stage are possible when these data are combined with flood-loss data. It indicates further that airphoto-interpretation techniques and sample cross-section data are useful tools in situations in which stage-area maps and other necessary hydrological data are lacking.

The general approach used in the test case has been accepted for use in the evaluation of agricultural flood damages on the main stem and major tributaries of the Potomac River. The procedure to be followed involves four steps: (1) A sample of half-mile river segments will be selected from each designated damage reach; (2) the inundation line of the largest flood of record will be drawn on airphotos and the total flood-plain acreage determined by dot grid count; (3) a field crew will survey a single cross-section in each of the sample river-mile segments; and (4) field data will be summarized according to the method described in the preceding section.

Comparative Methods of Surveying Horticultural Specialty Crops

By R. A. McGregor and O. M. Frost

A program of estimates covering eight classes of nursery products and four selected cut flowers grown in 5 States was undertaken in late 1956 by the Fruit and Vegetable Statistics Branch of the Agricultural Estimates Division, AMS. The initial survey was an almost complete enumeration with estimates being required for only a few small nonrespondents whose size of operation had previously been established. To reduce time and costs, random sampling was tested in a 1957 survey in these same States. A sample was drawn to measure 1957 sales in relation to those made in 1956 with sampling errors of about 2 percent by States for each item. The sample was checked against (1) the results obtained from a general mailing to all producers with several followups and (2) the results obtained from similar mailings and followups of large nonrespondents by personal interview. Final results show that more accurate estimates are obtained from general mailings to all known producers with selective followups of the larger nonrespondents.

IN DECEMBER, 1956, the Fruit and Vegetable Branch of the Agricultural Estimates Division, Agricultural Marketing Service, began a new program of crop reports on the horticultural specialties industry. Five States were selected for a pilot study on the basis of their geographic distribution and importance in the industry.

Considerable time was spent in assembling a list of nearly 8,700 potential producers in California, Colorado, Florida, Illinois, and Iowa. Each was mailed a questionnaire which sought information on size and type of production. Approximately 90 percent answered the inquiry after five mailings were made. Nonrespondents were classified by personal contacts or from information obtained from secondary sources.

About 2,800 qualified as commercial growers of the products to be estimated in future surveys.

A commercial producer is defined as one who grows and sells in a calendar year cut flowers, flowering plants, or nursery products with a total value of $1,000 or more.

The first production survey, made during the winter of 1956–57, covered four selected cut flowers and eight classes of nursery products. The mailed inquiry yielded an 80-percent return. Four general mailings, followed by special delivery airmail letters to larger nonrespondents, were used to obtain this return. Followup work through personal contact was concentrated on larger growers.

The data were summarized by seven size strata established after the initial enumeration. They covered 97 percent of the estimated sales of four selected cut flowers and 94 percent of the estimated sales of eight classes of nursery products.

Nonrespondents were classified according to size of operation. Estimates for these represented mainly the operations of smaller growers; they were made on the basis of size group averages.

In June, 1957, a similar size classification survey was undertaken in Michigan, Ohio, Oregon, New York, and Texas. Five general mailings were made to a list of 11,700 names in these States. About 11 percent failed to reply. Nonrespondents were again checked at the field level to obtain a complete size classification. About 3,700 growers qualified as commercial producers of the selected cut flowers and nursery products.

During the winter of 1957–58, a second production survey was undertaken. This covered 1957 operations in the original pilot States and the five additional States. For cut flowers, reports were received from 86 percent of the growers covering 98 percent of total commercial sales. In the case of nursery products, reports were received from 75 percent of the growers covering 94 percent of commercial sales.

To obtain this high return, it was again necessary to mail five requests and to use selective followup field contacts on the larger nonrespondents. Nonrespondents were classified by size of operation. Estimates were made for nonrespondents in each size group in line with reports received for that size group.

Drawn Sample Tested in Second Survey

To reduce time and cost in such surveys, the practicability of sampling was investigated. A general-purpose sample would not be efficient because many producers tend to specialize in one or two of the products covered in the surveys. A medium-sized overall producer, for example, sometimes turned out to be a rather large chrysanthemum producer, or a large rose grower would sometimes grow a few carnations. Each flower or class of nursery products had therefore to be considered in relation to its own universe. It was necessary to draw a separate sample for each class of products in each State.

