CHAPTER 7

The National Agricultural Statistics Service County Estimates Program

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7.1 Introduction and Program History

The National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA) publishes over 300 reports annually regarding the Nation's crop acreage, crop production, livestock inventory, commodity prices, and farm expenses. The primary source of this information is surveys of U.S. farmers, ranchers, and agribusinesses who voluntarily provide information on a confidential basis. These surveys are normally designed to provide State and U.S. level indications of agricultural commodities. There is also a need for county level estimates to assist farmers, ranchers, agribusinesses, and government agencies in local agricultural decision making.

NASS has published annual county estimates for over 70 years through funding provided by cooperative agreements with State departments of agriculture and agricultural universities, and directly from other USDA agencies. The earliest known record of published county estimates is by the Wisconsin State Board of Agriculture, which issued county estimates on acreage and production of crops for 1911 and 1912 along with the number and value of livestock for 1912. Not until 1917, following the signing of the first Federal-State cooperative agreement, did the USDA assist in the preparation and publication of the Wisconsin county estimates. The cooperative agreement helped eliminate duplication of efforts between Federal and State statisticians, making possible more service for less cost. The cooperative work grew rapidly after 1917 as other State departments of agriculture and State agricultural universities

established cooperative agreements with the USDA. State governments needed county level information and their funding made possible the publication of county level estimates by USDA.

The New Deal Farm Programs of President Franklin D. Roosevelt's Administration used county estimates of agricultural commodities extensively and refocused USDA's attention to these estimates. In May 1933, the Agricultural Adjustment Act was passed and the Agricultural Adjustment Administration (AAA) was soon in place. This agency had the task of reducing supply in order to improve prices of agricultural commodities. These programs greatly increased demands on NASS for county estimates of commodities used by the AAA to set county quotas and program pay-outs for surplus items.

In more recent years, the Federal Crop Insurance Corporation (FCIC) and the Agricultural Stabilization and Conservation Service (ASCS) of the USDA have used NASS county estimates to administer their programs and they provide funding to NASS for that purpose. Their programs involve payments to farmers if crop yields are below certain levels. Both agencies have chosen to use the NASS county estimates, when available, as the basis for determining these payments.

The estimation approach has remained relatively unchanged over the years. The basic process for estimating totals such as crop acreage and livestock inventory initially involves scaling various survey estimates and other available administrative data at the county level to be additive to the official USDA State level estimate. These scaled estimates are composited together, usually with the previous year estimate, to provide the actual county estimate for the current year. This scaling and compositing process tends to strengthen the final estimate over a direct design based expansion. These estimates are checked against any available administrative data that are reliable indicators of minimum levels and modifications are made if necessary. Program changes that have been made since 1917 involve data processing advances, allowing more data to be used, and larger sampling frames and more sophisticated sample selection techniques, providing better coverage of the farm population. Also, advances have been made to improve the quality of the State level estimates, which indirectly benefit the quality of the published county estimates through the scaling process. In the late 1950's, methodology was developed to conduct probability area frame surveys, where random segments of land would be selected for enumeration. In the 1960's these surveys became operational, which provided for the first time probability survey indications of crop acreage and livestock inventories on a State level basis. During this time frame, the State reporter lists were also increasing in size and improving in quality. With improved data processing capabilities in the 1970's, probability Multiple Frame (MF) Surveys were implemented at the U.S. and State levels, which combined the use of list and area sampling frames. Also, some States have conducted probability or quasi-probability MF County Estimates surveys (North Carolina Ag Statistics Service 1986).

States have traditionally shown a large degree of autonomy in designing and conducting their county estimates surveys. This has been due, in large part, to funding from the State cooperator, the quality of different data sources and different computing capabilities in each State. Recently, a NASS task force developed a County Estimates system for sample selection

and summarization that provides a general framework, but still allows considerable flexibility to each State in their sample selection and summarization procedures (Bass et al. 1989). This system is now the standard being used by NASS State offices for their county estimates program.

7.2 Program Description, Policies, And Practices

The NASS County Estimate Program is really 45 different programs conducted separately by each NASS State Statistical Office (SSO). There is some general structure provided by the 1989 County Estimates Task Group, but still each State has considerable flexibility in the implementation of the procedures. The quality of the county estimates is to some degree related to the amount of financial support being provided by the State cooperator, which is usually the State Department of Agriculture.

