Appendix C.
Statistical Methodology

THE CENSUS MAIL LIST AND SCREENER PHASE

The National Agricultural Statistics Service (NASS) maintains a list of farmers and ranchers from which the census mail list (CML) is compiled. The goal is to build as complete a list as possible of agricultural places that produce and sell, or would normally sell, $1,000 or more of agricultural products per year. This is the same list used to define sampling populations for NASS surveys conducted for the agricultural estimates program. Each record on the list includes name, address, and telephone number plus additional information used to efficiently sample and administer the NASS census of agriculture and its agricultural estimates programs.

NASS builds and improves the list on an ongoing basis by obtaining outside source lists. Sources include state and federal government lists, producer association lists, seed grower lists, pesticide applicator lists, veterinarian lists, marketing association lists, and a variety of other agriculture-related lists. NASS occasionally obtains special commodity lists to address specific list deficiencies. In 2000, NASS began an intensive push to increase list coverage in preparation for the census.

Most names on a newly acquired list are already on the list sampling frame. Those found on the list are set aside. Those not found are treated as potential farms until NASS can confirm their existence as a qualifying farm. Field offices routinely contact these potential farms to determine their status, however, the increased pre-census list building activity generated much more followup work.

Beginning in April 2002, NASS conducted the 2002 Farm Identification Survey to screen 591,288 potential farms before placing them on the CML. These records were mailed a one-page report form and a nonresponse followup mailing was made in May 2002. A second mailing to a group of 568,692 additional potential farm records was conducted in mid-July 2002. There was no followup mailing. The entire screener phase confirmed 349,664 qualifying farms that were added to the CML. A total of 282,901 names were confirmed as out of scope and were dropped from the list. Names returned as undeliverable-as-addressed totaled 92,203 and they were excluded from further census mailings. The remaining 435,212 names did not respond and were mailed census forms although they were not added to the CML as active farms.

During the spring and summer of 2002, measures were taken to improve name and address quality. Checks were made to detect and remove duplication both within states and across states. List addresses were processed through the National Change of Address registry and the Locatable Address Conversion System to ensure they were correct and complete. Records on the mail list with missing or invalid phone numbers were matched against a nationally available telephone database to obtain as many phone numbers as possible.

Records requiring special handling for census data collection or for analysis and summarization were identified. These were mostly farms considered unique because of their size or because they produced specialty commodities.

The official CML was established on September 1, 2002. The list contained 2,841,788 records. There were 1,839,533 records that were thought to meet the NASS farm definition and 1,002,255 potential farm records.

CENSUS SAMPLE DESIGN

All name and address records on the final CML received a 2002 Census of Agriculture report form. Two different types of census report forms, sample and

nonsample, were used to collect data. Sections 1 through 16 and 22 through 25 of the sample form were identical to sections on the nonsample census form. Sections 17 through 21 of the sample form contained additional questions on usage of fertilizers and chemicals, farm production expenditures, value of machinery and equipment, value of land and buildings, and hired workers. There were 12 regional versions of the nonsample form and 13 regional versions of the sample form with listings of crops varying by region.

The sample form was mailed to all mail list records in Alaska and Rhode Island and to a sample of records in other states. Mail list records were selected into the sample with certainty if they (1) were expected to have large total value of agricultural products sold or large acreage, (2) were in a county with less than 100 farms in 1997, or (3) had other special characteristics (e.g., abnormal farms such as institutional farms, experimental and research farms, Indian reservations, etc.). Mail list records in counties containing 100 to 199 farms in 1997 were systematically sampled at a rate of 1 in 2; counties containing 200 to 299 farms in 1997 were systematically sampled at a rate of 1 in 4; counties containing 300 to 399 farms in 1997 were systematically sampled at a rate of 1 in 6; and counties containing 400 or more farms in 1997 were systematically sampled at a rate of 1 in 8. The mail list records not chosen to receive the sample form received the nonsample form. This differential sampling scheme was used to provide reliable data for the sample sections of the report form for all counties.