One prerequisite of an efficient sample is that pertinent control data for the universe be available. The study was therefore limited to the five States covered in the 1956–57 production survey. With the high response rate obtained in the original survey, it appeared that a valid comparison could be made between results from the sample and those from a complete enumeration resulting from a mailed survey with followup field contacts.

A sample was drawn in the fall of 1957 for the 1957–58 production survey. The sample for each class of products was large enough by States, so that sampling errors would be within 2 percent. Growers in the 1957 survey were classified into seven strata, based on 1956 sales. It was considered necessary to enumerate all growers in stratum 7, consisting of those with a sales volume of $50,000 and over for a given product. A sample was drawn for each of the remaining six groups. The size limits for the seven strata were as follows:

Stratum	Sales limits (dollars)
1	0 to 999.
2	1,000 to 4,999.
3	5,000 to 9,999.
4	10,000 to 14,999.
5	15,000 to 24,999.
6	25,000 to 49,999.
7	50,000 and over.

The number of growers included in the sample varied by State and by product, depending on the variances of the data. On the average, the sample for all items covered about 35 percent of the producers of a given product in each State.

Sample Allocation

The following relationships were used to allocate the sample by strata. The computations are for California carnations, but they were similar for all other products involved in the survey.

$$\text{Total Sample, } \eta = \frac{\Sigma^2(\omega_i{}^1\sigma_i)}{(\sigma_{\overline{x}})^2 + \Sigma\left(\dfrac{\omega_i{}^2\sigma_i{}^2}{N_i}\right)}$$

$$\text{Stratum 1, } \eta_1 = \eta\left[\frac{\omega_1{}^1\sigma_1}{\Sigma(\omega_i\sigma_i)}\right]$$

$$\text{Stratum 2, } \eta_2 = \eta\left[\frac{\omega_2{}^1\sigma_2}{\Sigma(\omega_i{}^1\sigma_i)}\right]$$

Etc.

In table 1, N_i is the number of producers in each stratum, σ_i is the standard deviation of the number of 1,000 units sold (blooms in this case), and w_i is the adjusted stratum weight excluding stratum 7 growers who were enumerated. The

TABLE 1.—*California carnation computations*

Stratum	N_i	G_i	w'_i	$w'_i G_i$	$(w_i G_i)^2$	$\dfrac{(w_i G_i)^2}{N_i}$
1	6	9.2	0.046	0.422	0.178	0.030
2	30	48.5	.230	11.155	123.319	4.111
3	26	89.8	.198	17.780	316.128	12.158
4	22	118.5	.168	19.901	396.050	18.002
5	26	226.5	.198	44.847	2011.253	77.355
6	21	445.5	.160	71.280	5080.838	241.945
7	26	(1)	(1)	(1)	(1)	(1)
Sum	157	--------	1.00	165.385	---------	353.601

[1] Enumerated.

numerical value of N was set to provide a sampling error of 2 percent in the final estimate, including stratum 7 producers who were enumerated.

$$\text{Desired } \sigma_{\overline{x}} = (.02)\overline{X}$$

In this example, $\overline{X}=636.6$, desired $\sigma_{\overline{x}}=12.7$. This means that the standard error of the average for the first 6 strata must be $=15.2$. For California carnations, this resulted in the sample allocation shown in table 2.

TABLE 2.—*California carnation producers, by stratum*

Stratum	Producers	
	Total	Drawn
	Number	*Number*
1	6	1
2	30	3
3	26	5
4	22	6
5	26	12
6	21	20
7	26	26
Total	157	73

Survey Procedures and Results

Production schedules were mailed to all commercial growers on the list. In the fall of 1957, some new growers were added to the various State lists. Five requests were made by mail, and followup field contacts were made for selected nonrespondents. Reports for all nonrespondents in the drawn sample were obtained by field contact.

In the general listings, reports were tabulated by size group and product within States. If the value of sales for the current report departed by more than one size group from the predetermined size group, the report was listed in the size group based on the current report. The only exception to the rule was for producers in strata 6 and 7. Reports showing material differences between the 1957 sales and the predetermined size group for the two classes were tabulated on the basis of the size group indicated by 1957 sales.

For the drawn sample, reports were tabulated in the size groups in which they were drawn, regardless of the change that might have been indicated for the 1957 value.

