Agricultural Chemical Usage - Fruit Methodology and Quality Measures

ISSN: 2167-1745

Released August 1, 2012, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

Fruit Chemical Use Survey Methodology

Scope and Purpose: The National Agricultural Statistics Service (NASS) Fruit Chemical Use Survey (FCUS) collects entire farm level chemical use data from growers of select fruits in program states. The fruit and vegetable chemical surveys have been conducted in alternating years since 1990 with data collected on vegetables in even numbered years and fruits in odd numbered years. The states involved and the commodities surveyed are selected based on NASS acres planted and evaluated each cycle to ensure maximum coverage. NASS aims to cover at a minimum 80 percent of targeted fruit crop acres planted in the United States. Farm level data are combined during summary and, pending compliance with disclosure rules, published at state and national levels. Data are published for 23 targeted fruit crops in 12 States.

Survey Timeline: Data collection may begin on October 1 and continue through mid January of the following year to ensure completion of the crop year. NASS Field Offices (FOs) along with NASS Headquarters (HQ) spend the next several months reviewing reported data for reasonableness and conduct producer follow-ups, as necessary. The estimates were released to the NASS Quick Stats 2.0 system during the first week of August.

Sampling: The target population for the FCUS is all agricultural establishments with more than $1,000 in agricultural sales (or potential sales). NASS uses a dual frame approach, consisting of list frame and area frame components, to provide complete coverage of this target population.

NASS maintains a list of farm and ranch operators. NASS is constantly seeking new operations from outside list sources confirmed to be qualifying farms before being added to the list. A profile, known as control data, of each operation is maintained which indicates what the farm has historically produced and a general indication of size. This information allows NASS to define sampling populations that are specific to each survey and employ advanced and more efficient sample designs.

The FCUS list sample is selected based on a calculated Farm Value of Sales (FVS). All farms on the list frame with an estimated FVS of $1,000 or more are eligible. The value of sales control data need not be exact as it is used to stratify similar list operations into homogeneous groups.

Sampling Frames and Methods: The sample for the FCUS is selected from the NASS List Sampling Frame. The population of interest is fruit growers having positive list frame acreage for one or more of the target fruit crops. The sample will use the Multivariate Probability Proportional to Size (MPPS) design, in which each reporting unit's probability of selection depends on its total acres of the target crops. The reporting unit is one farm associated with the selected operator. Sampled units that were known to have multiple farms had one farm randomly selected as the reporting unit.

The 2011 FCUS consists of a single data collection phase. The sample size for the FCUS is 6,573.

Data Collection: All federal data collections require approval by the Office of Management and Budget (OMB). NASS must document the public need for the data, show the design applies sound statistical practice, ensure the data do not already exist elsewhere, and show that the public is not excessively burdened. The fruit chemical use questionnaires must display an active OMB number that gives NASS the authority to conduct the survey, a statement of the survey purpose and the use of the collected data, a response burden statement that estimates the time required to complete the form, a

confidentiality statement that the respondent's information will be protected from disclosure, and a statement that response to the survey is voluntary and not required by law.

Using these questionnaires, chemical data are collected only by personal visit from an enumerator. Letters were mailed out to producers prior to field contact stating the importance of cooperation and that contact will be made in the coming weeks. Once contact is made by the field enumerator, an appointment is made to collect data when the farm operator indicates no further chemical applications are remaining. The field enumerator returns the questionnaires to the NASS FO for editing. The FO sends their completed questionnaires to the National Processing Center (NPC) for keying and scanning. Questionnaire responses are captured and edited for consistency using automated systems.

Survey Edit: As survey data are collected and captured, they are edited for consistency and reasonableness using automated systems. Reported data are typically first edited as a "batch" of data when first captured. The edit logic ensures administrative coding follows the methodological rules associated with the survey design. Relationships between data items on the current survey are verified and in certain situations, items are compared to data from earlier surveys to make sure certain relationships are logical. The edit determines the status of each record to be either "dirty" or "clean". NASS FO statisticians will correct the errors on the report or comment to their validity if the data are deemed to be correct. Only clean records are eligible for analysis tools and summary.