The regional report form versions and the sampling scheme were used to provide reliable data for a large number of items/commodities at the county level, while reducing response burden.

EDITING DATA AND IMPUTING FOR ITEM NONRESPONSE

The mailing label on all forms returned to the National Processing Center (NPC) were scanned using bar code readers to capture identifiers and for check-in purposes. Forms determined to represent qualifying, in-scope farms were submitted for imaging. A snapshot was taken of each page of every report form and optical mark recognition (OMR) and intelligent character recognition (ICR) techniques were used to capture reported data from the images. The ICR engine determined a confidence level for every cell read. Any cell with a confidence level below a prescribed value was referred to analysts to review and correct from the image, when necessary. The images and the captured data were transferred to NASS on a flow basis. Data collected by telephone were captured using computer-assisted telephone interview software.

Captured data were processed through a format program. This program verified that record identifiers were valid and checked the basic integrity of the data fields. Rejected records were referred to analysts for correction. Accepted records were posted to the database.

All 2002 census data were passed through a complex computer edit. Data were batched by state for submission to the computer edit. The edit determined whether a reporting operation met the minimum criteria to be counted as a farm in the census. Operations failing to meet the minimum criteria were referred to analysts for verification. The edit examined each report for reasonableness and completeness and determined whether to accept, delete, impute (supply), or alter the reported value for each data record item.

Whenever possible, imputations, deletions, and changes made by the editing system were based on related data on the respondent's report form. For some items, such as operator characteristics, available data for that farm from the previous census were used. Values reported on previous NASS surveys were used, where applicable.

When these and similar methods were not available and values had to be supplied, the imputation process used information reported for another farm operation in the same state or in a neighboring state with characteristics similar to those of the farm operation with incomplete data. For example, a farm operation that reported acres of corn harvested, but did not report bushels of corn harvested, was assigned the same bushels of corn per acre harvested as that of another farm from that region having similar characteristics and reporting an acceptable yield. Assigned values for one operation could come from more than one respondent because imputation for missing items in each section of the report form was conducted separately.

Each execution of the computer edit consisted of records from only one state. Successfully edited records were made available as potential "donors," to supply values needed in subsequent imputations. These records were accumulated into pools of donors according to geographic location, so that each pool might be used during the computer edit of any reports from appropriate states. When imputation was required, a report's collective imputation needs for a section were used to identify a group of matching variables for the report which contained acceptable data relating to the missing items. For example, acres of corn harvested would be a matching variable for bushels of corn harvested, in consideration of the high correlation between the two items.

Similarity to the report being edited was evaluated for the matching variables for all farms in the appropriate donor pool. Values were imputed from the donor report considered most similar, referred to in this context as the "nearest neighbor" to the report being edited. Similarity between the edited record and a donor was calculated as the Euclidean distance between their selected matching variables. As part of the distance computation, the values of the matching variables were normalized to have the same variance within each donor pool. Latitude and longitude were consistently included in all imputation requests as matching variables, so that geographic proximity played a role in all donor selections.

Imputation conformed to logic provided by the complex edit. When appropriate, only donors able to contribute a nonzero imputed value were considered. For a farm reporting harvested corn acreage, for example, imputed bushels of corn harvested would be taken only from farms with harvested corn. In addition, imputed values were often adjusted. In some cases, acceptable data in another field of the edited report were used to establish a ratio between the edited report and the donor report. This proportion was applied to the imputed value as a scale factor. In the corn example, total bushels of corn from the donor would be scaled by the ratio of the acres of corn in the edited report to those in the donor report.

To maintain consistency with the complex edit, the imputed values in most sections of the report were tested to ensure they satisfied critical relationships among items within the section. If any of these constraints were not met, alternative donors were considered in order of their similarity to the edited report, until all the constraints for the module were satisfied.