In summarizing the reports, average numbers of cut flower and nursery products sold in 1957 were computed. These were expanded on the basis of number of growers in each size group. Estimates for the other items, such as plants in production for cut flowers and inventory numbers for nursery products, were based on the relationship of the item to number of cut flowers or nursery products sold in 1957, as reported by other producers within the same size class.

Three different summaries were prepared, as follows:

1. Reports received *only* from direct mailings were expanded to a State basis for all growers. The number of growers in the universe was changed to allow for new growers added to the lists in the fall of 1957.
2. Reports received from direct mailing and reports received by field contact for selected nonrespondents were expanded to a State basis for all growers. The number of growers in the universe was changed to allow for

TABLE 3.—*Comparative survey summary for eight classes of nursery products, by selected States*

State	Drawn sample indication as a percentage of published totals (mailed and followup)			
	Producers	Sales	Wholesale value	Jan. 1, 1958, inventory
	Percent	*Percent*	*Percent*	*Percent*
California	101. 4	98. 9	97. 4	99. 6
Colorado	104. 6	95. 4	100. 4	97. 5
Florida	96. 2	96. 3	101. 9	78. 9
Illinois	98. 7	86. 6	86. 3	99. 5
Iowa	100. 0	93. 0	95. 3	100. 8
Average	99. 2	[1] 96. 4	96. 7	[1] 96. 6

[1] Weighted by value of sales.

TABLE 4.—*Comparative survey summary for five selected cut flowers, by selected States*

State	Drawn sample indication as a percentage of published totals (mailed and followup)			Plants in production	
	Producers	Sales	Wholesale value	1957	Indicated 1958
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
California	105. 7	94. 0	93. 5	93. 9	91. 9
Colorado	95. 7	97. 1	93. 9	95. 1	89. 9
Florida	104. 7	99. 4	100. 7	96. 4	92. 4
Illinois	104. 8	97. 3	97. 1	97. 2	95. 6
Iowa	102. 5	91. 3	93. 4	90. 4	88. 7
Average	103. 7	[1] 96. 8	96. 7	[1] 95. 4	[1] 92. 4

[1] Weighted by value of sales.

growers going out of business and for new growers added to the list in the fall of 1957.

3. Reports from growers in the drawn sample (either by mail or field contact) were expanded to a State basis for all growers. The number of growers in the universe was held to the level established prior to drawing the sample.

A. *Basis of estimate in published report.*—The figures published in June 1958 under Sp Cr 6–1 (58) "Cut-Flowers" and Sp Cr 6–2 (58) "Nursery Products" are based on method (2) as outlined above.

TABLE 5.—*Comparative survey summary for nursery products, by product, selected States*

Product	Drawn sample indication as a percentage of published total			
	Producers	Sales	Wholesale value	Jan. 1, 1958, inventory
	Pct.	*Pct.*	*Pct.*	*Pct.*
Conifers	101. 2	99. 8	93. 6	101. 7
Broadleaved evergreens	104. 1	95. 7	97. 4	92. 8
Deciduous shade trees	98. 5	87. 4	86. 4	90. 1
Deciduous shrubs	98. 7	92. 9	94. 3	100. 6
Rose plants	95. 8	108. 0	103. 0	105. 7
Deciduous fruit and nut trees	96. 2	95. 0	93. 3	92. 8
Grapevines	92. 7	105. 0	96. 1	114. 5
Citrus and subtropical fruit trees	96. 0	94. 0	97. 9	86. 6
Average	99. 2	[1] 96. 4	96. 7	[1] 96. 6

[1] Weighted by value of sales.

TABLE 6.—*Comparative survey summary for cut flowers, by product, in selected States*

Item	Drawn sample indication as a percentage of published totals			Plants in production	
	Producers	Sales	Wholesale value	1957	Indicated, 1958
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Carnations	101. 6	95. 3	94. 7	94. 8	91. 3
Chrysanthemums, Standard	102. 0	95. 2	92. 0	95. 2	89. 4
Pompon	103. 0	99. 8	100. 7	101. 8	93. 8
Gladiolus	113. 6	98. 1	99. 4	93. 7	94. 6
Roses	101. 8	95. 2	94. 5	93. 7	93. 4
Average	103. 7	[1] 96. 8	96. 7	[1] 95. 4	[1] 92. 4

[1] Weighted by value of sales.