Analysis Tools: Chemical use data are processed through an interactive data analysis tool which displays data for all reports by product or commodity. This application tool provides various tables, charts, and listing tools that allow the analyst to compare an individual record to other similar records within their state or at a national level. Outliers and unusual data relationships are investigated by FO and HQ statisticians to determine validity. Suspect data found to be in error are corrected.

Nonsampling Errors: Nonsampling errors are present in any survey process. These errors include reporting, recording, editing, and imputation errors. Steps are taken to minimize the impact of these errors, such as comprehensive interviewer training, validation and verification of processing systems, detailed computer edits, and the analysis tool. Re-contact with respondents is conducted on an as needed basis.

Nonresponse Adjustment: Response to the FCUS is voluntary. Some producers refuse to participate in the survey, others cannot be located during the data collection period, and some submit incomplete reports. These nonrespondents must be accounted for if accurate estimates of total chemical usage. For this survey, item level nonresponse is accounted for by imputing data where there are missing values. Imputed rates of application for chemicals are calculated through an automated imputation system that calculates an unweighted mean for an imputation group based on commodity, state, and product. When a group lacks sufficient responses, groups are collapsed to preserve as much of the homogeneity as possible.

Calibration: Calibration is a weighting technique used in survey sampling to adjust the survey weights for sampled elements so that the weighted sum of a set of benchmark variables equals a pre-determined set of values for the population. The input to the calibration algorithm is the weights generated from the sampling procedures. Sampling weights are calculated based on numerous factors so that the sample allocations are representative of the entire population of farms at the state level for the target fruit crop(s) in that state. Due to survey nonresponse, weights are adjusted through a calibration algorithm. Calibration adjusts the sampling weights so the expanded data will match planted acreage totals from the July Noncitrus Fruits and Nuts report and the September Citrus Fruits Summary. This ensures that the chemical data collected will accurately represent the chemical usage for all target fruit crops for the entire target population.

Estimators: The FCUS utilizes direct expansions and/or ratio indications for all survey indications. Direct expansions are calculated by applying sampling weights and non-response adjustments to reported data and summing these values.

Outliers: NASS conducts a review of outliers found in the chemical use data by reviewing application rates for all records for the same product and commodity combinations. The FO and HQ statisticians work together to ensure the data are as accurate as possible. The FO statisticians review outliers within their states, and the HQ statistician examines outliers across all states for the published categories. A determination is made as to whether an adjustment to the application data

is required. Most outliers trace back to unique situations that do not exist in the target population as much as the survey weight would indicate.

Estimation: HQ statisticians execute a summary that generates state level and national level indications. Field office statisticians are responsible for performing a detailed review of their survey results and providing comments that justify their survey results. HQ statisticians conduct a final review of survey results from all states. Any irregularities revealed by the summary must be investigated and, if necessary, resolved. After final review, national level summary results are adopted as official national estimates except in cases where strong justification supports deviating from survey totals.

For this survey there are two main types of data that NASS estimates - pesticide application and Integrated Pesticide Management (IPM) data. For the application data, NASS collects information about commercial pesticides applied during the crop year. Fertilizer data is collected every other survey year. For pesticides, these applications are collected at the product level, generally per application. These product level data are converted to pounds of active ingredient, summarized, and published. If there are not a sufficient number of reports, the data are suppressed from publication, along with any needed complementary suppression.

For the pesticide application data, NASS estimates Area Applied (percent acres treated), Number of Applications, Rate per Application (pounds of active ingredient per acre), Rate per Crop Year (number of applications multiplied by rate per application), and Total Amount Applied. In order to publish data for an active ingredient, there must be a minimum number of reports for the specific active ingredient at the summary level (by crop, by state, or all program states). If there are not a sufficient number of reports, the data is suppressed from publication, along with any needed complementary suppression.

The standard deviation for each active ingredient is calculated to determine data distribution for each crop. Chemical distribution rates are given by active ingredient for the Percent of Acres Treated, Number of Applications, Rate per Application, and Rate per Crop Year. Rate Distribution tables include the median, the 10^{th} and 90^{th} percentiles, the mean, and the coefficient of variation (CV) for an active ingredient when a sufficient number of farm operators report applying it on the specified crop.

