS monthly, quarterly, and annual surveys. One reaction sometimes received from State statisticians after their State had just finished an intensive two-week operation was, "Oh, if we had fully understood what we were going to do, we could have done it even better."

The 1997 Census of Agriculture results for the United States and for each of the 50 States were released February 1, 1999. This was 12 months after the deadline for farmers to mail back their census forms and about 10 months earlier than the original schedule. Because field offices and NASS headquarters' units were so familiar with the 1997 Census data, a decision was made during 1998 to proceed with the traditional, five-year historic review and revision of all NASS estimates at the same time as the final review of census data. A national board review of existing U.S.-level 1997 compared with preliminary census results was used to set revision targets before the review of State-level 1997 Census data.

By performing the five-year review of commodity estimates ahead of the 1997 Census release, revisions were published a week or so before the major 1998 end-of-the-year report and the January 1, 1999 "Agricultural Statistics Board (ASB) reports." This provided data users with revisions, if any, one year earlier than expected, and it prevented confusion when new estimates levels did not match up with previously published figures. There was some apprehension about publishing revisions ahead of the end-of-year commodity reports. However, there were not many significant data-series revisions to 1997 Census of Agriculture data. The biggest changes were for farm numbers, which are not market sensitive. The new revision publications were advertised ahead of time and were very well-received by data users, as they could update their databases ahead of the end-of-year reports.

NASS was able to electronically release not only national and State data on February 1, but also all 12,000 national, State, and county data files. Those included special State and county profiles and highlights.

The county, State, and national data released were adjusted for nonresponses from operations included on the census mail list. The tables were also broken out by size of farm and farm-income size groups. They did not adjust for list incompleteness, which was measured by using the names and addresses of operators in the June area frame sample segments. One appendix table did summarize the list incompleteness for farms, land in farms, farm income and expenditures, and selected major commodities.

There was considerable consideration given to the use of the list incompleteness data to create a table of adjusted census totals for the front of the publication. However, that was rejected for the 1997 Census, as it might have created confusion about having three sets of numbers: census-tabulated results, NASS official estimates, and census-adjusted numbers.

Along with the general data products, NASS also created a number of special, multicolor Quick Facts brochures. In addition to a brochure that highlighted changes in a number of farm characteristics, Quick Fact brochures were also created on topics such as Hispanic farms, Puerto Rico agriculture, aquaculture, and horticulture. Census of agriculture results for Puerto Rico, Guam, Virgin Islands, and the Northern Mariana Islands were also available electronically as soon as the summaries were complete.

NASS received Congressional funding to conduct some follow-on studies after the main census had been summarized. In FY 2000, the 1998 Farm and Ranch Irrigation Survey, the 1998 Census of Horticultural Specialties, and the 1998 Census of Aquaculture were released. The Agricultural Economics and Land Ownership Survey, which is normally conducted every 10 years to provide financial information on agricultural producers and landlords, was released in FY 2001.

Improvements for the 2002 Census of Agriculture

As mentioned above, the 1997 Census of Agriculture focus was to be as comparable as possible. The goal for the 2002 Census of Agriculture was to be as relevant as possible. The shortcomings of previous censuses had included the fact that demographic information was only collected for one operator per farm, and not total operators per farm. This led to the common misunderstanding that the United States must have only 2 million farmers if it has 2 million farms. Little information had been collected on true income and expenses for operators contracted by others to raise broilers, hogs, or other commodities. There were similar concerns about other important farm business relationships that had been omitted in the past.

One significant planning development for the 2002 Census of Agriculture (and for those that followed) was the creation of a formal advisory committee. There had been many recommendations in the past that called for NASS to charter such a committee, but USDA already had its maximum number of formal advisory committees under the Federal Advisory Committee Act (FACA). In transferring the census of agriculture responsibility to NASS, the Bureau of the Census agreed to transfer their FACA authority for a census of agriculture advisory committee to USDA. Instead of mimicking the Census Advisory Committee, NASS established the Advisory Committee on Agriculture Statistics to ensure that the census of agriculture would be coordinated with other agricultural statistics programs.

NASS instead established new membership guidelines. The Census Advisory Committee included a number of organizations that had permanent membership. To serve agriculture more broadly, NASS established several categories of membership such as producers, agricultural economists, rural sociologists, farm policy experts, agricultural-related business and marketing experts, and representatives of the larger group of national farm organizations. One position was intended for a representative of the State departments of agriculture.

Committee members are selected to serve the larger interests of agriculture and not just the organization(s) they belong to. Members serve staggered two-year terms, and they can serve on the committee for up to six years. In selecting the initial Advisory Committee on Agriculture Statistics, a mix of new members and former Census Committee members were selected. Half the members started with one-year terms to begin the rotation process.

The new committee has been interested in census of agriculture issues, but it also has provided good counsel on other issues, such as environmental statistics and the poor performance of the monthly Hogs and Pigs Survey. The committee has also favored expanding the coverage of specialty commodities and the improvement of information on women and minority farm operators.

A fresh look at the census of agriculture planning process was implemented for 2002 through the Project to Reengineer and Integrate Statistics Methods (PRISM). PRISM had one underlying goal of standardizing methodology and procedures for the ongoing current estimation program and the periodic censuses whenever possible. PRISM identified 15 component parts that should be coordinated into one efficient processing system. A new software system was definitely needed; it had been difficult during the 1997 Census of Agriculture to find anyone who could modify the existing programs.

One major goal for the 2002 Census of Agriculture was to use optical character- recognition techniques for capturing data. If this was feasible, it would provide faster data entry and create electronic records for NASS field offices to use for editing and analysis.

Another important aspect included in the PRISM effort was to explore improved methodology for adjustment of census data for nonresponse and incomplete mailing lists. The Research and Development Division took the lead in exploring alternatives for both adjustments. One solution to the nonresponse problem was to implement a nearest-neighbor approach for selecting a report that had most of the same size, location, and farm-type characteristics to represent a missing operation. The approach under study for the mailing list incompleteness was to collect as much high-level control data, such as total certified acreage for crops in Federal Farm programs, total acreage of farmland, and production of livestock. A multivariable calibration could then, theoretically, be created to better estimate for operations not on the mailing list.

A New Organization Structure and New Leadership

After the 1997 Census of Agriculture results were released in early 1999, NASS managers were able to address the issues of a permanent organizational structure that would best serve the production of current agricultural statistics and censuses of agriculture. Instead of creating a new program-based organization, which would keep the census and ongoing estimation programs separate, it was decided to expand the functional organization structure that NASS had employed. The changeover was scheduled for the start of FY 2000; it became effective October 10, 1999.

One change in organizational structure was the creation of a new deputy administrator for programs and products (DAPP). This position was essentially parallel to the deputy administrator for field operations (DAFO). All field offices reported to the DAFO, and the headquarters divisions reported to the DAPP. A marketing and information services office (MISO) was also created and reported to the DAPP.

MISO was to take over all ASB administrative functions such as security, printing of reports, coordination and improvement of the agency Internet presence, and coordination with reporters and other visitors for special secured releases. MISO also had a new Marketing Section, which would take the lead on census of agriculture and other products and publicity. The well-functioning customer service office was included within the Marketing Section.

All divisions now had some census responsibilities. The new Census and Survey Division added the Census Planning Branch to the existing Data Collection, Sampling, and Survey Administration branches. The newly named Information Technology Division now had a Census and Survey Systems Branch along with Data Services, Estimation and Support Systems, and Technical Services branches. The Research and Development Division had a Census and Survey Research Branch and a renamed Geospatial Information Branch. The Statistics Division now had an Environmental, Economics, and Demographics Branch along with the Crops, Livestock, and Statistical Methods branches.

Administrator Bay retired in December 1999. He had taken a leadership role on all aspects of the shift in the census of agriculture responsibility. He was responsible for strengthening the 1997 Puerto Rico Census of Agriculture and establishing a NASS field office in Puerto Rico. He also had worked diligently on the arrangements for the new Advisory Committee on Agriculture Statistics.