B. *Drawn sample versus mailed survey and followup.*—Tables 3, 4, 5, and 6 compare results from the drawn sample with the published estimates by State and item, respectively, for nursery products and cut flowers. As noted earlier, the mailed survey and followup method yielded a high return, necessitating little estimating in terms of total sales. The exhibits compare the total indicated by the drawn sample with that from the mailed and followup survey on a percentage basis for

State, item, and type of survey	Drawn sample and mailed survey only indications as a percentage of published totals (mailed survey and followup)			
	Producers	Sales	Wholesale value	Jan. 1, 1958, inventory
	Percent	*Percent*	*Percent*	*Percent*
California:				
Broad-leaved evergreens:				
Drawn sample	102. 7	93. 1	91. 8	97. 3
Mailed only	100. 0	85. 4	92. 4	84. 6
Rose plants:				
Drawn sample	94. 8	108. 1	103. 1	105. 8
Mailed only	100. 0	100. 6	100. 6	100. 1
Deciduous fruit and nut trees:				
Drawn	106. 3	94. 3	92. 2	19. 1
Mailed only	100. 0	100. 3	99. 2	100. 1
Colorado:				
Conifers:				
Drawn sample	109. 4	85. 2	94. 6	92. 9
Mailed only	100. 0	106. 1	103. 3	116. 1
Deciduous shade trees:				
Drawn sample	104. 3	103. 2	89. 5	104. 9
Mailed only	100. 0	103. 2	87. 5	115. 8
Florida:				
Broad-leaved evergreens:				
Drawn sample	109, 0	104. 5	113. 6	77. 3
Mailed only	100. 0	98. 0	112. 3	86. 4
Citrus and subtropical fruit trees:				
Drawn sample	94. 9	93. 8	93. 9	82. 8
Mailed only	100. 0	99. 6	128. 6	92. 9
Illinois:				
Conifers:				
Drawn sample	101. 4	92. 0	90. 3	103. 1
Mailed only	100. 0	86. 0	90. 3	74. 1
Deciduous shade trees:				
Drawn sample	99. 4	87. 2	84. 5	84. 9
Mailed only	100. 0	97. 0	104. 7	63. 6
Broad-leaved evergreens:				
Drawn sample	99. 0	103. 2	75. 3	112. 2
Mailed only	100. 0	59. 2	88. 2	51. 1
Iowa:				
Deciduous shrubs:				
Drawn sample	103. 8	97. 5	100. 0	97. 6
Mailed only	100. 0	100. 0	100. 0	99. 8
Deciduous fruit and nut trees:				
Drawn sample	116. 7	99. 7	99. 4	99. 7
Mailed only	100. 0	100. 0	100. 0	99. 9
Average:				
Drawn sample	100. 9	[1] 98. 5	100. 9	[1] 96. 1
Mailed only	100. 0	[1] 94. 1	97. 4	[1] 88. 7

[1] Weighted by value of sales.

ease of comparison. The drawn sample for nursery products had a downward bias of 3.6 percent for the five States under survey, based on the number of plants sold. Likewise, the cut-flower drawn sample data had a downward bias of 3.2 percent. By individual products, sales of conifers were about the same on both surveys, whereas the drawn sample was nearly 13 percent below the published figure on deciduous shade trees. In contrast, the drawn sample for rose plants was 8 percent above the published figure (mailed survey and followup). For cut flowers, sales of pompon chrysanthemums were about the same on both surveys, while the drawn sample showed a small to moderate