The IPM data are generally a series of yes/no questions pertaining to specific pest management practices. IPM data are collected for the entire operation. From these data, NASS releases the percent of operations using the practice as well as the percent of acreage. The percent of acreage assumes that, if the operation uses the practice on one acre, it is used on all acres. This also means that the IPM data are not crop specific; they are distributed across all fruit acres.

Quality Metrics for Agricultural Chemical Usage

Purpose and Definitions: Under the guidance of the Statistical Policy Office of the Office of Management and Budget (OMB), the United States Department of Agriculture's National Agricultural Statistics Service (NASS) provides data users with quality metrics for its published data series. The metrics tables below describe the performance data for the survey contributing to the publication. The accuracy of data products may be evaluated through sampling and non-sampling error. The measurement of error due to sampling in the current period is evaluated by the coefficient of variation for each estimated item. Non-sampling error is evaluated by response rates and the percent of the estimate from respondents.

Sample Size is the number of observations selected from the population that are used to be representative of the entire population.

Response rates measure the proportion of the sample that is represented by the responding units in the survey.

Coefficient of Variation provides a measure of the size for the standard error relative to the point estimate and is used to measure the precision of the results of a survey estimator.

Fruit Chemical Distribution, Sample Size, and Response Rates – Program States: 2011

State	Sample size	Response rate
	2011	2011
California	2,287	52.2
Florida	565	63.4
Georgia	158	72.8
Michigan	622	70.6
New Jersey	167	68.3
New York	384	64.8
North Carolina	256	72.3
Oregon	614	68.4
Pennsylvania	239	72.8
South Carolina	75	68.0
Texas	377	62.1
Washington	829	65.5
Program States	6,573	62.0

Apples: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
2,4-D, dimeth. salt	12	4	8	9
Carfentrazone-ethyl	25	6	5	7
Diuron	21	3	8	11
Glyphosate iso. salt	16	9	5	11
Glyphosate pot. salt	27	8	9	8
Oryzalin	43	19	12	18
Paraquat	18	4	7	7
Pendimethalin	16	7	8	12
Rimsulfuron	30	11	8	11
Simazine	23	4	6	8
Terbacil	50	2	23	23
Insecticides				
Abamectin	10	3	5	5
Acetamiprid	8	8	4	6
Azinphos-methyl	9	5	3	5
Beta-cyfluthrin	19	6	4	7
Bifenazate	23	1	3	3
Bt kurstaki ABTS-351	23	15	(NA)	(NA)
Carbaryl	8	3	4	5
Chlorantraniliprole	10	4	2	4
Chlorpyrifos	9	2	3	3
Clothianidin	17	10	6	12
Cyfluthrin	17	7	12	13
Diazinon	22	4	9	7
Emamectin benzoate	13	6	2	7
Endosulfan	62	18	10	18
Esfenvalerate	11	6	6	7
Etoxazole	21	2	5	5
Fenpropathrin	15	8	6	10
Fenpyroximate	12	3	4	3
Flubendiamide	20	6	6	7
Formetanate hydro.	11	7	3	8
Imidacloprid	9	5	3	7
Indoxacarb	28	13	7	10
Kaolin	31	10	7	7
Lambda-cyhalothrin	10	8	4	7
Methomyl	14	20	13	17
Methoxyfenozide	14	3	2	4
Novaluron	19	4	6	6
Petroleum distillate	35	17	13	20
Phosmet	8	6	5	8
Pyridaben	20	5	5	9
Pyriproxyfen	27	12	7	12
Spinetoram-J	13	4	3	3
Spinetoram-L	13	4	3	3
Spinsosad	30	7	6	12
Spirotetramat	26	8	4	8
Thiacloprid	9	4	3	5
Thiamethoxam	9	8	4	6

See footnote(s) at end of table.