Once again, only NASS managers were considered in the selection of a new administrator. R. Ronald (Ron) Bosecker was chosen, and he was installed December 19, 1999, as the fifth SRS/NASS administrator. Bosecker grew up on a small farm in southeastern Illinois and received his undergraduate degree from Southern Illinois University. His first agricultural statistics experience was as a student trainee in the Illinois field office. After graduation, he transferred to the Ohio field office. While in Ohio, he went to Ohio State University and completed a master's degree in agricultural economics through a cooperative program. He then completed a master's in mathematical statistics through the full-time SRS program. Bosecker held various positions in the Research Division during his first tour in headquarters; he rose to a Section head position before transferring to the California State statistical office as the deputy state statistician in 1981. He returned to headquarters in 1985 as the statistical methods branch chief and moved to the Research and Development Division the next year as the sampling branch chief. He served in two senior executive service positions, Research Division director and deputy administrator for field operations, before being selected for administrator.

Results from the 2002 Census of Agriculture

Although the new 2002 Census of Agriculture questions were successful in improving information relevance, they were overshadowed by a publication decision. Research into the calibration approach for adjusting mailing list incompleteness was extremely promising. A tentative decision was made to publish traditional "as tabulated" results and to later publish results adjusted to the county level, as a research or proof-of-concept product.

The internal debate on how many summaries to publish was reminiscent of the debate over publishing a table of adjusted 1997 results. To publish more than one 2002 Census of Agriculture summary would be confusing to many data users. Individuals who did not agree with some results might be extremely critical of the adjusted product or might use the differ-

ences in the products to embarrass NASS about incompleteness in the traditional product.

Administrator Bosecker made the decision to publish one product: the fully adjusted county, State and U.S. results. All field offices had the opportunity to review the first calibration trials and suggest specific variables and control data that should be included for their States. Improvements were made to the calculation procedures and summaries prepared, which included adjustments at the county level. In order to complete all necessary review of the new results, a preliminary summary was issued in February and final results were published in June.

The new product was fairly well-accepted, in part because it was the only product available. Based on requests from individuals who wanted to do further study of trends, the 1997 county and State results were retabulated using the new methodology.

Most internal procedures added for the 2002 Census of Agriculture processing worked fairly well. However, entering the data through the optical character-recognition (OCR) procedure was not as successful as hoped. Many respondents put lines through answer boxes that did not apply to them. The OCR process usually considered that each cell with a line through it had received an answer of one. Fortunately, an electronic image of each page was captured and forms went through a "correct from image" review. The OCR approach was eventually dropped from the 2007 Census of Agriculture plans.

The extra 2,400 June area frame segments that had been enumerated in June 2002 were extremely valuable for providing improved estimates of the mailing list incompleteness. Four telephone call centers were used, and more operators were contacted by telephone or personal contacts than for other recent censuses of agriculture.

One major advantage of the census of agriculture over the ongoing commodity statistics program is the measurement of the demographics of U.S agriculture. The added questions regarding numbers of operators per farm and the demographics of multiple operators presented a new picture. More than 3.1 million farm operators were reported on nearly 2.13 million farms in the 2002 Census of Agriculture. Of the total, 847,832 (27.2 percent) were women. Another new demographic result was that 13.6 percent of operations reported multiple households sharing the farm income.

The operator demographic questions on gender and age, which were asked of the first three operators per farm, provided new information for rural sociologists and organizations interested in a fuller picture of farming in the 21st century.

Other new questions also worked well. New production contracts questions provided a clearer picture of farm operator income from contract operations. A pilot project in Montana, North Dakota, and South Dakota presented more information about agriculture on American Indian Reservations for those States.

One of the first users of the new demographic information on farm operators was USDA. The 2002 Census of Agriculture data on race, gender, and ethnicity of farm operators at the county level were used in preparing the first annual "USDA Program Participation by Socially Disadvantaged Farmers and Ranchers" report to Congress.

Special reports such as "Operators by Race" and "Women Principal Operators" were created and released. The "2002 Census of Agriculture Agricultural Atlas" was released as an electronic product; it contains 276 maps and graphs illustrating agricultural trends across the United States. Based on the Research and Development Division work, a new interactive mapping tool on the agency's Web site allowed users to customize their own maps.

Finally, new procedures were also deployed for the 2002 Puerto Rico Census of Agriculture. A toll-free telephone number was made available for the census (as it had been for the 50 States) that helped improve response. In addition, personal interviewers were used to collect reports not returned by mail.

Improvements for the 2007 Census of Agriculture

A census content test was conducted in 2006 that included a short questionnaire version. Three agricultural identification surveys were conducted; they were aimed at removing non-farms from the census mailing list. Many efforts were made to improve the mailing list coverage of minority and small farm operators. Pilot testing of improved procedures for contacting American Indian farm operators was done in

New Mexico. One significant change for the 2007 Census of Agriculture was that an electronic data-reporting instrument was offered for the first time.

Chapter 8: Accomplishments in the Past Decade

Estimating Program and Reimbursable Activities

In the past 10 years, there have been many additions to both the estimates created and the reports issued by NASS. Some additions have been due to changes in U.S. agriculture and to improvements in customer service; other additions expanded the coverage of topics of interest. Also, NASS is now publishing agricultural statistics for Puerto Rico and including Puerto Rico commodity statistics in ongoing NASS reports such as "Farms, Land in Farms, and Livestock Operations." Improvements in sample sizes and/or geographic coverage have been made for some surveys.

NASS started a series of "Farm Computer Usage and Ownership" reports in 1997, based on questions added to the June Area Frame Survey. Questions are asked only every two years because within-State sample variations might be greater than the true annual changes. The 1997 survey asked if the operation had computer access (38 percent had); if the operation owned or leased a computer (31 percent did); if the operator was using a computer for the farm business (20 percent were); and if the operation had Internet access (13 percent had). Questions have been added in subsequent years about the types of high-speed Internet access being used and the types of business being conducted over the Internet (e.g., purchasing inputs, selling products, and/or accessing reports and services). The 2007 survey indicated that 63 percent of farms had computer access; 59 percent owned or leased a computer; 35 percent were using a computer for the farm business; and 55 percent had Internet access. However, these results varied widely by region, economic class, and type of farm.

Another survey change that had been due to new agricultural trends was the reporting of corn, soybean, and cotton acreage planted with biotechnology seed. Biotechnology seeds have been modified for resistance to herbicides, insects, or both. Questions related to biotechnology were first asked in 2000 and are now repeated annually. The results are included in the annual "Acreage Report" at the end of June.

In 1997, the Secretary of Agriculture requested that NASS develop a weekly survey to estimate the weekly price of un-aged cheddar cheese sold by cheese makers. (This is a major determinant in the price for different classes of milk produced by farmers.) Because less than 100 cheese plants produced about 95 percent of all un-aged cheddar, NASS was able to contact just those plants and implement the survey in short order. When the survey procedures had been verified, NASS started releasing prices and volumes sold for the previous five weeks each Friday. The survey was quite successful, and the next year NASS was asked to expand data collection to a "Dairy Product Prices" report, which also included butter, nonfat dry milk, and dry whey.

Due to changes in the Federal support program for peanuts, NASS was asked to start a weekly "Peanut Prices" report in 2006, which covered purchases from farmers. Another new report series that was created in 2006, which provides information for producers and analysts to use in forecasting supplies, was a monthly "Catfish Feed Deliveries" report. The report breaks out data by State and by feed for food-size fish versus fingerlings and brood fish.

The large increase in dairy and meat goats in the United States prompted the change from "Sheep" reports to a "Sheep and Goats" report in 2006.

One report change that did not work well was a monthly "Hogs and Pigs" report, which was started in 1997. Analysts hoped more frequent hog breeding coverage would improve the ability to forecast future supplies and prices of pork. Survey cooperation was much poorer than for standard quarterly surveys. Monthly results were inconsistent, and they seemed to be affecting the quality of the quarterly survey, so the monthly survey and reports were dropped in 2003 after considerable discussion and industry input.