In some cases, nearest-neighbor imputation was not possible. The requirement of a positive imputed value might rule out all available donors, resulting in an imputation failure. However, if some members of the donor pool were found to satisfy this requirement, then as many as 25 nearest neighbors were given further consideration. But if none of the candidate donors could provide qualifying data, the result was also noted as an imputation failure. Processing of records that encountered these imputation failures was suspended at the section where the failure occurred. These records were made available for analyst review and later reconsidered by the automated edit as a followup to corrective actions taken by the analyst.

The donor pool for each region was frequently updated with records from its area which had completed the editing process. As records were added to the donor pool, the records became available to donate values to incomplete reports subsequently edited for that region. Prior to editing, all donor pools were empty and no donors were available. Initial donor pools were created by giving special treatment to the first batches of data received from each state. Similar to the way that imputation failures were resolved through analyst review of the reports, early reports from initial batches were reviewed and adjusted manually by teams of analysts. This process was employed until each donor pool became self-sufficient in consistently providing imputed values for its region through the automated nearest-neighbor selection process.

To streamline editing once they had reached a mature stage in their growth, donor pools for some regions were not expanded in size beyond a chosen plateau. This provided assurance that computer edits would not exceed a reasonable processing time for nearest-neighbor searches. Although their size was limited, these donor pools did not become static. They were regularly recreated with representative samples of all records available from their regions. Within a given region, all successfully edited sample form records were included in the appropriate donor pool. Successfully edited nonsample form records were ordered by farm size and sales volume for a given

region, and then systematically sampled. Every "ith" record from the nonsample form list was joined to the complete list of sample forms for its region to form a refreshed donor pool. The steady renewal of donor pools for regions with large numbers of records assured a more diverse selection of donors over time.

All records with data changes were resubmitted to the edit to verify that acceptable corrections were made. Records with imputation failures were referred to an analyst for resolution. Corrected data were posted and the record was re-edited.

The complex edit ensured the full internal consistency of the record. Analysts were provided an additional set of tools to review record-level data across farms. These examinations detected extreme outliers or unique data distribution patterns that were possibly a result of reporting, recording, or handling errors. Potential problems were researched and, when necessary, corrections were made and the record re-edited.

NONRESPONSE AND SAMPLE ESTIMATION

Statistical estimation procedures were used to account for whole farm nonresponse and sample data collection. The procedures for nonresponse were necessary because some farm operators did not respond to the census despite numerous attempts to contact them. Statistical estimates for sample-form-only data items had to be calculated since, by design, the data were not collected from every farm. Nonresponse and sample estimation procedures were not applied in Alaska and Rhode Island because all farms received the sample form and data were collected from all farms.

Treatment of Farms Selected for the Screener Phase

The screener phase and followup strategies resulted in several possible outcomes depending on whether the screener name responded and was in or out of scope. Each of these outcomes was handled differently to adjust for nonresponse.

Names responding to the screener as out of scope (nonfarms) were excluded from the CML. If the respondent answered the screener as in scope, the respondent was added to the CML and received a census form. If this in-scope screener respondent answered the census form, the operation's report was eligible to be used to help account for nonrespondents to the census. If the in-scope screener respondent failed to respond to the census form, that operation's data were accounted for by census respondents.

Records for operations that did not respond to any of the three screener mailings were not considered to be part of the CML, but they were sent a census form. Screener nonrespondents that responded as in-scope operations on the census were assigned a fixed nonresponse weight of 1 for census tabulations. Screener nonrespondents that failed to respond to the census form were treated in summarization as if they never existed on a mail list.

Whole Farm Nonresponse Estimation

Whole farm nonresponse to the census occurred when no data were received from an operation on the CML. Records deemed to represent either a large farm, as defined by the total value of production or acreage, or a unique farm operation received intensive telephone or personal followup during census processing to obtain a response. If these attempts failed, data were imputed for the record. These large and/or unique records were designated as "Must" records and were assigned a fixed nonresponse weight of 1, meaning their data were not used for nonresponse adjustment. Screener respondents with reported sales above a certain level automatically became Must records.