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Apples: Agricultural Chemical Distribution Table – Program States: 2011 (continued)

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Fungicides				
Bacillus subtilis	33	7	(NA)	(NA)
Basic copper sulfate	11	6	8	8
Boscalid	10	4	2	4
Calcium polysulfide	21	6	6	4
Captan	2	4	4	5
Copper chloride hyd.	28	12	17	15
Copper hydroxide	21	9	16	12
Cyprodinil	8	6	3	8
Difenoconazole	5	5	6	8
Dodine	23	9	8	13
Fenarimol	20	7	5	5
Fenbuconazole	11	8	3	8
Kresoxim-methyl	10	6	4	5
Mancozeb	5	4	2	3
Metiram	15	9	8	11
Mono-potassium salt	21	11	17	15
Myclobutanil	13	7	2	7
Oxytetracycline calc	22	9	7	13
Potassium bicarbon.	85	38	3	40
Pyraclostrobin	10	4	2	4
Pyrimethanil	19	7	7	7
Streptomycin sulfate	8	10	6	13
Sulfur	13	7	6	5
Thiophanate-methyl	8	7	7	10
Trifloxystrobin	18	6	4	8
Triflumizole	15	4	4	7
Ziram	10	8	5	7
Other Chemicals				
Benzyladenine	9	3	10	9
Butenoic Acid Hydro.	14	4	5	5
Cytokinins	23	12	5	14
Dodecadien-1-ol	11	2	12	13
Dodecanol	13	3	4	5
Ethephon	13	4	11	10
Flutriafol	23	6	2	6
Gibberellins A4A7	14	5	5	9
Mineral oil	10	7	7	13
NAA, Ammonium salt	18	6	26	26
NAA, Potassium salt	15	3	19	20
NAA, Sodium	8	10	7	9
NAD	25	5	7	10
Prohexadione calcium	18	6	8	10
Spirodiclofen	16	3	3	2
Tetradecanol	13	3	4	4

(NA) Not available.

Avocados: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Glyphosate iso. salt	47	17	18	14
Insecticides				
Abamectin	20	9	15	22
Other Chemicals				
Mineral oil	25	5	9	11

Blackberries: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Fungicides				
Boscalid	20	10	19	16
Calcium polysulfide	45	13	22	23
Pyraclostrobin	21	10	19	15

Blueberries: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Diuron	15	3	9	11
Flumioxazin	22	5	5	6
Glufosinate-ammonium	27	10	9	16
Glyphosate iso. salt	17	7	12	15
Hexazinone	18	6	14	15
Mesotrione	12	5	11	15
Norflurazon	17	3	7	8
Oryzalin	20	5	13	12
Paraquat	19	18	6	18
Sethoxydim	30	10	18	15
Simazine	19	7	10	15
Terbacil	20	5	12	11
Insecticides				
Acetamiprid	25	6	3	6
Azinphos-methyl	20	9	4	10
Carbaryl	23	12	6	14
Diazinon	20	12	15	8
Esfenvalerate	14	6	9	11
Imidacloprid	19	6	6	8
Malathion	11	13	10	13
Methomyl	22	10	6	13
Methoxyfenozide	16	5	6	10
Phosmet	8	6	1	6
Xylene	20	13	13	14
Zeta-cypermethrin	11	6	5	6
Fungicides				
Azoxystrobin	19	22	5	19
Boscalid	7	7	2	8
Calcium polysulfide	34	2	29	29
Captan	10	7	4	8
Chlorothalonil	23	6	9	11
Copper hydroxide	31	19	25	13
Cyprodinil	13	11	4	15
Fenbuconazole	7	6	6	8
Fenhexamid	29	9	5	10
Fludioxonil	13	11	4	15
Propiconazole	28	12	8	13
Pyraclostrobin	7	7	2	8
Ziram	13	7	2	7
Other Chemicals				
Reynoutria sachaline	23	26	13	31