The Census of Agriculture, conducted by the Bureau of the Census, has always served as a benchmark for the USDA crop and livestock estimates, and especially for county estimates. The annual State Farm Census, funded by the State cooperator, was also an important benchmark for the county estimates in many States until the late 1970's. Since then it has been discontinued in most States due to lack of funding. The Census of Agriculture has been conducted every five years since 1920 (on a 4 year schedule from 1974 to 1982), providing county, district, State, and U.S. level estimates of most agricultural commodities. Since 1982, the Census has been conducted to coincide with the economic censuses (business, industry, etc.) in years ending in 2 and 7. Census county level estimates are closely watched since the USDA estimates are often based on very few survey returns. At the same time, the quality of the Census numbers are also closely evaluated. The completeness of the Census varies from State to State, county to county, and item to item. Consequently, the Census values are interpreted differently. After the Census values are published, NASS statisticians review their estimates and make revisions as necessary.

Another major component to the county estimate program has been the official USDA State level estimate. Preliminary survey estimates and administrative data are scaled to be additive to the official State total. State estimates are based on more data than each individual county estimate and, in recent years, have been based on probability survey indications. Consequently, the State estimates have always been considered more reliable than any individual county estimate. In addition to being more reliable, State level estimates are usually already published before county estimates are published. For these reasons, county level indications have always been scaled to the State level estimates rather than the State level estimate being the sum of independently derived county estimates.

Over the years, the county estimate surveys have developed into a major source of information for list frame maintenance and updating. Farm operations that had not been contacted within a prescribed time frame can be targeted for sampling for the annual county estimates survey. Currently, NASS has a stated policy that all control data on the list sampling frame (LSF) should be less than five years old (USDA 1991, Policy and Standards Memorandum 14-91). Control

data refers to the historic survey data values or data values from external sources that are stored on the LSF and used for stratification and sample design purposes.

Another policy that is followed in all States is the suppression of any county estimate that would disclose the data of any individual operation, as specified in Policy and Standards Memorandum 12-89 (USDA 1989). This policy preserves the confidentiality of all reports, which is a foundation of voluntary reporting to NASS. Estimates cannot be published if either: (1) the estimate is based on information from fewer than three respondents, or (2) the data for one respondent represents more than 60 percent of the estimate. Exceptions to this rule are only granted when written and signed permission is given by the respondent. Suppressed estimates may be combined with another county as long as the confidential data are not disclosed.

In most States, county estimates are made for all major crop and livestock categories. This may cover 50 - 100 separate commodity items. Estimates for crop items usually include planted acres, harvested acres, yield, production, and value of production for a particular crop year. Some States also publish separate estimates for different cropping practices, such as irrigated and non-irrigated acreages. Livestock estimates include inventory numbers on a particular date, possibly marketings, and inventory value. Each SSO develops their own county estimate publication because they are State funded. These estimates have associated sampling and non-sampling errors. No variances or error information are published for the final county estimates. Mean squared error information is only published for major agricultural items at the U.S. level.

7.3 Estimator Documentation

The new NASS County Estimate System uses a combination of scaling and compositing techniques to provide a county level total estimate for any particular agricultural item. Separate estimates that may be composited together include the previous year official estimate, current year direct expansion and ratio estimates, and other available indications. In recent years, remotely sensed data from satellites have been used to generate county level estimates of crop acreages for selected crops where this technology has been applied (see Chapter 6). County estimates of a ratio such as crop yield, which is the ratio of total crop production to total harvested acres, are dependent on the final estimates of the two items involved. Current year data are collected using primarily a mail survey in the fall of the year with some selected telephone follow-up. State sample sizes can range up to 40,000 with usable record counts around 200 for major items in major counties. However, county estimates for many commodities are based on fewer than 20 sample records.

A key feature of the system is the sample design which involves selecting sampling units from multiple overlapping stratified designs. A separate design is developed for each commodity of interest. The system combines data collected from sampled operations from these different designs such that the selection probabilities are not used in calculating the survey estimates. Another key feature of the system is the coordination of survey contacts from the different

designs to control respondent burden. A third feature is a synthetic scaling of the county estimates in order that they sum to the official U.S. Department of Agriculture State level estimates. A fourth feature is the compositing of the different estimates to provide final county level estimates. Further details on each of these features follow.

7.3.1 Commodity Specific Stratified Designs

The NASS County Estimate Program depends primarily on a large mail survey in the fall of the year with State level sample sizes ranging up to 40,000. Some States conduct two surveys, with an early fall survey covering acreage and production of small grains which are usually harvested by September. Then the late fall survey covers the fall harvested crops and livestock. The sample units are farm operations selected from the NASS list sampling frame in each State.