During mail list development, the field offices, in an effort to reduce respondent burden, identified operations that participated in multiple NASS surveys, and those that had special reporting relationships with an enumerator. The records for these operations were "Tagged." The field offices assumed full responsibility for the data collection for any Tagged operations, including imputing data for them if a response was not obtained. Tagged records became Must records. They had a nonresponse weight of 1 and the reports were not used for nonresponse adjustments.

Whole farm nonresponse that occurred within the remaining universe of records, called non-Musts, was accounted for by a statistical weighting procedure. All

responding non-Musts in a state were put into mutually exclusive weighting groups based on their size and county as recorded on the CML database. Statistical models were used to estimate the number of nonresponse farms that were in scope for each weighting group. The weights of the responding farms in each weighting group were increased to account for nonresponding farms in that group.

Throughout the data collection period, changes and additions were made to the CML. Records added after the initial CML was created on September 1, 2002 were designated as new adds, treated like screener nonrespondents, and given a nonresponse weight of 1. New adds responding as in-scope records to the census were subsequently subtracted from the measurement of undercoverage. New adds linked to operations originally on the CML were not considered new adds. New adds occurred any time after the CML creation and before final weighting in February, 2004.

Some operators were sent more than one census form. These operators were required to fill out a separate form for each operation. Also, an operator may have had an operation for which a census form was not received, but the existence of which was noted on the form of the known operation. That operator was sent a new census form or enumerated by telephone to obtain data for that previously unknown operation. If a response was obtained for the previously unknown operation, the nonresponse weight for the new record was set equal to the nonresponse weight for the original operation reporting its existence. If no response was obtained for the previously unknown operation, it was treated as out of scope.

Some large farms operating in more than one county were treated as distinct county-specific operations to more accurately allocate data to counties. Similarly, large farms operating in more than one state were treated as distinct state-specific operations. Split add records were created for these operations and they were assigned the same nonresponse weight as the original CML operation. Controls ensured the calculated and nonresponse weights never exceeded 2. The nonresponse weights were systematically rounded to integers and an integerized weight of either 1 or 2 was assigned to each record. The integerization process eliminated any impact rounding would have had on census farm counts and totals in each county and in cross tabulations.

Tables A and C quantify the effect of the nonresponse estimation procedures on selected census data items. These tables contain percentages of the census aggregates that were contributed by nonresponse adjustments. As noted earlier, names included in the screener sample that never responded were treated as if they never existed on a mail list. There was no such reallocation in Hawaii because records in that state were not adjusted to account for coverage errors.

The estimates provided in Tables A and C do not reflect the effect of item nonresponse on individual census data items. The effect of this item nonresponse is discussed in the ‘‘Nonmeasurable Census Error’’ section.

Sample Estimation

All Must records were preselected to receive the census sample form. Non-Must records were sampled to determine which would receive the sample form and which the nonsample form. All records in some small counties automatically received the census sample form but these records were not necessarily Must records. Nonresponse adjustment was allowed for the non-Musts.

Weights applied to the sample items appearing on the sample form only (Sections 17 through 21) were calculated by multiplying the farm’s coverage-adjusted weight, which is described later, by the sample factor (e.g, 6 for a farm sampled with a 1-in-6 rate, 1 for a Must). An adjustment was made that ensured the number of farms operating in a county as estimated from the sample matched the number estimated from the full census. Before computing published tabulations based on the sample, each record’s sample weight was integerized to eliminate the impact rounding would have had on census farm counts and totals.

Operators with more than one operation were sampled as one record and received the same census form for each operation. Operations added after sampling were treated differently depending on whether or not the record was linked to a record on the original CML. Added operations that linked to a record on the original CML were mailed the same census form as the

original CML operation. Added operations that were **not** linked to a record on the original CML were mailed the sample form.

MEASURABLE CENSUS ERROR

The root mean squared error of an estimated data item from the census provides a measure of the error a field office associated with completing a census. It measures the variation in the value of that estimated data item based on all possible outcomes of the census collection, including variants as to who was on the census list, who returned a census form, and who was selected to fill out the sample form.