TABLE 7.—*Comparative survey results for nursery products, selected States*

State, item, and type of survey	Drawn sample and mailed survey only indications as a percentage of published totals (mailed survey and followup)			
	Producers	Sales	Wholesale value	Jan. 1, 1958, inventory
California:	*Percent*	*Percent*	*Percent*	*Percent*
Broad-leaved evergreens:				
Drawn sample	102.7	93.1	91.8	97.3
Mailed only	100.0	85.4	92.4	84.6
Rose plants:				
Drawn sample	94.8	108.1	103.1	105.8
Mailed only	100.0	100.6	100.6	100.1
Deciduous fruit and nut trees:				
Drawn	106.3	94.3	92.2	19.1
Mailed only	100.0	100.3	99.2	100.1
Colorado:				
Conifers:				
Drawn sample	109.4	85.2	94.6	92.9
Mailed only	100.0	106.1	103.3	116.1
Deciduous shade trees:				
Drawn sample	104.3	103.2	89.5	104.9
Mailed only	100.0	103.2	87.5	115.8
Florida:				
Broad-leaved evergreens:				
Drawn sample	109.0	104.5	113.6	77.3
Mailed only	100.0	98.0	112.3	86.4
Citrus and subtropical fruit trees:				
Drawn sample	94.9	93.8	93.9	82.8
Mailed only	100.0	99.6	128.6	92.9
Illinois:				
Conifers:				
Drawn sample	101.4	92.0	90.3	103.1
Mailed only	100.0	86.0	90.3	74.1
Deciduous shade trees:				
Drawn sample	99.4	87.2	84.5	84.9
Mailed only	100.0	97.0	104.7	63.6
Broad-leaved evergreens:				
Drawn sample	99.0	103.2	75.3	112.2
Mailed only	100.0	59.2	88.2	51.1
Iowa:				
Deciduous shrubs:				
Drawn sample	103.8	97.5	100.0	97.6
Mailed only	100.0	100.0	100.0	99.8
Deciduous fruit and nut trees:				
Drawn sample	116.7	99.7	99.4	99.7
Mailed only	100.0	100.0	100.0	99.9
Average:				
Drawn sample	100.9	[1] 98.5	100.9	[1] 96.1
Mailed only	100.0	[1] 94.1	97.4	[1] 88.7

[1] Weighted by value of sales.

ease of comparison. The drawn sample for nursery products had a downward bias of 3.6 percent for the five States under survey, based on the number of plants sold. Likewise, the cut-flower drawn sample data had a downward bias of 3.2 percent. By individual products, sales of conifers were about the same on both surveys, whereas the drawn sample was nearly 13 percent below the published figure on deciduous shade trees. In contrast, the drawn sample for rose plants was 8 percent above the published figure (mailed survey and followup). For cut flowers, sales of pompon chrysanthemums were about the same on both surveys, while the drawn sample showed a small to moderate

TABLE 8.—*Comparative survey results for cut flowers, selected States*

State, item, and type of survey	Drawn sample and mailed survey only indications as a percentage of published totals (mailed survey and followup)				
	Producers	Sales	Wholesale value	Plants in production	
				1957	Indicated, 1958
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
California:					
Carnations:					
Drawn sample	102. 6	94. 3	96. 3	94. 0	92. 0
Mailed only	100. 0	99. 1	97. 0	98. 8	92. 0
Standard Chrysanthemums:					
Drawn sample	107. 4	96. 3	92. 2	97. 5	92. 1
Mailed only	100. 0	98. 5	99. 4	100. 0	101. 1
Colorado:					
Carnations:					
Drawn sample	90. 1	97. 6	93. 7	97. 1	91. 0
Mailed only	100. 0	103. 1	104. 2	101. 6	98. 3
Pompon Chrysanthemums:					
Drawn sample	105. 3	102. 8	102. 9	88. 0	89. 5
Mailed only	100. 0	87. 5	87. 7	89. 5	96. 4
Florida:					
Pompon Chrysanthemums:					
Drawn sample	100. 0	104. 6	104. 6	102. 9	92. 4
Mailed only	100. 0	73. 3	81. 8	134. 4	118. 0
Gladiolus:					
Drawn sample	111. 3	97. 1	98. 8	93. 8	93. 8
Mailed only	100. 0	107. 5	109. 4	106. 2	106. 2
Illinois:					
Gladiolus:					
Drawn sample	116. 4	106. 0	106. 1	98. 2	103. 9
Mailed only	100. 0	98. 9	98. 3	101. 8	101. 9
Roses:					
Drawn sample	109. 1	100. 5	99. 3	100. 6	99. 9
Mailed only	100. 0	103. 7	102. 5	104. 2	103. 8
Iowa:					
Standard Chrysanthemums:					
Drawn sample	96. 8	97. 2	101. 0	92. 6	95. 0
Mailed only	100. 0	101. 4	101. 0	101. 2	101. 2
Roses:					
Drawn sample	100. 0	99. 9	100. 0	100. 0	100. 0
Mailed only	100. 0	99. 5	99. 4	101. 1	101. 1
Average:					
Drawn sample	103. 9	[1] 98. 4	97. 3	[1] 96. 8	[1] 94. 6
Mailed only	100. 0	[1] 98. 2	99. 6	[1] 96. 6	[1] 97. 7

[1] Weighted by value of sales.

downward bias for carnations, standard chrysanthemums, gladiolus, and roses.