One of the major goals of the new system is to provide a framework that will ensure adequate representation for each agricultural item of interest. In order to provide adequate county level estimates, major farm operations for each item of interest must be represented appropriately in the sample. This is relatively easy for the major crops in a State since a sample design representing all known operations with cropland would represent any major crop adequately. However, in order to provide adequate representation for rare crop and livestock items, the strategy used in the new system is to develop separate stratified sample designs for each agricultural commodity as needed. The sample design strata for each commodity are based on the positive control data for that particular item. Control data are the historic data values stored on the list sampling frame. Strata boundaries typically coincide with the categories used in the Census of Agriculture publications. Table 1 illustrates the stratified design that might be developed for barley in a particular State, covering all known operations that have positive control data for barley.

Table 1: Example Stratified Design for Barley

Stratum	Population Count	Boundary (acres)
10	2,500	1 - 49
20	1,000	50 - 99
30	400	100 - 299
40	100	300+
Total	4,000	

The major function of the stratified design is to provide a framework to group similar size operations for summarization (see 7.3.3). Initial sampling may occur at the State level within each stratum. Or, different sampling rates may be used at the county level in order to assure

an adequate sample within each county. Different sampling rates by county would typically occur when the commodity frame contains only a few records in a particular county. It may be necessary to sample all records with "probability one" in that county, where a smaller sampling fraction is sufficient in other counties. This most frequently occurs with rare commodities. Another sampling option keys on whether the sampling unit reported in the previous year. If the current to previous year ratio is a primary indication for a State, units that reported in the previous year may be sampled heavily, and other records sampled at a lighter rate.

7.3.2 Coordination of Multiple Samples

The samples selected from the different commodity designs contain many overlapping records. A farming operation could easily be selected from multiple commodity designs. In addition, many of the selected operations may have already provided all or some of the requested information on another current year survey. These other survey data files are used as input to the County Estimate System. The system is designed to identify which records already have provided the requested information and questionnaires are not sent to these operations. Even if an operation has only provided some of the needed data on previous crop specific or livestock specific surveys, it will typically not be recontacted to help control respondent burden. Data items not included on the previous surveys are treated as "missing" in the county estimates expansions. The system also identifies which records are duplicated in multiple designs and in multiple samples. Only one questionnaire is sent to each sampled unit. The same questionnaire, containing all items of interest, is used regardless of the commodity design (barley, corn, hogs, etc.) from which the record was selected. There is usually some telephone follow-up to non-respondents as resources allow. Telephoning may be targeted to provide sufficient data for each commodity. Since a secondary objective of the county estimate survey is to update control data on the list sampling frame, some telephoning may be targeted at operators with missing control data or control data that are more than five years old.

7.3.3 Creation of Survey Indications

The County Estimates System is designed to provide direct expansion and ratio estimates based on sample data collected from the county estimates survey and from sample data collected from other current year surveys. As mentioned previously, the same questionnaire is used for all farm operations selected specifically for the county estimates survey, regardless of the originating commodity design. Consequently, a farm operation selected from the barley design will also be asked to provide data on all other crop and livestock items. All reported data from the county estimates survey and from other surveys are used in providing the survey indications. For each operation, the system identifies the assigned strata from all of the commodity designs. All records will not be included in each commodity design since all records do not have positive control data for all commodities. Records that do not have an original design stratum for a commodity are assigned to "pseudo stratum 99" for summary. Then corn data are summarized in the corresponding stratum from the corn design for each operation and hog data are summarized in the corresponding hog stratum. Since data are used for a particular item from records that were not selected in the original sample design, the direct expansion and ratio

estimates are not based on the selection probabilities. However, this approach probably doubles the number of positive data records available for most survey items compared to just using data records from the original commodity designs. The use of this additional data is a stabilizing factor in providing reliable county level estimates.

Survey estimates from the County Estimate System are provided at State, district, and county levels for each item. Districts are groups of geographically contiguous counties with relatively homogeneous agricultural practices and climate within each district. There are usually four to nine districts per State. The State and district estimates are used primarily in the scaling process described later. The county level survey estimates are the basis for the final published estimates, but they also go through a scaling and compositing process. Population counts and useable record counts are generated by the system at each level. The direct expansion estimate for a particular commodity at any level is represented as follows:

$$\hat{T}_{(E),d} = \sum_{h=1}^{H} \frac{N_{dh}}{n_{dh}} \sum_{i=1}^{n_{dh}} y_{dhi}$$

where: d = domain indicator (State, district, or county)

$\hat{T}_{(E),d}$ = direct expansion estimate for domain d

N_{dh} = population count for stratum h, domain d

n_{dh} = number of usable records for stratum h, domain d

y_{dhi} = reported value for i^{th} record in stratum h, domain d.