Table B presents the fully adjusted total with the root mean squared error for selected items. The relative root mean squared error is obtained by dividing the root mean squared error by the value of the estimate and then multiplying by 100. The table also includes the percent contribution to the mean squared error (the square of the root mean squared error) from nonresponse adjustment and sampling. Mean squared errors for Hawaii are entirely due to nonresponse adjustment.

Nonsampling error due to mail list incompleteness and duplication as well as misclassification of records on the mail list is called coverage error. The section titled "Classification Error Study" addresses attempts to assess, at least qualitatively, the impact of classification error on the census results.

NONMEASURABLE CENSUS ERROR

The accuracy of the census counts is affected jointly by the measurable errors described in the previous section and by nonmeasurable errors (nonmeasurable in the sense of not being included in root mean squared error estimates). Extensive efforts were made to compile a complete and accurate mail list for the census, to design an understandable report form with instructions, and to minimize processing errors through the use of quality control measures. Despite these efforts, nonmeasurable errors are inevitable and arise from many sources, including respondent or enumerator error, incorrect data capture, editing, and imputing for missing data. These errors are discussed in this section.

Respondent and Enumerator Error

Incorrect or incomplete responses to the census report form or to the questions posed by an enumerator can introduce error into the census data. To reduce reporting error, detailed instructions for completing the report form were provided to each respondent. Questions were phrased as clearly as possible based on previous tests of the report form. Computer-assisted telephone interviewing software included immediate integrity checks of recorded responses so suspect data could be verified or corrected. In addition, each respondent's answers were checked for completeness and consistency by the complex edit and imputation system.

Item Nonresponse

As information flowed from data collection to tabulation, various types of item nonresponses were identified on the census report forms. Nonresponse to particular questions on the form that logically should have been present created a type of nonsampling error in both complete count and sample count data. In this case, information from a similar farm was used to impute for these missing data items. The resulting data may have been biased if the characteristics of the nonreporting farms were different from those of reporting farms for those items. The section titled "Editing Data and Imputing for Item Nonresponse" provides a detailed explanation of item imputation procedures.

Processing Error

All phases of processing for each census report form were potential sources of nonsampling error. An automated check-in procedure recorded that the report had been returned and excluded it from further followup mailings. Approximately one-third of the mail returns were reviewed to resolve questions dealing with multiple reports, respondent remarks, or no reported data. The remaining mail returns (about two-thirds), along with some of the reviewed cases containing farm data, were batched and sent directly to imaging and data capture. Data were transmitted, formatted, and run through the complex edit and imputation system to ensure within record consistency. About one-fifth of all forms edited were clerically reviewed for inconsistencies, omissions, or

questionable values. While reviewing these forms, staff determined if the action taken by the computer edit and imputation system was correct. Additional analysis tools were used to examine data across records for distributional irregularities and extreme values. Edited records were tabulated to the county level. Each county was reviewed and, when necessary, individual records were corrected prior to publication.

Developing accurate processing methods is complicated by the complex structure of agriculture. Among the complexities are the many places to be included, the variety of arrangements under which farms are operated, the continuing changes in the relationship of operators to the farm operated, the expiration of leases and the initiation or renewal of leases, the problem of obtaining a complete list of agriculture operations, the difficulty of contacting and identifying some types of contractor/contractee relationships, the operator's absence from the farm during the data collection period, and the operator's opinion that part or all of the operation does not qualify and should not be included in the census. During data collection and processing of the census, all operations underwent a number of quality control checks to ensure results were as accurate as possible.