C. *Drawn sample versus mailed survey without followup.*—Tables 7 and 8 compare the total indicated by the drawn sample with the total based on a mail survey only, by State and item, respectively, for nursery products and cut flowers. Selected items were taken in each State. For cut flowers (table 8) there was no material difference in the 5-State average for the two methods of survey. But the greater differences were more often shown on the mailed survey without followup, especially for Colorado and Florida pompon chrysanthemums. In the case of nursery products, the drawn-sample survey was somewhat better than the mailed survey without followup. Direct summarization without followup introduced large errors for broad-leaved evergreens grown in California for conifers and broad-leaved evergreens grown in Illinois. These large errors

TABLE 9.—*Comparative survey results for selected products, by three methods of summarization, selected States*

Method	Total number of producers in universe used for expansion	Number sold	Wholesale value	Plants in production	
				1957	1958
California:					
Carnations:		*Thousands*	*Thousands*	*Thousands*	*Thousands*
Mailed and followup	[1] 153	102, 468	4, 816	9, 300	10, 005
Mailed only	[1] 153	101, 574	4, 672	9, 193	9, 987
Drawn sample	[2] 157	96, 657	4, 640	8, 741	9, 205
Florida:		*Thousand dozens*			
Gladiolus:			*Thousands*	*Acres*	*Acres*
Mailed and followup	[1] 62	16, 471	9, 059	8, 000	8, 000
Mailed only	[1] 62	17, 708	9, 916	8, 500	8, 500
Drawn sample	[2] 69	15, 988	8, 953	7, 500	7, 500
Illinois:					
Roses:		*Thousands*	*Thousands*	*Thousands*	*Thousands*
Mailed and followup	[1] 40	45, 714	3, 703	2, 142	2, 122
Mailed only	[1] 40	47, 482	3, 799	2, 236	2, 206
Drawn sample	[2] 44	45, 944	3, 676	2, 154	2, 120

Method	Producers	Number sold	Wholesale value	Jan. 1, 1958 inventory
California:				
Broad-leaved evergreens:		*Thousands*	*Thousands*	*Thousand plants*
Mailed and followup	[1] 331	8, 060	5, 803	12, 000
Mailed only	[1] 331	6, 885	5, 364	10, 153
Drawn sample	[2] 340	7, 503	5, 327	11, 683
Florida:				
Citrus and subtropical fruit trees:				
Mailed and followup	[1] 470	1, 886	2, 263	3, 322
Mailed only	[1] 470	1, 878	2, 911	3, 087
Drawn sample	[2] 446	1, 770	2, 124	2, 751
Illinois:				
Conifers:				
Mailed and followup	[1] 204	736	2, 136	3, 133
Mailed only	[1] 204	633	1, 836	2, 321
Drawn sample	[2] 207	677	1, 929	3, 232

[1] Number of producers, adjusted for those going out of business and those entering into production for the first time in 1957.
[2] Number of producers in drawn sample as determined from 1956 survey.

arose mainly in estimating for larger nonrespondents in the stratum expansions in the mail survey, chiefly for strata 6 and 7.

D. *Drawn sample versus mailed survey with and without followup.*—A comparison for selected items in the five States is shown in table 9; it covers results from the three methods of summarization mentioned earlier. In general, the drawn-sample figures show some downward bias, whereas those summarized as a mailed survey without followup indicate plus and minus departures from the published data.

Analysis of Drawn Sample

Although the sampling method has proved to be generally sound and has provided overall results with a fair degree of accuracy, several weaknesses in a size-group stratification were apparent in applying that method to horticultural specialty products. The greatest weakness found was in the shift in size of growers from 1956 to 1957. On the basis of a reclassification analysis made for selected products in each State, it is estimated that approximately 25 percent of the drawn sample was out of class because of the change in size

TABLE 10.—*Standard chrysanthemums: Producers, by size, 1956 and reclassified in 1957 (excluding new growers), California*

Size	1956	Reclassified in 1957							
		0	1	2	3	4	5	6	7
1	9	5	3	------	1	------	------	------	------
2	48	11	1	26	10	------	------	------	------
3	30	4	------	1	18	4	3	------	------
4	16	1	------	------	1	5	7	2	------
5	25	2	------	1	------	2	12	8	------
6	28	1	------	------	------	2	3	18	4
7	6	------	------	------	------	------	------	------	6
Total	162	24	4	28	30	13	25	28	10