Combined U.S. and Canada livestock reports were also added to the NASS program. In the past, there had been frequent complaints about both the difficulty of obtaining Canadian livestock supply information and the fact that everyone had to pay for those reports (in contrast to the free U.S. electronic reports). NASS worked with Statistics Canada to develop a combined cattle report. Because neither country changed survey procedures nor timing, the

approach was to combine both countries' information into a consolidated release that would be electronically available to everyone, free of charge. The first "U.S. and Canadian Cattle" report was issued in 1999. Because Canadian hog and pigs information was collected and issued by a different group than that for cattle, it took some time to make similar joint release arrangements. However, the first "U.S. and Canadian Hogs and Pigs" report was issued in 2004 and has been continued on a quarterly basis since.

One new, significant NASS procedure was the use of data warehousing to analyze all data on hand and create a number of structure reports. These included "U.S. Hog Breeding Structure" and "U.S. Cattle Supplies and Disposition" in 2001, followed by "U.S. Dairy Herd Structure" and "U.S. Broiler Industry Structure" in 2002, and "Licensed Dairy Herds" in 2004.

Another new report was issued in February 2003. Questions had been asked about crop marketing contracts on the 2001 Agricultural Resource Management Survey, which typically would have been used for special economic analyses. NASS made sure that the results received wider coverage by issuing the "Corn, Soybeans, and Wheat Sold Through Marketing Contracts 2001 Report."

One other new endeavor was the annual updating of the "Track Record" reports for crops, grain stocks, and livestock. These updates summarize record highs and lows for the various commodities and show the changes from each forecast or preliminary estimate to the final estimates. A similar type of report now routinely published is "Price Reactions," which tracks market price changes following major NASS statistical reports.

Examples of expanded coverage reports included the 1999 "Equine" and the 2001 "Nursery" reports. In both cases, all available information was provided for these two industries at one point in time.

NASS took on some changes in the spirit of governmental efficiency. Starting in 1997, NASS coordinated the sampling and summarization of its California agricultural labor surveys with the California Economic Development Department (EDD). Since EDD was contacting even more operations than NASS and asking basically the same questions, the coordination between the two groups reduced the contact burden on farm operators.

NASS took over the "Farmland Values" report from ERS in 1997 to ensure that annual publications would be continued. NASS later added cash rents to that report.

NASS has long provided statistical services to other Government agencies on a cost-reimbursable basis. Often this involved one-of-a-kind surveys or analyses. Those types of requests still occur today, but a major shift took place in the past 10 years, as NASS worked almost every year to help specific agencies implement new programs.

In the late 1990s, NASS conducted a number of customer service surveys for other USDA agencies and assisted on some organizational climate surveys. NASS also conducted the Childhood Agricultural Injury Study for the National Institute of Occupational Safety and Health (NIOSH). That study was parlayed into a series of NASS surveys for NIOSH on childhood injuries, minority childhood injuries, and adult occupational health issues on farms. As the full analyses of NIOSH surveys often take a few years, NASS requested that a short summary report of results of each survey be published. NASS normally drafts the summary after the data quality review is finished, and then NIOSH reviews and approves it before release.

Another ongoing effort since 1999 is a series of surveys for the National Animal Health Monitoring System (NAHMS) of the USDA Animal and Plant Health Inspection Service (APHIS). NASS conducted NAHMS surveys for layers and egg operations, feedlots, swine, sheep, cattle, catfish, non-ambulatory cattle and calves, backyard poultry flocks, and non-ambulatory sheep and goats. NASS also conducted a number of surveys for the APHIS Wildlife Services program on death losses due to predators and other causes for cattle, sheep and goats, and catfish.

NASS also assists the USDA Agricultural Research Service (ARS) Nutrient Lab with their sampling issues for dietary and other food-related surveys on an annual basis.

Federal Farm Programs and NASS

NASS does not have any USDA regulatory, payment, or inspection authorities. Thus, it has been able to build and maintain its reputation for providing consistent, unbiased statistical information regardless of each administration's politics or present Farm Bill legislation.

However, NASS program offerings have been impacted by new Farm Program legislation. At times, the agency has been asked to provide reports of marginal statistical value. One example was the July 1 forecasts of the current corn crop. July 1 is too early for producers to fully interpret their crop's potential and too early to collect meaningful objective yield information. At various times in the past, USDA policy officials wanted a July 1 evaluation of the crop size so they could be ready to act if low (or perhaps high) production levels triggered Farm Program provisions later in the season. The agency usually suggested discontinuation of the July 1 corn forecast whenever budgets were tight, in order to save as much funding as possible for more statistically defensible forecasts and estimates.

In 1980, the July 1 corn forecast issue was handled through the establishment of the World Agricultural Outlook Board (WAOB) and the creation of the monthly "World Agricultural Supply and Demand Estimates" ("WASDE") report. Each May, WOAB starts analyzing the current year's crop potential. They use available NASS reports to make projections when it is too early to statistically forecast production. For example, the July 1 corn production number now available in the July "WASDE" for policy analysts is based on the NASS "June Acreage" report estimate of corn acreage expected to be harvested. It's also based on a trend yield that might be somewhat adjusted by the WAOB if plantings were particularly early or late.

New Farm Program provisions often have led to estimating program expansions. For example, inclusion of minor oilseeds for special Farm Program provisions led to funding for improved estimates of those crops. Most of the county estimates that NASS routinely creates and publishes (particularly the cropping practices data on irrigated, non-irrigated, and following summer fallow) are paid for by either the USDA Farm Service Agency (FSA) or Risk Management Agency. NASS usually has to increase sample sizes to provide these county estimates.

Occasionally, NASS has needed to deal with requests for changing the timing of specific reports in order for USDA to implement Farm Program provisions. One example was an effort to issue advanced soybean crop yield insurance payments. In this approach, a portion of the expected payment would be issued before harvest was completed. Final payments would be based on NASS county estimates that are not available until February. The compromise reached was for NASS to create Agricultural Statistics District (ASD) yield forecasts based on the October 1 "Crop Production" report. The advanced payments to producers would then be based on the normal relationship of yields in specific counties to the ASD yields. The new procedure was implemented and was successful in most areas. However, some counties ended up with higher-than-typical yields related to the final ASD average yield, and producers had to return the advance payments.

One new experience for NASS was the fact that mandatory reporting requirements for the "Dairy Product Prices" report were written into legislation. The agency hadn't needed to write official regulations before; it's a rigid and time-consuming procedure. There was also difficulty in implementing the spirit of the legislation because NASS is not a regulatory agency and has no audit authority. The question of how to implement auditing without violating confidentiality of reporting is still being resolved.

Integrating Surveys, One More Time

One decision that greatly shaped the past 10 years or so was the creation of the Agricultural Resource Management Survey (ARMS) by NASS and ERS. In 1996, the annual cropping practices survey was integrated with the Farm Costs and Returns Survey Program. Because of the integration, total farm economic data were usually collected for operations included in the chemical-use surveys. This created larger sample sizes for the annual farm production expenditures analyses and allowed analyses of chemical-use practices related to different sizes and types of farm operations.

ARMS was originally named the Agricultural Resource Management Study by ERS, although NASS staff members usually referred to it as a survey

program. ARMS became so well known that it usually went by its acronym and was rarely spelled out. However, when the two agencies were documenting the need for additional funding for the program around 2001, it became clear that the reluctance from the Office of Management and Budget (OMB) reviewers to agree to funding increases was due, in part, to the ARMS name. OMB viewed the study as a one-time, relatively small program. The term "survey" might imply a broader, more ongoing program. At that point, ARMS was renamed as the Agricultural Resource Management Survey in all ERS communications, and the program's expansion was approved by OMB the next year.

Several increases in chemical-use coverage occurred under ARMS. The first after-harvest chemical applications survey was conducted for apples and potatoes in 1997. Later agricultural practices surveys covered post-harvest chemical applications for commodities such as fruits and vegetables, peanuts and rice, and oranges. A survey of adoption of integrated pest management practices was conducted for pastures. Another new chemical-use approach was to collect information on chemicals applied to animals and animal facilities.

NASS field offices became concerned with the extreme length of many ARMS interviews. Complaints were particularly aimed at the long, complicated economic questionnaire that was administered to all operations, even those primarily selected for chemical-use or cost-of-production data surveying. Requests were made to ask more global questions instead of asking for full details at each interview. A short question version was tested for one quarter of the 2004 core sample and was expanded to all core samples in 2005. The shorter version led to partial use of mail contacts. Mail response was low, but it was cost effective because personal interview costs are high.