Table A. **Summary of State Nonresponse Adjustments: 2002**

[For meaning of abbreviations and symbols, see introductory text]

Item	Total	Percent from nonresponse adjustment
Farms ..... number	5,398	6.9
Land in farms ..... acres	1,300,499	0.8
Farms by size:		
1 to 9 ..... farms	3,440	7.4
acres	12,110	7.2
10 to 49 ..... farms	1,309	6.7
acres	26,972	6.8
50 to 179 ..... farms	335	5.7
acres	29,979	5.6
180 to 499 ..... farms	146	5.5
acres	42,911	6.1
500 to 999 ..... farms	61	4.9
acres	40,307	4.9
1,000 to 1,999 ..... farms	41	2.4
acres	56,159	2.8
2,000 or more ..... farms	66	0.0
acres	1,092,061	0.0
Market value of agricultural products sold $1,000	533,423	1.1
Farms by value of sales:		
Less than $1,000 ..... farms	661	6.5
$1,000	165	6.4
$1,000 to $2,499 ..... farms	746	7.6
$1,000	1,207	7.7
$2,500 to $4,999 ..... farms	714	6.9
$1,000	2,549	6.7
$5,000 to $9,999 ..... farms	916	9.1
$1,000	6,366	9.1
$10,000 to $19,999 ..... farms	807	7.3
$1,000	11,035	7.4
$20,000 to $24,999 ..... farms	249	7.6
1,000	5,346	7.8
$25,000 to $39,999 ..... farms	341	7.6
$1,000	10,519	7.7
$40,000 to $49,999 ..... farms	165	6.1
$1,000	7,109	5.9
$50,000 to $99,999 ..... farms	314	6.1
$1,000	20,907	5.8
$100,000 to $249,999 ..... farms	249	2.8
$1,000	37,734	2.7
$250,000 to $499,999 ..... farms	103	1.0
$1,000	36,198	1.0
$500,000 to $999,999 ..... farms	62	0.0
$1,000	42,801	0.0
$1,000,000 or more ..... farms	71	0.0
$1,000	351,486	0.0
Farms by type of organization:		
Family or individual ..... farms	4,629	7.4
acres	329,179	2.8
Partnership ..... farms	225	4.9
acres	116,737	0.4
Corporation:		
Family held ..... farms	392	4.8
acres	344,755	0.2
Other than family held ..... farms	80	2.5
acres	368,784	(Z)
Other - cooperative, estate or trust, institutional, etc ..... farms	72	0.0
acres	141,044	0.0
Tenure:		
Full owners ..... farms	3,202	7.0
acres	246,865	0.9
Tenure - Con.		
Part owners ..... farms	589	7.0
acres	(D)	(D)
Tenants ..... farms	1,607	6.7
acres	(D)	(D)
Principal operator characteristics by-		
Sex of operator:		
Male ..... farms	4,338	7.1
acres	1,189,541	0.8
Female ..... farms	1,060	6.1
acres	110,958	1.2
Primary occupation:		
Farming ..... farms	3,125	6.6
Other ..... farms	2,273	7.3
Spanish, Hispanic, or Latino origin (see text) ..... farms	241	8.3
acres	(D)	(D)
Race:		
White ..... farms	2,148	7.2
acres	963,520	0.5
Black or African American ..... farms	12	16.7
acres	70	17.1
American Indian or Alaska Native ..... farms	30	6.7
acres	1,270	0.7
Native Hawaiian or Other Pacific Islander ..... farms	424	8.0
acres	110,389	1.8
Asian ..... farms	2,090	6.7
acres	122,799	1.1
More than one race reported ..... farms	694	5.8
acres	102,451	1.8
Reporting primary occupation as farming by age group:		
Under 25 years ..... farms	7	0.0
25 to 34 years ..... farms	82	6.1
35 to 44 years ..... farms	382	8.1
45 to 54 years ..... farms	927	6.0
55 to 64 years ..... farms	742	6.2
65 years and over ..... farms	985	7.0
Reporting primary occupation as other than farming by age group:		
Under 25 years ..... farms	7	14.3
25 to 34 years ..... farms	72	5.6
35 to 44 years ..... farms	338	5.6
45 to 54 years ..... farms	845	7.1
55 to 64 years ..... farms	558	8.1
65 years and over ..... farms	453	8.2
All operators by age group [1]:		
Under 25 years ..... farms	84	6.0
25 to 34 years ..... farms	304	3.9
35 to 44 years ..... farms	1,194	6.5
45 to 54 years ..... farms	2,541	6.5
55 to 64 years ..... farms	1,801	7.0
65 to 74 years ..... farms	1,138	8.2
75 years and over ..... farms	753	6.6

[1] Data were collected for a maximum of three operators per farm.