Cherries, Sweet: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
2,4-D, dimeth. salt	49	9	15	21
Glyphosate iso. salt	21	13	10	20
Oryzalin	29	8	10	13
Oxyfluorfen	21	12	30	41
Paraquat	14	9	24	23
Pendimethalin	25	6	28	32
Insecticides				
Abamectin	50	11	3	14
Acetamiprid	33	3	4	7
Azinphos-methyl	10	4	3	4
Carbaryl	17	6	5	5
Chlorpyrifos	11	4	3	6
Diazinon	33	11	5	12
Dimethoate	21	1	6	6
Esfenvalerate	31	9	10	8
Flubendiamide	19	9	5	12
Imidacloprid	12	4	2	4
Lambda-cyhalothrin	14	8	10	16
Malathion	20	14	5	11
Methoxyfenozide	26	5	5	8
Permethrin	34	9	19	18
Spinetoram-J	17	4	3	6
Spinetoram-L	17	4	3	6
Spinsosad	17	15	21	12
Thiamethoxam	24	7	4	7
Fungicides				
Basic copper sulfate	21	5	14	12
Boscalid	12	4	2	4
Calcium polysulfide	108	30	59	29
Captan	12	13	7	17
Chlorothalonil	12	9	6	10
Copper hydroxide	19	8	4	10
Fenarimol	20	9	3	11
Fenbuconazole	9	7	11	13
Iprodione	29	6	6	4
Myclobutanil	24	5	2	6
Potassium bicarbon.	24	7	2	6
Propiconazole	28	8	3	7
Pyraclostrobin	10	4	2	4
Quinolin	16	5	1	5
Sulfur	16	10	5	8
Tebuconazole	44	19	13	12
Thiophanate-methyl	19	7	5	8
Trifloxystrobin	15	9	4	11
Triflumizole	15	5	2	5
Ziram	10	13	5	12
Other Chemicals				
Cytokinins	57	36	7	43
Ethephon	10	1	9	10
Gibberellic acid	14	4	18	19
Mineral oil	21	24	10	28

Cherries, Tart: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
2,4-D, dimeth. salt	30	5	16	17
Glyphosate iso. salt	14	3	10	11
Paraquat	44	5	14	13
Insecticides				
Azinphos-methyl	8	19	24	10
Chlorpyrifos	29	14	26	38
Esfenvalerate	10	51	51	8
Imidacloprid	45	9	13	13
Permethrin	22	10	17	11
Phosmet	25	4	5	4
Thiamethoxam	34	5	4	5
Fungicides				
Boscalid	33	5	6	7
Captan	27	9	4	9
Chlorothalonil	8	32	12	21
Dodine	12	19	12	8
Fenbuconazole	38	10	11	14
Myclobutanil	22	19	7	15
Pyraclostrobin	33	5	6	7
Sulfur	18	57	67	15
Tebuconazole	59	15	10	23
Trifloxystrobin	17	40	28	14
Other Chemicals				
Ethephon	5	3	11	13
Gibberellic acid	39	6	17	17

Grapefruit: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Bromacil	61	7	5	12
Diuron	43	10	6	12
Glyphosate iso. salt	65	16	18	32
Glyphosate pot. salt	69	24	12	23
Norflurazon	59	26	34	59
Simazine	65	7	4	11
Insecticides				
Abamectin	52	69	54	19
Chlorpyrifos	77	111	58	53
Diflubenzuron	70	39	9	36
Fenbutatin-oxide	79	11	2	12
Fenpropathrin	64	44	37	12
Imidacloprid	27	39	7	39
Pyridaben	61	4	9	7
Pyriproxyfen	85	45	62	40
Spirotetramat	41	35	6	36
Sulfur	51	73	8	76
Thiamethoxam	59	50	15	64
Zeta-cypermethrin	50	40	11	34
Fungicides				
Copper hydroxide	38	112	14	110
Fenbuconazole	37	43	16	59
Pyraclostrobin	92	26	41	64
Trifloxystrobin	64	99	65	37
Other Chemicals				
Mineral oil	44	59	14	47
Spirodiclofen	34	35	17	20