When NASS began collecting data on the Conservation Effects Assessment Project (CEAP) for the USDA Natural Resources Conservation Service (NRCS) during 2003–07, ERS requested that ARMS-type data be included. This would allow for a broader analysis of the CEAP, rather than one that focused only on the environmental benefits from conservation programs. After negotiations, an integrated ARMS/CEAP questionnaire was developed in 2004.

In addition to broadening the ARMS scope, improvements were made to publications and to the presentation of the summary data. For example, all agricultural chemical-use summaries now have distribution tables that show medians, averages, and 10th and 90th percentiles for each chemical's rates of application and number of applications data distribution.

New Technology Developments in the Past 10 Years

Data technology emphases from 1997 to 2007 might best be summarized as having continually updated to state-of-the-art processing, security, and access procedures. Many changes and upgrades have been made to enhance the tools that agency personnel have to do their jobs, which have also ensured that proper security for data and processing systems is in place. Innovations have been added to improve NASS customer access and analytic capabilities. To make these improvements, NASS often needed to hire employees with specific training and mandatory certifications.

At the same time, USDA (and other Federal organizations such as the Office of Management and Budget) has had some impact on NASS technology programs since the late 1960s. As mentioned in part 2 of this account, some agency acquisition plans in the late 1960s and 1970s were delayed because long-range data processing plans were either not in place or were not acceptable to USDA. The Clinger-Cohen Act of 1996 (CCA) specified that Government information technology offices should be operated just as efficient and profitable businesses would be operated. The CCA emphasis was on departments, not individual agencies, and called for leadership by Department chief information officers.

The CCA called for the creation of an integrated framework of technology for carrying out the business of each department and for considering all facets of capital planning for acquisition of new hardware and software systems. Following CCA, USDA emphasized the need for agencies to align their information technology (IT) strategy with their business goals, and to demonstrate sound IT investment portfolio management that would be linked to good project management practices. Those initiatives were very sound approaches, but they often required extensive NASS documentation to clarify the appropriate efforts that were already underway. It was also

time consuming to fully justify NASS requirements for specially enhanced processing and security software in order to acquire necessary waivers.

One significant agency change in the past 10 years was the 1998 migration of mainframe processing activities from an outside contractor to the USDA National Information Technology Center (NITC). This ended more than 25 years of contract arrangements. Not only was NITC able to provide the level of support that NASS required and meet peak workload demands, but processing costs were also reduced. The NITC processing system also offered improved file and processing management and gave NASS users more control over the timing and priority of processing jobs.

One special technology effort was the review of all agency data systems in order to identify and repair any that might not function properly come the year 2000. Since NASS did not have many accounting-type systems that performed operations based on calendar dates, there were probably fewer systems to repair than for many other organizations. This "Year 2000" (known as Y2K) effort provided an impetus to review all NASS programs and operating systems for those which should be retired and for those needing to be replaced or rewritten. NASS also scrutinized all commercial software that had become part of its standard processing technology to be sure those programs were compliant. The review and assessment was necessarily thorough and extended to all workstations and to non-data processing computerized applications, such as security systems for entering offices. NASS tackled the Y2K concerns aggressively and accomplished all the necessary steps on or ahead of schedule.

A number of past decade improvements provided new or enhanced tools for agency personnel. Completing the agency's wide area network (WAN) in 1997 gave all employees Internet access and provided each field office access to needed data for efficiently carrying out the 1997 Census of Agriculture. Also, 1997 marked the completion of the enhanced list maintenance operations (ELMO) system, which replaced the existing list- sampling frame software and greatly improved operations. As part of the ongoing ELMO development efforts, a full list frame database was available at the time NASS acquired the census of agriculture responsibilities. The ELMO system provided invaluable query capabilities during processing of the 1997 Census of Agriculture.

New Windows-based CATI and interactive editing software were introduced in 1999, which were easy to learn and use. A questionnaire repository system (QRS) was added in 2003, which provided all field offices full access to all standard questions for preparing new questionnaires. The QRS has been powerful in standardizing questions for surveys that use multiple modes of collection, including paper, telephone, personal interviews, and online survey responses.

Many steps have continued to be taken to improve customer access to NASS reports. Portable Document Format (PDF) versions of major reports were added in 1997, in addition to text files for immediate Internet releases. Also in 1997, the USDA computerized information delivery service contract expired. However, NASS was already providing better access through its Internet home page and through a multi-agency contract with the Mann Library at Cornell University. The Mann Library provided archival access to all NASS electronic reports and maintained the customer subscription service for online reports. The Mann Library wanted to become known as the leading agricultural information center, and it was providing this excellent service to NASS, ERS, WAOB, and the USDA Extension Service for a total cost equivalent to hiring one entry-level Federal statistical assistant. In 2001, the agency began offering spreadsheet-ready data files in addition to the text and PDF formats.

Data users were provided direct access to NASS historical data by adding the online "Quick Stats" reports database as an agency homepage feature in 1998. Users select commodities or data series, time periods, and geographic areas to create data files for viewing, printing, or down loading. The "Quick Stats" design has not worked as well internally as hoped, and it will likely be replaced by an improved application.

Another database feature was added in 2004 when NASS and ERS introduced an online query system that allowed Agricultural Resource Management Survey database users to create their own special tabulations of data. In 2006, NASS began using Rich Site Summary (RSS) feeds of news and announcements to provide better public access. The agency developed full text scans of many historic

reports not previously available in electronic accessible formats.

One significant success story of the past decade was NASS's leadership role in data warehousing for statistical applications. In the early 1990s, several internal NASS reports addressed the need to improve the agency's data management of historical survey data so that NASS could enhance its sampling capabilities, reduce survey respondent burden, improve data quality, broaden analytical capabilities, and expand estimation methods. The NASS Strategic Plan, published in late 1994, called for a data system that would permit maximum use of historical data and that would be easily accessible by all NASS users. The Data System 2000 Steering Committee was then formed in 1995 as a spin-off to the NASS Strategic Plan to pursue development of an enterprise database containing historical survey data. In 1998, over 600 staff members used the easy-to-access data warehouse system to carry out analyses during the 1997 Census of Agriculture processing. It was also used by many agency personnel for improved analyses of survey data and estimates. By the end of 2007, the NASS data warehouse contained over 5 billion survey responses from farmers and ranchers from 1997 through 2007.

The agency has often been called upon by other statistical organizations for advice and guidance in creating data warehouse systems. Staff members participated in a number of data warehousing conferences, and NASS hosted the second International Conference on Statistical Data Warehousing and Business Intelligence. The conference showcased presentations from seven countries.

A small, but significant, realignment in 2004 added the Field Services Section and the Data Warehousing Group to the Information Technology Division (ITD). The realignment promoted a more unified and cohesive approach to information technology products and services. More employees are now involved in broader IT applications instead of focusing on just specific contributions. The change has strengthened the support for field office activities by having a wider cadre of people to call upon.

New technologies were also used to improve data collection options. Beginning in 1999, weekly crop progress survey responses were collected over the Internet. This was feasible because most reporters were USDA Extension Service personnel who had Internet access. They would sign on to get the current questionnaire and submit their observations by early Monday morning in order for NASS field offices to summarize, analyze, and issue the current week's report at 4 p.m. eastern time. The present crop progress and condition system handles questionnaires that change weekly and require fast turnaround for both mail and Web versions. The system leverages all historic reported data for week-to-week comparisons and can even offer multiple questionnaire versions within a State during the same week. The system also efficiently handles multiple modes of data collection and often receives 2,000 or more Web-based responses each week.