Expansion factors (N_{dh}/n_{dh}) are generated for each stratum within each design at the county and district levels as if the sampling occurred at those levels. The n_{dh} refers to the number of usable records in stratum h, domain d, which includes records from multiple sampling designs. Consequently, the quantity N_{dh}/n_{dh} does not represent the actual sampling weight of any survey record. Under this approach, county level estimates are not necessarily additive to the district and district level estimates are not necessarily additive to the State. Table 2 provides an illustration for an example stratum in a State with four counties and two districts (USDA 1992). The county expansions do not add to the district nor do the district expansions add to the State at this stage. In addition, the county, district, and State estimates will typically all be biased downward due to the incompleteness of the list. For most major items, the separate commodity designs will only provide about 80% coverage. So scaling to the official USDA State estimate is absolutely necessary.

Table 2: Examples of Direct Expansion County, District, and State Estimates, for Corn Planted Acres

Stratum	District	County	N_{dh}	n_{dh}	N_{dh}/n_{dh}	$\sum_{i=1}^{n_{dh}} y_{dhi}$	$\hat{T}_{(E),d}$
01	10	003	25	10	2.50	400	1,000
01	10	005	300	30	10.00	700	7,000
01	10	999[a]	325	40	8.13	1,100	8,943
01	20	001	200	20	10.00	200	2,000
01	20	007	75	10	7.50	300	2,250
01	20	999[b]	275	30	9.17	500	4,585
01	99	999[c]	600	70	8.57	1,600	13,712

[a]District 10 values
[b]District 20 values
[c]State level values

In addition to direct expansion estimates, ratio estimates of totals and ratio estimates of ratios are also created. For crop acreage items, possible ratio estimates are based on ratios of current year planted acres to previous year planted acres, harvested to planted acres, planted acres to total cropland acres, and irrigated acres to planted acres. The ratio estimates are generated from usable reports for both the numerator and denominator and are expressed as:

$$\hat{T}_{(R),d} = \left(\frac{\sum_{h=1}^{H} \frac{N_{dh}}{r_{dh}} \sum_{i=1}^{r_{dh}} y_{dhi}}{\sum_{h=1}^{H} \frac{N_{dh}}{r_{dh}} \sum_{i=1}^{r_{dh}} x_{dhi}} \right) X_d$$

$$= \hat{R}_{(R),d} X_d$$

where:

$\hat{T}_{(R),d}$	=	ratio estimate for domain d (State, district, or county)
N_{dh}	=	population count for stratum h, domain d
r_{dh}	=	number of usable reports for ratio in stratum h, domain d
y_{dhi}	=	reported value for i^{th} record in stratum h, domain d
x_{dhi}	=	reported value of auxiliary variable for i^{th} record in stratum h, domain d
X_d	=	value of auxiliary variable for domain d.

Unweighted ratios, calculated without the N_{dh}/r_{dh} stratum weight, may also be used. The actual ratio estimates generated are at the option of the State, dependent on their historic data series and what estimates the State has found to be reliable. The domain value of the auxiliary variable (X_d) is usually not a survey estimate, but a composite estimate based on multiple surveys and other indications (see 7.3.5).

The ratio estimate of the ratio, $\hat{R}_{(R),d}$, provides the initial estimate of such items as crop yield at the county level. If the number of reports is minimal and the estimate is not reasonable, the State office may adjust the estimate based on surrounding counties. For crop yield, these initial estimates are then typically multiplied by the final harvested acres estimates to provide estimates of total crop production. The production estimates are scaled to the official USDA State level estimate. This may necessitate further adjustments to the yield estimates. Consequently, the final yield estimates are really driven by the county level harvested acres estimates and the State level production estimate. The scaling and compositing processes described in the next two sections only apply to yield estimates through their application to the production and harvested acres items.

7.3.4 Scaling of Indications

The first step in the process is to scale the individual county and district "indications" to the official published USDA State level estimate. Typically, "indications" that are scaled include:

1) survey direct expansion estimate
2) survey ratio estimates
3) previous year estimate
4) other indications (remotely sensed acreage estimates, Census of Agriculture, other Administrative data).