Table B. **Reliability Estimates of State Totals: 2002**

[For meaning of abbreviations and symbols, see introductory text]

Item		Total	Root mean squared error (RMSE)	Relative RMSE (percent)
Farms	number	5,398	27	0.5
Land in farms	acres	1,300,499	3,140	0.2
Farms by size:				
1 to 9	farms	3,440	23	0.7
	acres	12,110	94	0.8
10 to 49	farms	1,309	13	1.0
	acres	26,972	308	1.1
50 to 179	farms	335	6	1.8
	acres	29,979	576	1.9
180 to 499	farms	146	4	2.7
	acres	42,911	1,350	3.1
500 to 999	farms	61	2	4.0
	acres	40,307	1,651	4.1
1,000 to 1,999	farms	41	1	3.4
	acres	56,159	2,208	3.9
2,000 or more	farms	66	0	0.0
	acres	1,092,061	0	0.0
Market value of agricultural products sold	$1,000	533,423	954	0.2
Farms by value of sales:				
Less than $1,000	farms	661	9	1.4
	$1,000	165	4	2.3
$1,000 to $2,499	farms	746	11	1.4
	$1,000	1,207	18	1.5
$2,500 to $4,999	farms	714	10	1.4
	$1,000	2,549	35	1.4
$5,000 to $9,999	farms	916	13	1.4
	$1,000	6,366	92	1.4
$10,000 to $19,999	farms	807	11	1.3
	$1,000	11,035	154	1.4
$20,000 to $24,999	farms	249	6	2.5
	1,000	5,346	135	2.5
$25,000 to $39,999	farms	341	7	2.1
	$1,000	10,519	226	2.1
$40,000 to $49,999	farms	165	4	2.7
	$1,000	7,109	187	2.6
$50,000 to $99,999	farms	314	6	2.0
	$1,000	20,907	398	1.9
$100,000 to $249,999	farms	249	4	1.5
	$1,000	37,734	569	1.5
$250,000 to $499,999	farms	103	1	1.4
	$1,000	36,198	537	1.5
$500,000 to $999,999	farms	62	0	0.0
	$1,000	42,801	0	0.0
$1,000,000 or more	farms	71	0	0.0
	$1,000	351,486	0	0.0
Farms by type of organization:				
Family or individual	farms	4,629	26	0.6
	acres	329,179	3,032	0.9
Partnership	farms	225	5	2.1
	acres	116,737	472	0.4
Corporation:				
Family held	farms	392	6	1.6
	acres	344,755	666	0.2
Other than family held	farms	80	2	2.5
	acres	368,784	12	(Z)
Other - cooperative, estate or trust, institutional, etc	farms	72	0	0.0
	acres	141,044	0	0.0
Tenure:				
Full owners	farms	3,202	21	0.7
	acres	246,865	472	0.2
Part owners	farms	589	9	1.5
	acres	(D)	(D)	(D)
Tenants	farms	1,607	15	0.9
	acres	(D)	(D)	(D)
Principal operator characteristics by-				
Sex of operator:				
Male	farms	4,338	25	0.6
	acres	1,189,541	3,082	0.3
Female	farms	1,060	11	1.1
	acres	110,958	602	0.5
Primary occupation:				
Farming	farms	3,125	20	0.7
Other	farms	2,273	18	0.8
Spanish, Hispanic, or Latino origin (see text)	farms	241	6	2.6
	acres	(D)	(D)	(D)
Race:				
White	farms	2,148	18	0.8
	acres	963,520	2,683	0.3
Black or African American	farms	12	2	16.7
	acres	70	13	19.2
American Indian or Alaska Native	farms	30	2	6.7
	acres	1,270	9	0.7
Native Hawaiian or Other Pacific Islander	farms	424	8	1.9
	acres	110,389	1,118	1.0

See footnote(s) at end of table.