Because nearly all NASS surveys are voluntary, it was not expected that many people would respond over the Internet, except for special cases such as the crop progress survey. However, some agricultural-related businesses, as they automated their own records, preferred to transmit electronic information for reports such as "Cold Storage" instead of copying data to questionnaires. These early transmissions often were e-mail messages, as electronic questionnaires had not been created. The first test of electronic data reporting (EDR), other than for crop progress surveys, was for the "Cotton Ginnings" report in 2001. By 2004, NASS had developed a well- functioning EDR software system that was integrated with the questionnaire repository system to create effective survey instruments. The NASS system fully met the objectives of the Government Paperwork Elimination Act to provide the public with reporting options in dealing with Federal organizations. EDR applications were first prepared for smaller, business- type surveys, but they have been expanded to all surveys. EDR was available for the 2007 Census of Agriculture data collection for the first time.

As mentioned above, security has been a major focus. As soon as electronic communications between headquarters and field offices were feasible, electronic encryption (using National Institute of Standards and Technology-approved protocols) was used for transferring the speculative data and recommendation files for Agricultural Statistics Board (ASB) reports. In 2001, a personal computer-based local area network (LAN) was assembled as an ASB reports backup processing alternative. In a later security upgrade, all ASB data files were encrypted.

Because of Federal Governmentwide electronic security concerns, NASS was successful in receiving specific funding for strengthening security, starting in FY 2001. A full risk assessment of all agency processing and communications was completed in 2003. About that time, a virtual private network (VPN) was created for encrypting all non-primary network communications (such as for telecommuters). Security training was conducted for all employees and new intrusion detection features were added to all facilities.

Many state-of-the-art security features have been added to ensure proper security of the NASS network and its data, equipment, and facilities. Vulnerability scanning software has been installed, along with implementation of an automated security-dispatch management system. An intrusion detection system has been installed to detect any unusual network activity. Outside contractors have been hired to certify that all systems have adequate security controls and penetration testing has been done to monitor for potential security improvements. One key factor has been to install advanced network auditing tools to validate that proper security controls are always in place and functioning.

NASS has been a leader in creating and testing disaster recovery and continuity of operations systems. It initiated a number of new activities in order to comply with the Best Enterprise Architecture Practices. It upgraded the encryption procedures being used in order to strengthen the VPN. All operations also have been migrated to a more secure operating system and plans are in the works to encrypt all files on work stations.

One other improvement in the past decade was a new approach for implementing agency technology priorities and communicating the status of planned efforts. The agency's Information Technology Council meets every two years to set strategic and longer-term priorities and directions. The agency's Senior Executive Team addresses tactical and shorter term technology issues every month. The significant new agency management approach was creation of the agency's Business Council. The Business Council is composed of the branch chiefs of each headquarter division, plus representation from the field offices. The branch chiefs control day-to-day assignments of personnel and are acutely aware of progress on most agency survey, estimation, and personnel operations. Business Council members do not set technology priorities, but they can provide up-to-date time tables for implementing the priority decisions that have been set.

One new approach implemented in response to the Clinger-Cohen Act was the creation of the NASS Enterprise Architecture Council (NEAC). USDA has defined four levels of architecture: the business layer, the applications and services layer, the data layer, and the technology layer. One example of the Department's standardization efforts to improve operations, reduce costs, and avoid redundancies was the time and attendance reporting system that NASS created in the 1990s. It was considered for use by all agencies as part of the applications and services layer. However, the Department's final decision was to acquire a commercial system.

As stated at the start of this section, NASS technology is being continually updated to take advantage of improved processing advances. One good example is the work underway to create what has been dubbed GENESIS (generalized enhanced sampling and information system). This new system will enhance and replace the mainframe classify and sampling programs. It will build on present ELMO and data warehouse efforts, and it will specifically add features that had been proposed in the past but were not achievable.

Training Developments in the Past 10 Years

Training in recent years has essentially been a technology story in itself. NASS has taken advantage of online and other computer-based training methods. Many new methodologies offer employees the flexibility to complete required training on their own schedule. For example, USDA has purchased or internally developed several thousand online employee training modules. Examples include modules for required annual ethics and security training. USDA normally requires all employees to complete certain modules each fiscal year, but other modules are available to employees when specific questions or needs arise.

NASS has a learning culture that is committed to proper training for all employees. A typical agency allocation to training is 3 percent of the total budget. The 2000 calculation showed that the training expenditure that year was actually 3.4 percent. Train-

ing programs are constantly evaluated and modified as needed. For example, the New Statistician Orientation, which brought groups of new professional employees to headquarters after they had worked six months or so, has been changed to New Employees Orientation. This program includes all new field office and headquarters employees. Orientation timing and content were adjusted to fit the expanded goals.

One long-standing commitment has been to develop communication, supervision, and management skills. At one time, the U.S. Office of Personnel Management (OPM) required 80 hours of training for all Federal supervisors. During the 1990s, it was reduced to 40 hours. NASS, however, has kept a two-part, 80-hour guideline for its entire professional staff. The first 40 hours are provided through contracted courses for newer NASS employees. The second 40 hours are normally provided through USDA, OPM, or other training opportunities in which NASS employees participate with employees from other organizations.

Training on census of agriculture procedures has been a major NASS emphasis. Soon after it was known that the census responsibility would be coming to NASS, national training sessions were held for 200 State directors, deputy State directors, census coordinators, and census support leaders. One sign of ongoing training improvements was evidenced in the 1997 Census seminar for all agency managers. It was announced that overhead transparencies would not be allowed, and all presenters had to use computer-based presentation tools. This forced many presenters to examine new tools for the first time and devote considerable effort to their message, visual aids, and delivery. The result was one of the most effective training sessions the agency had ever presented.

One key agency self-evaluation approach has been a long series of climate surveys that ask all employees to evaluate a wide variety of organizational issues, such as work place, personnel relations, communications, management and others. To ensure confidentiality, the organizational climate surveys have normally been conducted by outside organizations such as survey research centers at the University of Maryland and George Mason University, or through the Joint Program in Survey Methodology. Climate surveys are now conducted using secure, Web-based methods.

One reflection of management's desire to truly learn from climate surveys (as well as to respond to employees' reactions like "What difference does the survey make?") was the appointment of an Organizational Climate Survey Evaluation Team. This team was designed to thoroughly study current results in light of earlier surveys and to make specific recommendations to management. Many recommendations involve training, and those recommendations are implemented by the training and career development office (TCDO).

In 2000, TCDO took the lead in contracting for an agency leadership- effectiveness inventory evaluation of all supervisors and managers. This included evaluation of each individual by supervisors, subordinates, and peers. The process, led by experienced contractors, formed the backdrop for an agency leadership workshop. The analyses highlighted the agency's leadership strengths and weaknesses as it prepared for the future. TCDO also used the results to identify and implement additional leadership training.

TCDO has also added many new training features. "Train the trainer" sessions have been held for headquarters and field office survey leaders to better prepare them to help with office training. TCDO leads agency personnel in using best practices to prepare detailed agendas and learning objectives for each training program. Because the agency is using online and interactive editing, summary, and analysis routines, TCDO has scheduled many training sessions at the USDA Farm Service Agency facility in Kansas City. This facility offers NASS attendees opportunities to train on new computerized tools.

Because of the constant assessment of employee training needs and the innovative approaches used to providing that training, NASS was nominated during the 1990s for the W. Edwards Deming Award for Excellence in Federal Government Education, sponsored by the Graduate School, USDA. The nomination acknowledged the "cradle to grave" attention that NASS gives to employee needs, and it was well-received by the selection committee. In 2006, NASS received another Deming Award nomination for TCDO's design, development and delivery of an online leadership course on performance management for all supervisors.

Several new action-learning approaches have been successfully implemented by TCDO since 2003. Field office and headquarters staff members have

worked together to learn new problem-solving techniques while learning about leadership. The first approach included four face-to-face sessions, followed by individual introspection and action follow-ups. A later approach included face-to-face, online, and teleconference sessions for the participants, which utilized electronic white board technology. Participants were very pleased with the confidence they gained by using new problem-solving and leadership skills; they also increased their comfort with technology. The agency's cutting edge efforts to employ these new learning methods have been recognized across Federal agencies. TCDO has been invited to speak at several human resource sessions and to consult with other organizations on implementing innovative leadership training.