Initially, each district indication (direct expansion, ratio, administrative data) is scaled. Suppose there are "M" different indications. The scaling at the district level occurs as follows:

$$\hat{T}_{(SC_m),e} = \frac{\hat{T}_{(m),e}}{\sum_{e=1}^{E} \hat{T}_{(m),e}} \hat{T}_{(O),s}$$

where:
- e = district index ($e=1,\ldots, E$)
- m = indication index ($m=1,\ldots,M$)
- $\hat{T}_{(m),e}$ = value of m^{th} indication, district e
- $\hat{T}_{(O),s}$ = official USDA level estimate, State s
- $\hat{T}_{(SC_m),e}$ = scaled estimate for m^{th} indication, district e.

The resulting district level estimates for each of the "M" indications, $\hat{T}_{(SC_m),e}$ will then sum to the official State estimate. Then, each of the "M" county level indications are scaled to the corresponding scaled district estimate as follows:

$$\hat{T}_{(SC_m),c} = \frac{\hat{T}_{(m),c}}{\sum_{c=1}^{C} \hat{T}_{(m),c}} \hat{T}_{(SC_m),e}$$

where:
- c = county index within district ($c=1,\ldots,C$)
- $\hat{T}_{(m),c}$ = value of m^{th} indication, county c
- $\hat{T}_{(SC_m),c}$ = scaled estimate for m^{th} indication, county c.

The resulting county level estimates for each of the "M" indications (direct expansion, ratio, administrative data) then sum to the district estimate. This scaling process serves as a weighting adjustment to account for any incompleteness in the various indications. As mentioned previously, the NASS list sampling frame typically provides about 80% coverage for major commodities. Administrative data values also have varying degrees of completeness.

7.3.5 Compositing of Scaled Estimates

The next step in the process is to composite together the various scaled estimates to provide satisfactory county and district level estimates. The composite estimates generated for each county and district are represented as follows:

$$\hat{T}_{(COMP),d} = \sum_{m=1}^{M} W_{(m),d} \quad \hat{T}_{(SC_m),d}$$

where: d = domain indicator (district or county)

$W_{(m),d}$ = composite weight for m^{th} indication, domain d

$\hat{T}_{(SC_m),d}$ = m^{th} scaled estimate, domain d

$\hat{T}_{(COMP),d}$ = composite estimate, domain d.

Currently, the composite weights are subjectively set by the statisticians in the State office to provide satisfactory and reliable estimates. They are subject to the conditions that they are non-negative and $\sum_{m=1}^{M} W_{(m),d} = 1$ for each domain. These weights are generally the same for a particular item in all counties and districts, but can be different when unusual survey data (outliers) cause a certain estimate to be unreliable. Typically, the previous year estimate is given some weight, which helps stabilize the composited value. This compositing is a form of an indirect estimator across time. The composite estimate borrows strength from previous estimates for the same small area domain.

Rounding rules are incorporated into this process so that the final estimates are the published values. These estimates are reviewed by statisticians in the State office for reasonableness based on their knowledge of the location and general size of the largest operations in the State for each commodity. The estimates must exceed minimum levels and not exceed maximum levels provided by reliable administrative data sources. For example, a State may check that the sum of major crop acreages does not exceed the Census of Agriculture total cropland acres for each county. If estimates are not reasonable, the data will be more closely examined for outliers and insufficient sample sizes. Different weights for the compositing process or adjustments to the outlier indications may be needed to provide the final published county level estimates.

7.4 Evaluation Practices

Each NASS State Statistical Office has taken a major responsibility in developing and evaluating procedures that help provide reliable county estimates in an efficient manner in their State. The automony in each program is primarily a function of the funding received from the different State cooperators. The recently developed NASS County Estimates System provides a common framework for producing county estimates within each State. However, the actual sampling and estimation methods still vary to some degree. Some documented research has been conducted over the years to evaluate different procedures. But the Census of Agriculture continues to be the major evaluation tool.

Ford, Bond, and Carter (1983) examined a model-based approach that estimates the percentages of the total USDA State level crop acreage allocated to each county and district. A composite estimator was used to estimate North Carolina county and district level percentages for 1981. The composite included the estimated percentages based on direct estimates of crop acreage from two separate probability crop acreage surveys and the estimated percentage from a simple linear regression on the percentages over time (1972-1980). The time trend component tended to have much larger weights than the survey components in the composite. Results demonstrated that indications from this procedure were more stable and closer to published values than indications from either of the separate crop acreage surveys. Since the published values tended to follow the composite which is strongly influenced by the time trend model, the results suggested that NASS statisticians were already informally following the linear time trends in setting the county estimates, and consequently, these procedures were never implemented.