TABLE 11.—*Carnations: Producers, by size, 1956, and reclassified in 1957 (excluding new growers), Colorado*

Size	1956	Reclassified in 1957							
		0	1	2	3	4	5	6	7
1	------	------	------	------	------	------	------	------	------
2	7	------	------	7	------	------	------	------	------
3	8	2	------	------	6	------	------	------	------
4	15	1	------	------	------	14	------	------	------
5	19	1	------	------	------	------	18	------	------
6	34	1	------	------	------	------	------	33	------
7	28	------	------	------	------	------	------	------	28
Total	111	5	------	7	6	14	18	33	28

TABLE 12.—*Broad-leaved evergreens: Producers, by size, 1956 and reclassified in 1957 (excluding new growers), California*

Size	1956	Reclassified in 1957							
		0	1	2	3	4	5	6	7
1	69	11	56	------	2	------	------	------	------
2	131	11	1	112	------	6	1	------	------
3	46	1	------	------	41	------	1	3	------
4	14	3	------	1	------	10	------	------	------
5	20	------	------	2	2	------	13	2	1
6	24	------	------	------	------	2	3	11	8
7	36	------	------	------	------	------	1	4	31
Total	340	26	57	115	45	18	19	20	40

of producers that occurred between 1956 and 1957. But this was not uniform between items and States. Tables 10 to 13 demonstrate some of the changes that occurred. Table 11 shows that carnation producers in Colorado do not change much in size from year to year; therefore, they provide a sound sampling base. But standard chrysanthemum growers in California can change their scale of operations rapidly from year to year, as indicated by table 10. Growers of broad-leaved evergreen plant material in California, and citrus and subtropical fruit trees in Florida, tables 12

Size	1956	Reclassified in 1957							
		0	1	2	3	4	5	6	7
1	131	18	109	4	-	-	-	-	-
2	226	51	19	155	-	-	-	1	-
3	42	2	3	4	30	2	1	-	-
4	22	1	-	2	-	15	1	3	-
5	18	3	1	1	1	1	10	1	-
6	2	-	-	-	-	1	1	-	-
7	5	-	1	-	-	-	-	-	4
Total	446	[1] 75	133	166	31	19	13	5	4

[1] More than offset by new growers (about 100 citrus nurseries added to list in 1957).

and 13, also show a tendency to change operations materially from year to year. The changes shown by these exhibits tend to distort stratum averages rapidly in a predetermined sample.

Another apparent weakness of the drawn sample was found in the effect of new growers entering the business. A fixed sample, often with drawn zeros, adjusts downward as growers leave the business. But this bias is not offset unless all new growers are enumerated and added in independently after the drawn sample has been summarized. The incidence of "zero reports" in 1957 among drawn sample producers was much greater than expected following the complete grower classification survey in 1956.

In analyzing the results of the drawn sample survey, it is apparent that the heavy reclassification of producers between size groups coupled with the "zero report" bias, introduced surprisingly large errors that could not be controlled through the mechanics of a predetermined sample.

Analysis of Mailed Survey Without Personal Followup

While the mailed survey without personal followup was frequently as good as the mailed survey with followup, and often superior to the drawn sample, the chance of a large error was much greater. This is indicated by data for broad-leaved evergreens grown in California and for pompon chrysanthemums grown in Florida. Such errors usually result from estimating, based on average size for the stratum, for very large nonrespondents, usually for growers in stratum 7, in which there is no upper limit to size of operation.

Summary

Although the composite results of the drawn sample method were not discouraging, the totals for some of the individual products in the five States indicated larger errors than were expected, and larger errors than are desirable in handling an operating program. The results of the mailed survey without followup, although they often prove to be satisfactory, can result in substantial errors, even when the universe is relatively large. Because of this drawback, the mailed survey without followup would probably not be satisfactory, even though some economies of operation could be realized.

Considering overall inputs of time and money, it appears that a general mailing—probably four mailed requests—followed by highly selective field followups aimed at larger growers in strata 6 and 7 will produce results of better quality by product and by State than either a predetermined sample or general mailing without field followup. This assumes a size reclassification survey about once every 3 years aimed at growers not cooperating in the program. However, the results of this study do not exclude the possibility of sampling such a universe for other characteristics, which may not demand the same degree of precision desired in estimating the number of plants and value of sales for horticultural products.

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