Remote Sensing Developments in the Past 10 Years

A 2001 remote sensing paper suggested that the Cropland Data Layer (CDL) Partnership Program might expand to cover the top 15 to 20 cropland States. Indeed, this idea did seem to have strong interest from many sources, particularly State government agencies looking at watershed issues. By 2001, data analysts were located in Illinois, North Dakota, Mississippi, and New Mexico. There also were ongoing negotiations for a partnership with Florida A&M University and one to create a CDL product for the Middle Atlantic States.

However, the partnership program did not expand as anticipated. Few State governments had research or information staffs with remote sensing interests or skills. State government organizations seemed to be interested in tackling a few specific research questions, but they often did not seek additional applications. If one person was designated and trained for the CDL project, there was usually no technology transfer when the analyst moved on to other assignments—and the entire effort would close. In university settings, only one or two people were trained; when those individuals completed their studies and moved on, they were not usually replaced. Another factor was that having the CDL for one point in time seemed sufficient for many other research interests because cropland does not change much from year to year.

There was, however, some excellent CDL partnership program work done. The State of Illinois added additional ground data to the effort and created a land cover layer, instead of just a cropland data layer. CDL products were helpful in making some agribusiness economic decisions in North Dakota by adding data layers such as transportation. Much of the documented use of the CDL products related to within-State watershed and other water-quality efforts for which the CDL approach was extremely appropriate.

Through 2006, CDL products had been created for Arkansas, Florida, Idaho, Illinois, Indiana, Iowa, Louisiana, Mississippi, Missouri, Nebraska, North Dakota, and Wisconsin (with multiple dates for all but Idaho, Louisiana, and Wisconsin). In addition, combined States products are available for the Midwestern States, which cover crop years 2005 and 2006 (the State of Washington is included in the 2006 product), and the Mid-Atlantic States for the 2002 crop year. There has been considerable interest in these products—198 requests were made in 2005; 139 in 2006; and 118 in the first seven months of 2007. As of midyear 2007, products were available over the Internet through the USDA Natural Resources Conservation Service (NRCS) Geospatial Gateway.

An interesting new line of remote sensing and Geographical Information System (GIS) research and application has arisen in the past three years or so. There is a great amount of interest in building an expanded information system for citrus fruit. This includes using remote sensing products (perhaps from satellites with higher-resolution sensors) to identify plantings of citrus trees and, perhaps, to count or estimate the numbers of trees. There is also interest in being able to judge the maturity and health of individual blocks of trees as possible indicators of crop size. The Florida citrus industry, the State of Florida Department of Citrus, and major citrus companies are all interested in the research, and they have obtained research funding from NASA. NASS is contracting to do much of the basic GIS research. Because the new goals are to not only improve Florida industry information but also evaluate citrus industries in Brazil or elsewhere in the world, the research is bringing in concepts from both the LACIE of the 1970s (discussed in chapter 3) and the AgRISTARS early warning and crop condition assessment project of the 1980s (discussed in chapter 5).

The NASS remote sensing efforts and the research into uses of GIS-registered data files, such as USDA Farm Service Agency's (FSA) digitized field boundar-

ies for all farms signed up for Federal farm programs, have both reached an advanced level of maturity and have set the stage for new research in 2007. Many of the time-consuming technical issues involved in rectifying and registering ground and satellite data have been solved by registering new satellite data to a standard available mosaic of the entire United States, which is based on 30-meter Thematic Mapper data. For the first time in 2007, remote sensing interpretations of current-season crop acreages for major States were available by October 1, instead of by the end of the harvest season. Those interpretations were based on samples selected from FSA's digitized field boundaries and certified crop uses for 2007. The satellite data were from the moderate resolution imaging spectroradiometer (MODIS) sensor aboard NASA's Aqua and Terra satellites, which provide more scenes than Landsat satellites.

The biggest development is that P-EDITOR, which has been a tremendous workhorse research and application system, may soon be replaced. A new artificial intelligence system built on the classification and regression tree (CART) analysis approach is being tested. The CART approach is non-parametric and uses decision tree techniques, which should improve on the P-EDITOR parameter-driven approach. CART can handle many satellite- imagery dates at once (P-EDITOR was limited to two) and can combine other data sources, such as slope and elevation data, at the same time. The CART approach will also be able to accept cloudy satellite scenes by ignoring cloud problems, assuming there are other non-cloudy scenes in the same analysis.

Other Research Directions in the Past 10 Years

Many Research and Development Division (RDD) activities over the past 10 years have already been covered in chapter 7 and in the remote sensing and reimbursable material sections discussed earlier in this chapter. However, there were many other active research efforts.

Several important results came out of ongoing sampling and estimation investigations. A new State-by-State sample allocation for the June Area Frame Survey (using a national sampling approach) reduced the total number of area segments by 20 percent while maintaining the same U.S.-level precision. A key breakthrough was the implementation of multivariate probability proportional to size (MPPS) sample designs for surveys such as quarterly crop/stocks and for environmental surveys that have multiple crops of interest. The new design provided better targeting of rare commodities, lowered overall sample sizes and survey costs, and reduced respondent burden.

A number of other efforts were aimed at reducing respondent burden. An approach to better communicate with large producers called the "Top 100" was started. This method would summarize data for the top producers of specific commodities, evaluate their impact on estimates, and develop communication strategies to establish rapport, in order to collect the best, most consistent data for each operation. An improved, more detailed respondent-burden tracking and management system was also developed to better understand and hopefully minimize respondent burden. A related effort tested the effectiveness of designating personal enumerators for some large or otherwise important producers.

Cognitive research methods were used in a number of investigations. Small group meetings were held with producers to gain their evaluations of NASS survey approaches to make data collection more convenient. These interviews were also designed to identify services and information that the respondents desire. Cognitive interviews were conducted with reluctant survey respondents in South Dakota, which led to a new enumerator training program for handling reluctant respondents. RDD staff members also participated in the testing and evaluation of a new short version of the Agricultural Resource Management Survey (ARMS) core questionnaire and the 2007 Census of Agriculture form design pretesting.

A special respondent-incentives research effort was conducted in conjunction with the 2005 ARMS data collection. A debit card was used as the incentive, and various treatments were tested, such as providing the debit card with the mail questionnaire versus promising to deliver a debit card when the questionnaire was returned. All incentive treatments resulted in higher response rates than mailings without incentives; they were, therefore, cost effective. The largest additional increase in treatment response was measured at 9 percent.

An ongoing research theme for NASS is the improvement of data analysis tools for field-office and headquarters statisticians. In the late 1990s, new graphic tools were developed and added to the interactive

data analysis system. A new agricultural generalized imputation edit system (AGGIES) was developed and tested that had many advantages over traditional editing procedures. Since editing and imputation were fully automated, manual operations inconsistencies were avoided. Functions were performed objectively and more consistently than with multiple, independent operations. Other statistical agencies in the United States and several other countries have requested information on the system.

U.S. Agriculture, Circa 2007

The biggest story in American agriculture in 2007 was the tremendous increase in the acreage planted to corn for the production of ethanol. Government policies promoting the blending of ethanol with gasoline for automotive fuel and the construction of ethanol plants led to a proliferation of such plants. The amount of corn being used to produce ethanol has increased tremendously. Some 3 billion bushels of the 2007 corn crop were used for ethanol—42 percent more than a year earlier and double the figure from 2005. Economic projections predict the amount of corn used for ethanol will increase for another three years before leveling off.

The 93.6 million acres planted to corn in 2007 was the highest total since 1944, an increase of 20 percent from 2006. (The 86.5 million acres harvested in 2007 represent the highest total on record since 1933.) Much of the extra acreage came from a 16-percent decline in the acreage of soybeans planted. The 63.6 million acres of soybeans planted in 2007 was the lowest since 1995. In spite of the large increase in corn acreage and hot, dry conditions in many Eastern States, the average U.S. corn yield for 2007 was the second highest on record.

In general, crop yields have continued to increase over the past 10 years. Soybean average yields have been above 40 bushels per acre ever since 2004—a level that had only been reached once before 2000. Average corn yields have been above 140 bushels per acre since 2003, with a record 160.4 bushels per acre in 2004. All winter wheat average yields seemed to have leveled off since the big increases of the late 1990s.