Grapes, All: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Carfentrazone-ethyl	34	4	17	18
Flumioxazin	23	10	15	16
Glufosinate-ammonium	14	6	13	13
Glyphosate iso. salt	21	5	7	9
Glyphosate pot. salt	26	18	5	16
Oryzalin	77	4	19	16
Oxyfluorfen	17	10	14	12
Paraquat	60	9	7	10
Pendimethalin	33	3	17	17
Rimsulfuron	55	4	27	26
Simazine	48	12	14	20
Insecticides				
Abamectin	33	8	7	4
Bifenthrin	28	7	13	13
Carbaryl	27	9	6	13
Fenpropathrin	50	15	21	21
Imidacloprid	15	5	12	13
Methoxyfenozide	21	4	10	10
Spirotetramat	31	3	4	5
Fungicides				
Azoxystrobin	43	12	2	12
Basic copper sulfate	107	29	29	10
Boscalid	18	5	5	4
Captan	17	23	6	28
Copper hydroxide	20	7	7	10
Cyprodinil	18	7	8	12
Difenoconazole	40	5	4	4
Fenarimol	49	4	12	16
Fenhexamid	28	5	2	5
Kresoxim-methyl	27	1	11	11
Mancozeb	9	7	3	7
Mandipropamide Techn	19	12	3	11
Myclobutanil	27	10	5	13
Potassium bicarbon.	36	18	9	13
Pyraclostrobin	18	5	5	4
Quinoline	26	3	3	5
Sulfur	11	21	9	16
Tebuconazole	32	20	3	22
Trifloxystrobin	13	19	6	14
Triflumizole	25	8	5	10
Ziram	31	7	8	13
Other Chemicals				
Gibberellic acid	13	28	22	31
Mineral oil	22	16	13	19

Grapes, Raisin: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Fungicides				
Sulfur	24	22	10	30

Grapes, Wine: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Flumioxazin	24	13	14	16
Glufosinate-ammonium	14	7	19	17
Glyphosate iso. salt	26	8	9	12
Glyphosate pot. salt	20	9	11	12
Oxyfluorfen	21	12	17	14
Pendimethalin	33	3	18	18
Insecticides				
Abamectin	30	4	4	7
Imidacloprid	18	5	20	20
Fungicides				
Boscalid	32	7	9	6
Copper hydroxide	21	7	10	11
Cyprodinil	29	5	7	8
Kresoxim-methyl	31	4	5	6
Myclobutanil	22	5	4	6
Potassium bicarbon.	84	28	3	29
Pyraclostrobin	32	7	9	6
Quinoline	17	4	4	4
Sulfur	16	17	6	21
Tebuconazole	25	10	4	7
Trifloxystrobin	19	10	6	11
Other Chemicals				
Mineral oil	26	12	16	16

Lemons: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Glyphosate iso. salt	56	22	55	48
Other Chemicals				
Gibberellic acid	32	6	13	14
Mineral oil	97	11	63	56

Oranges, All: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
2,4-D, isoprop. salt	30	16	23	24
Bromacil	28	11	18	26
Diuron	26	15	23	20
Glyphosate iso. salt	42	40	24	28
Glyphosate pot. salt	122	38	34	63
Norflurazon	33	25	24	21
Paraquat	28	11	13	18
Pendimethalin	63	36	17	41
Rimsulfuron	270	124	23	115
Simazine	54	8	14	16
Insecticides				
Abamectin	13	19	15	23
Carbaryl	54	34	4	33
Chlorpyrifos	42	33	49	25
Diflubenzuron	45	42	76	45
Dimethoate	32	48	21	37
Fenpropathrin	25	49	5	53
Imidacloprid	35	22	21	19
Malathion	98	14	90	80
Phosmet	30	21	18	22
Pyriproxyfen	54	41	19	34
Spinetoram-J	26	11	5	14
Spinetoram-L	26	11	5	14
Spinsosad	228	10	26	17
Spirotetramat	26	14	5	12
Sulfur	46	18	7	19
Thiamethoxam	31	6	37	35
Zeta-cypermethrin	14	20	2	20
Fungicides				
Basic copper sulfate	35	21	12	26
Copper hydroxide	19	18	11	13
Mefenoxam	32	13	29	26
Trifloxystrobin	34	4	21	24
Other Chemicals				
2,4-D, isoprop ester	23	46	25	70
Gibberellic acid	58	32	3	35
Mineral oil	13	24	15	19
Spirodiclofen	36	44	3	44