The major evaluation process of the NASS county estimates continues to be the review against the Census of Agriculture numbers every five years. NASS statisticians are actually involved in the review of the Census numbers before they are published to resolve any major discrepancies based on their knowledge of the State's agriculture and their county estimates for the comparable year. After this review, the Census data are resummarized and published. NASS State offices then go through the "Census Review" process. The county estimates series during the last five years is reviewed for consistency with the Census numbers and any necessary changes are made. This is a subjective process, and handled differently in each State. Other available check data may also be used in the revision process, such as data from livestock or crop associations.

7.5 Current Problems and Activities

Currently, research is being conducted on general small area estimation methodology through a cooperative agreement with the Department of Statistics, The Ohio State University. In addition, research needs are being identified by the developers and users of the county estimates system as they gain experience with the programs.

The methodology research with The Ohio State University has focused on statistical procedures for non-probability survey data with the constraint that the sum of the county estimates must sum to the official NASS State estimate. Initial research considered a multiple regression estimator for obtaining county estimates of wheat production in Kansas (Stasny, Goel, and Rumsey 1991). The regression model is of the form:

$$Y_{ci} = \beta_o + \beta_1 X_{ci1} + \ldots + \beta_j X_{cij} + \epsilon_{ci}$$

where: Y_{ci} = value of dependent variable for the i^{th} record, county c
X_{cij} = value of j^{th} independent variable for the i^{th} record, county c
β_j = j^{th} regression parameter.

Fitted model parameters are obtained from the survey data set of individual farm records. The county total for the c^{th} county may then be estimated as:

$$\hat{T}_{(REG),c} = \sum_{i=1}^{N_c} \left[\hat{\beta}_0 + \hat{\beta}_1 x_{ci1} + \hat{\beta}_2 x_{ci2} + \ldots + \hat{\beta}_j x_{cij}\right]$$
$$= \hat{\beta}_o N_c + \hat{\beta}_1 x_{c.1} + \hat{\beta}_2 x_{c.2} + \ldots + \hat{\beta}_j x_{c.j}$$

where: N_c = number of farms, county c
$x_{c.j}$ = total of the j^{th} independent variable, county c.

The county total can be estimated if county level values are known for all independent variables in the regression model. In the initial analysis of wheat production county estimates, the independent variables were planted acres of wheat and a district indicator which accounted for differences in yield for different areas of the State. Since production is closely related to planted acres and yield, these seem to be reasonable independent variables. It may be more difficult to identify independent variables for estimated planted acreage. These indications would then be scaled by some method. Evaluation of the regression estimator using simulated data indicated that it generally produced more precise indications than a direct expansion of sample data within the respective county. Analysis also indicated that a constant proportional scaling method worked just as well as more sophisticated methods involving the sum of squared differences or the sum of squared relative differences between the county indications and the final estimates. Future research is planned to consider other variables and other small-area estimators.

Research is also being conducted through the cooperative agreement with The Ohio State University on a synthetic estimator for counties that have zero or only a few positive records for a commodity. In spite of the improved sampling capabilities of the new system, this situation still occurs. Approaches that share information from neighboring counties and across States are being investigated.

Also, there is a need to evaluate survey estimates (direct expansion and ratio) generated on a probability basis. The current program combines data from different sampling designs in such a manner that the actual selection probabilities are not used. This procedure was chosen because it is easy to implement. Also, it makes use of all data collected. As stated previously, the same questionnaire is used for all sample units, regardless of the original sampling design. Consequently, barley data are collected from the barley design, from the corn design, from the hog design, etc.. An alternative approach that also makes use of all data collected is to first generate, for each commodity, probability based estimates independently from each design. That is, generate separate barley acreage estimates from the barley design, from the corn design, from the hog design, etc., using the appropriate selection probabilities. These estimates can then be combined to produce an unbiased (or nearly unbiased) estimator with less variance than an estimate based on a single design. Analysis is currently being conducted to evaluate alternative post-stratification and composite estimation strategies.

As has been described, the NASS County Estimates System has evolved over the past 70 years. The published estimates continue to be a relied upon source of essential information for many data users in the agricultural community. However, there is a constant concern about the quality of the estimates and methodological improvements that could be made. The program requires a major commitment of resources for the editing, summarization, and publishing of the data. These issues will continue to be a focus of future research as resources allow.

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