U.S. cotton acreage harvested had stayed between 12 and 13.8 million acres for 2000–06 before dropping to 10.5 million acres in 2007. Cotton yields have varied from 632 to 871 pounds per acre for 2000–07; the 2004–07 yields all stayed above 800 pounds per acre. The 2007 average cotton yield of 871 pounds per acre set a new record.

Most of the corn, cotton, and soybean acreages are planted to biotechnology varieties, which have been modified for resistance to insects, herbicides, or both. In 2007, 73 percent of the corn acreage, 83 percent of the cotton acreage, and 91 percent of the soybean acreage were of biotechnology varieties. The varieties contributed greatly to further increases in farm operator efficiencies. In 2004, the efficiency had improved 16 percent from 1997 and stood at 253 percent of the 1957 efficiency level.

Farmland values have essentially doubled across the country in the past 10 years. The 2006 U.S. average value of farmland was $1,900 per acre, compared to $926 in 1997 ($1,168 in 2007 dollars). Some States selected for comparisons of 2006 values with those for 1997 were: California ($5,390 vs. $2,500); Illinois ($3,800 vs. 1,980); Indiana ($3,630 vs. $1,870); Iowa ($2,930 vs. $1,600); Kansas ($930 vs. $565); Nebraska ($1,090 vs. $524); and Texas ($1,250 vs. $554).

Livestock production continued to become more specialized. Cattle continued to be the agricultural commodity raised on more farms than any other, but the number of farms with cattle was under 1 million (971,400 compared with nearly 1.15 million in 1997). Most cattle operations (762,880 in 2006) had beef cows. Given this, there were 75,140 farms with milk cows in 2006. Hog farms totaled 65,540 in 2006, a decrease from 122,160 in 1997 and from more than 1 million in 1965. Sheep farms declined from 72,680 to 69,090 between 1997 and 2006.

Table 11 indicates that per capita consumption of meat, poultry, and fish increased in total from 1997 to 2005 by 17.2 pounds (7.9 percent). Chicken consumption continued its steady rise and totaled 86.2 pounds per person (up from 71.4 pounds). Thus, the average per capita chicken consumption has increased 252 percent in slightly less than 50 years. Total beef consumption changed little during the period (65.5 pounds in 1997 and 65.3 pounds in 2005), but pork consumption increased almost 2 pounds (from 47.6 to 49.5). Total fish consumption rebounded from 14.3 pounds in 1997 to 16.1 pounds in 2005, the same level as in 1987. Turkey consumption declined

slightly (17.2 to 16.6 pounds), lamb held steady at 1.1 pounds, and veal consumption continued to decline (from 1.0 to 0.5 pounds per person) between 1997 and 2005.

Table 11. Per Capita Consumption of Meat, Poultry, and Fish, United States 2005

Total Population 296,639,000

Category	Total Consumption (Pounds/person)	Percent of Total
Beef	65.3	27.8
Veal	0.5	0.2
Lamb	1.1	0.5
Pork	49.5	21.0
Chicken	86.2	36.6
Turkey	16.6	7.1
Total Fish	16.1	6.8
Total Meat, Poultry & Fish	235.3	100.0

Table 12. Cash Receipts from Farm Marketings, by Commodity Groups, United States 2006

Category	Total Cash Receipts (Million dollars)	Percent of Total
All Cash Receipts	239,272	100.0
Total Crops	119,951	50.1
Food Grains	9,106	3.8
Feed Grains	27,962	11.7
Cotton	6,173	2.6
Oil-bearing Crops	18,193	7.6
Tobacco	1,156	0.5
Fruits and Tree Nuts	17,011	7.1
Vegetables	17,935	7.5
Nursery, Greenhouse & Flowers	16,892	7.1
Other Crops	5,524	2.3
Total Livestock and Products	119,320	49.9
Cattle and Calves	49,148	20.5
Hogs and Pigs	14,085	5.9
Sheep and Lambs	473	0.2
Dairy Products	23,422	9.8
Eggs	4,340	1.8
Broilers and Farm Chickens	18,905	7.9
Turkeys and Other Poultry	4,248	1.8
Wool	24	0.0
Other Livestock and Products	4,674	2.0

[table continues on next column]

Cash receipts from livestock and crops were almost equal in 2006 (i.e., 50.1 percent of receipts were from crops). However, there has been considerable shifting in the livestock/crops mix since 1997. Crops cash receipts were 51 percent or more of all cash receipts in 1998, 2002, and 2003, but they were 49 percent or below in 1999–2001, 2004 and 2005.

Cash receipts for fruits and tree nuts, vegetables, and nursery, greenhouse and flowers were all up from 1997 to 2006, in terms of dollars received and percent of total cash receipts. Nursery, greenhouse and flowers products now accounted for 7.1 percent of total cash receipts, which equaled fruits and tree nuts and neared the contribution from vegetables (7.5 percent).

Cattle and calves cash receipts once again exceeded 20 percent of total receipts (20.5 percent). Hogs and pigs cash receipts continued their pattern of increasing in dollar values during each decade since 1957. However, they made up a lower percentage of total receipts in each subsequent period. Cash receipts for broilers and farm chickens continued to increase their proportionate share of total receipts to 7.9 percent. Wool cash receipts, at $24 million, made up only 0.01 percent of total cash receipts.

International Assistance in the Past 10 Years

There has been a wide variety of international assistance efforts in the past 10 years. All assistance was provided through a temporary duty (TDY) and training approach, except for a resident assignment in Ethiopia early in the period. Much of the work continued to be funded through the U.S. Government Emerging Markets Program.

Some contact and assistance was provided to countries such as China, Ecuador, Kazakhstan, Mexico, Russia, and Ukraine nearly every year of the past decade. Three to five years of TDY efforts were provided to South Africa, Ethiopia, Brazil, and El Salvador. TDY visits in only one or two years were made to Armenia, Belize, Chile, Costa Rica, Georgia, Ghana, Guatemala, Honduras, Mongolia (which was funded through the World Bank), Morocco, Nepal, Nicaragua, Oman, Panama, Pakistan, Philippines, Romania, and Sudan.

Discussions are well underway for assistance to Brazil, and a project for Argentina may open up. One interesting new development is a three-year agreement to aid Madagascar, which is being well-funded by the U.S. PL-480 program. The Agricultural Trade Development and Assistance Act of 1954 established the U.S. policy of using the Nation's abundant agricultural resources to enhance food security in the developing world. This was commonly referred to as the PL-480 Food-for-Peace Program.

NASS continued to actively provide training to foreign visitors. Every year NASS hosted a minimum of 150 to 200 visitors from 20 or more countries (30 in 2005). For instance, 219 people visited in 2004, and 220 came in 2005.

In addition to making recommendations for improvements to a country's ongoing agricultural statistical program, NASS also assisted with the preparation, conduct, and evaluation of censuses of agriculture in China and Russia.

The 1997 China Census of Agriculture was likely the largest statistical data collection effort in history. Some 6 million enumerators were trained for contacting over 200 million households, and the total amount of data processed and tabulated was staggering. For example, 335 computer centers were created; they were staffed by 10,000 newly trained people. The Food and Agricultural Organization (FAO) of the United Nations was an active participant in the Chinese agriculture census, along with statistical personnel from several countries. The Italian government contributed $17 million to the project. For its part, NASS assisted by presenting data collection seminars and helping design questionnaires. NASS staff also participated in data collection monitoring. China conducted its second census of agriculture in 2007; it has been billed as an even larger effort despite the fact that less thorough planning and coordination were done.

NASS Staffing, Circa 2007

The present profile of NASS employees is significantly different than the USDA statistical unit of 50 years ago. As of FY 2005, there were 513 agricultural statisticians and 95 mathematical statisticians on board, compared with 246 total statisticians (agricultural and mathematical) in 1955 and 451 in 1965. Nearly all the statisticians in 1955 and 1965 were white men. As of 2005, 164 of the agricultural statisticians and 34 of the mathematical statisticians were women. In addition, 93 of the agricultural statisticians and nine of the mathematical statisticians were racial or ethnic minorities.