--continued

Table B. **Reliability Estimates of State Totals: 2002** - Con.

[For meaning of abbreviations and symbols, see introductory text]

Item		Total	Root mean squared error (RMSE)	Relative RMSE (percent)
Principal operator characteristics by- Con.				
Race - Con.				
Asian	farms	2,090	17	0.8
	acres	122,799	337	0.3
More than one race reported	farms	694	9	1.3
	acres	102,451	1,137	1.1
Reporting primary occupation as farming by age group:				
Under 25 years	farms	7	0	0.0
25 to 34 years	farms	82	3	3.9
35 to 44 years	farms	382	8	2.1
45 to 54 years	farms	927	11	1.1
55 to 64 years	farms	742	10	1.3
65 years and over	farms	985	12	1.2
Reporting primary occupation as other than farming by age group:				
Under 25 years	farms	7	1	20.2
25 to 34 years	farms	72	3	3.9
35 to 44 years	farms	338	6	1.8
45 to 54 years	farms	845	11	1.3
55 to 64 years	farms	558	9	1.7
65 years and over	farms	453	9	1.9
All operators by age group [1]:				
Under 25 years	farms	84	3	3.8
25 to 34 years	farms	304	5	1.6
35 to 44 years	farms	1,194	12	1.0
45 to 54 years	farms	2,541	18	0.7
55 to 64 years	farms	1,801	16	0.9
65 to 74 years	farms	1,138	14	1.2
75 years and over	farms	753	10	1.3
Net cash farm income of operations (see text) [2]:				
Farms with gains of [3] -				
Less than $1,000	farms	400	55	13.6
	$1,000	202	32	16.1
$1,000 to $4,999	farms	1,022	89	8.7
	$1,000	2,744	261	9.5
$5,000 to $9,999	farms	575	65	11.3
	$1,000	4,125	467	11.3
$10,000 to $24,999	farms	587	61	10.5
	$1,000	9,146	968	10.6
$25,000 to $49,999	farms	311	42	13.4
	$1,000	11,146	1,487	13.3
$50,000 or more	farms	383	31	8.0
	$1,000	110,284	1,993	1.8
Farms with losses of -				
Less than $1,000	farms	370	54	14.5
	$1,000	158	28	17.5
$1,000 to $4,999	farms	752	74	9.8
	$1,000	1,980	216	10.9
$5,000 to $9,999	farms	329	50	15.1
	$1,000	2,337	358	15.3
$10,000 to $24,999	farms	404	52	12.8
	$1,000	6,439	844	13.1
$25,000 to $49,999	farms	159	31	19.6
	$1,000	5,518	1,093	19.8
$50,000 or more	farms	146	23	15.9
	$1,000	23,069	1,882	8.2

[1] Data were collected for a maximum of three operators per farm.
[2] Data are based on a sample of farms.
[3] Farms with zero net cash income are included as farms with gains of less than $1,000.

Table C. **Summary of Nonresponse Adjustments by County: 2002**

[For meaning of abbreviations and symbols, see introductory text]

Geographic area	All farms		Land in farms		Sales	
	Total (number)	Nonresponse adjustment (percent)	Total (acres)	Nonresponse adjustment (percent)	Total ($1,000)	Nonresponse adjustment (percent)
STATE TOTAL						
Hawaii	5,398	6.9	1,300,499	0.8	533,423	1.1
COUNTIES						
Hawaii	3,216	6.0	821,276	0.6	187,736	1.7
Honolulu	794	7.1	70,705	1.3	179,321	0.5
Kauai	565	6.5	151,828	1.5	41,855	0.8
Maui	823	10.7	256,690	1.0	124,511	1.3