There have been considerable changes in the past 10 years—particularly the past two years. As of midyear 2007, eight of the 46 NASS State directors (including Puerto Rico) were nonminority women, and five were minority employees. Only 4 State directors in mid-2007 had been in the same positions 10 years earlier. Five 1997 State directors are in different positions than 10 years ago, and the rest of the 1997 cadre have retired. Six of the nine people in NASS Senior Executive Service (SES) positions in 1997 have retired, and the remaining three employees each are in different SES positions. Nearly half of the 2007 mid year State directors attained their positions in the past two years.

An even bigger change in 50 years is that 132 individuals were employed as information technology specialists in 2005—a career that did not exist in the 1950s. Nearly half (65) are women, and 56 are racial or ethnic minority employees.

As of mid-2005, the agency had 163 statistical assistants on board, which is much lower than 50 years prior, but down only slightly from 20 years ago. However, statistical assistants today are using different skills and taking on more responsibility than they did 20 or 50 years ago.

Reimbursable activities have a major impact on NASS staffing. Eleven percent of the total NASS 2007 budget comes from reimbursements (8 percent from USDA agencies, 1 percent from other Federal agencies, and 2 percent from other sources). More than

10 percent of NASS staff years are currently paid with the reimbursable funding.

Family Organizational Values

Throughout the past 50 years NASS has been known as a family organization. Early in the period, most professional employees hired for agricultural statistics work had similar backgrounds. Even as hiring changed and new practices provided a diversity of educational backgrounds and gender, racial and ethnicity composition, the NASS career development approach has offered all employees comparable career experiences. Employees are encouraged to try various types of positions in order to find a comfortable, rewarding role within the agency.

One factor that has helped to nurture a family atmosphere is that NASS has a single, well-defined mission to provide timely, accurate, and useful statistics. Although there are many occupational specialties at NASS, all employees feel a connection to the mission and know that their efforts are supporting agency goals. In contrast, many other Government agencies have several missions or are administering a broad array of unconnected programs. This often results in employees having little in common with one another from office to office.

The NASS functional organizational structure also brings people together to carry out most operational surveys and planning efforts. This provides a good understanding of and appreciation for the backgrounds, talents, and efforts of other team members. The team approach has become the modus operandi for informal activities as well as for accomplishment of major new projects. For example, in the mid-1990s when interest was growing in telecommuting or flexible workplace options, NASS management did not set policies unilaterally. Instead, a small committee that represented all major NASS occupations was formed to create the parameters and provisions for the agency. The committee did a thorough review of Government policies and considered the unique confidentiality and security concerns of NASS operations. Their review efforts were very thorough and resulted in a well- defined pilot program proposal.

As the agency has evolved in the past 50 years, so have personnel selection procedures. No longer does a small group of managers create its own list of best-qualified candidates for each new opening. Positions are announced and all interested individuals are encouraged to apply. Management referrals are accepted for nonsupervisory positions, but individuals must apply for supervisory positions. Since the 1995 reorganization, the associate administrator chairs the Human Resources Council (HRC) that makes the final selection decisions and serves as an advocate to ensure that each applicant receives full consideration. Each of the four headquarters division directors serves on the HRC, along with the two deputy administrators for field operations.

People working with NASS often comment on the professionalism and esprit de corps of the organization. Several recent outside evaluations have documented the organization's positive spirit. In 2005, the Partnership for Public Service ranked NASS 26th out of 277 Federal subagencies in the Office of Personnel Management (OPM) Best Places to Work in the Federal Government Survey. In the same year, the American Customer Satisfaction Index showed the NASS overall index score to be 77.5 points—higher than the average private sector score. (NASS had an index score of 91 for courtesy and professionalism.) In 2006, NASS received a Telly Award for Outstanding Documentation of an eight-minute film entitled "Safeguarding America's Agricultural Statistics." In 2007 OPM ranked NASS higher than any other Federal Government statistical organization, and ranked the agency 27th out of 222 Government units included in the 2007 Best Places to Work in the Federal Government Survey.

EPILOGUE

The foreword of this publication asserted that by 1957 the United States had the world's foremost agricultural statistics organization. Hopefully, this account has documented how the Statistical Reporting Service/National Agricultural Statistics Service has constantly improved survey and sampling techniques, report contents and formats, and customer service awareness in order to further enhance that standing.

However, this publication has also demonstrated that the agency's impact has been much greater than just on U.S. agricultural statistics. NASS is truly a world-class Federal Government statistical organization.

NASS has demonstrated its statistical procedures leadership in many ways. It was the organization that brought common sense, proper statistical sampling designs, and improved estimation approaches to the application of satellite remote sensing techniques for agricultural and land resources inventories. It even took on leadership roles for other Federal and international organizations. Those efforts also greatly improved the creation and documentation of area sampling frames.

In addition, NASS was the leading organization in the development of computer-assisted survey techniques that could handle the intricacies of agricultural and economic surveys with many internal survey logic relationships. Also, procedures were developed for the proper use of previously reported survey data without biasing the present survey responses.

NASS became a leader in the development of data warehouse techniques to capture myriad data files, survey indications, and official estimates created by the agency. These techniques also improved editing, summarization, and estimation procedures. Data warehousing is an excellent example of one of the critical roles statisticians play in designing NASS systems. The NASS data warehouse was designed, developed, and implemented by statisticians with consultation from private industry data-warehouse experts. The system was therefore designed from the statistician vantage point with a full understanding of the business needs for ready access to historical data—data that would improve NASS survey and census operations. This data warehouse expertise then paved the way for exploring the use of additional sampling frames, such as Federal Farm Program geographic field boundary files, and for creating calibration estimators for census of agricultural publications.

Particularly because of the unique Federal and State agricultural statistics responsibilities, NASS has always been extremely customer service- oriented. The agency listened to data users and other customers, and constantly improved data products and assistance efforts. It also embraced electronic data services ahead of most USDA and Federal statistical organizations.

NASS has always been a leader in employee-based programs—in great part because all employees realize that they have an important role to play in accomplishing the NASS mission. The movement of many agency personnel from office to office as part of the career development experience also provides employees with a greater appreciation for the diverse roles and abilities of their colleagues. New approaches to training, awards and other recognition, and benefits such as telecommuting have been implemented with input from all employees, and not from management-imposed mandates.

Fifty years ago, the USDA statistical organization faced many challenges in modernizing to probability survey procedures and developing proper staffing to properly conduct and interpret the new surveys. Twenty-five years ago, SRS had implemented most of the feasible goals of the 1957 Long-Range Plan and set out to improve operations through a new approach for documenting standards for all operations. The 1982 Long-Range Plan did prepare the organization for new surveys and challenges as the United States and world's information needs changed.

Ten years ago, NASS embraced the addition of the agricultural census responsibilities to its ongoing current statistical programs. Instead of maintaining two different statistical systems, a new combined culture resulted. The result was creation of some of the most significant additions to U.S. agricultural statistics in history. These include information on multiple farm operators, a better understanding of livestock and poultry production contractees, and creation of agricultural census publications adjusted for list frame incompleteness and nonresponse.

NASS has once again reached a maturity level similar to that of 1982, and the agency should reconsider its future emphases. It seems certain that the next few years will be eventful. However, there is an experienced staff in place to maintain the present quality of operations, tackle new challenges, and develop new approaches that will improve procedures.

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A wide variety of materials, publications, and databases were reviewed in compiling this publication. Most items were from the Charles E. Caudill Library located at the National Agricultural Statistics Service (NASS) headquarters. A collection of nearly all past agency research reports has been compiled in the Houseman-Huddleston Research Library in the agency's Statistical Research Division.

Some of the invaluable reference materials used included annual budget submissions to Congress. These documents contained summaries of year-to-year changes in programs, budgets, and staffing, as well as explanatory staffing and budget data tables for each fiscal year, and "Status of Programs" narratives recounting program increases and decreases.

Many internal NASS documents also served as useful references. These documents included: archived agency staffing and position rosters, annual listings of employee names and addresses, agency staff letters, and posted personnel changes. These materials clarified changes in organization subunit names, timing of specific individual's relocation to new positions, and fluctuations in the agency's number of employees.

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