Peaches: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
2,4-D, dimeth. salt	122	5	45	45
Glyphosate iso. salt	64	8	11	15
Oxyfluorfen	78	6	51	52
Paraquat	234	42	161	119
Pendimethalin	57	4	129	128
Simazine	61	18	18	21
Insecticides				
Acetamiprid	36	6	8	9
Beta-cyfluthrin	63	53	14	40
Carbaryl	30	10	21	23
Chlorantraniliprole	95	14	13	17
Chlorpyrifos	109	29	50	38
Cyfluthrin	26	73	4	72
Endosulfan	73	34	61	87
Esfenvalerate	36	14	14	26
Fenpropathrin	28	22	15	11
Imidacloprid	43	10	15	16
Lambda-cyhalothrin	59	42	19	31
Methomyl	22	11	12	13
Permethrin	150	91	27	98
Phosmet	65	36	20	25
Thiamethoxam	59	35	17	33
Fungicides				
Basic copper sulfate	78	16	69	85
Boscalid	50	12	9	7
Captan	31	19	8	17
Chlorothalonil	29	56	24	78
Copper hydroxide	53	54	52	87
Cyprodinil	252	13	3	13
Fenbuconazole	58	5	15	20
Iprodione	94	3	10	11
Myclobutanil	25	18	12	9
Oxytetracycline calc	36	7	13	10
Propiconazole	40	37	4	36
Pyraclostrobin	50	12	10	7
Sulfur	11	25	27	45
Tebuconazole	128	47	21	64
Thiophanate-methyl	46	75	26	53
Ziram	87	25	8	32
Other Chemicals				
Mineral oil	101	32	53	28

Pears: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
2,4-D, dimeth. salt	31	23	11	32
Glyphosate iso. salt	20	11	9	15
Insecticides				
Abamectin	12	3	3	4
Acetamiprid	24	6	4	6
Azinphos-methyl	23	6	4	5
Bifenazate	25	3	3	5
Buprofezin	20	16	4	18
Chlorantraniliprole	16	6	2	6
Chlorpyrifos	19	4	2	5
Endosulfan	16	7	3	10
Etoxazole	21	7	2	8
Imidacloprid	22	6	10	15
Kaolin	22	30	11	22
Lambda-cyhalothrin	13	4	2	6
Novaluron	20	5	2	5
Petroleum distillate	19	8	9	13
Piperonyl butoxide	15	9	9	18
Pyridaben	16	6	2	6
Pyriproxyfen	10	4	2	5
Spinetoram-J	13	5	1	6
Spinetoram-L	13	5	1	6
Spirotetramat	10	6	1	6
Thiamethoxam	16	6	5	6
Fungicides				
Basic copper sulfate	24	5	5	6
Boscalid	15	6	2	7
Calcium polysulfide	46	18	12	23
Copper hydroxide	15	15	18	13
Mancozeb	9	9	6	8
Oxytetracycline calc	16	29	11	21
Pyraclostrobin	15	6	2	7
Streptomycin sulfate	15	35	28	28
Sulfur	16	6	5	6
Thiophanate-methyl	18	5	5	6
Trifloxystrobin	45	21	2	21
Triflumizole	15	5	6	10
Ziram	38	21	8	24
Other Chemicals				
Benzyladenine	18	3	24	24
Cytokinins	31	13	8	19
Dodecadien-1-ol	29	11	11	10
Dodecanol	33	14	15	22
Mineral oil	8	4	8	8
NAA, Ammonium salt	32	3	14	15
NAA, Potassium salt	21	3	7	8
Tetradecanol	33	14	15	22

Prunes: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Glyphosate iso. salt	366	35	21	21
Oxyfluorfen	365	50	68	110
Insecticides				
Esfenvalerate	676	32	24	54
Fungicides				
Chlorothalonil	456	7	16	16
Propiconazole	614	53	7	46
Sulfur	641	22	129	120
Other Chemicals				
Mineral oil	828	39	12	43

Raspberries: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Carfentrazone-ethyl	12	10	8	14
Paraquat	6	8	6	8
Simazine	26	12	6	9
Insecticides				
Bifenthrin	9	8	1	8
Diazinon	15	6	15	14
Fungicides				
Boscalid	15	6	(Z)	6
Captan	6	8	19	16
Cyprodinil	8	10	21	23
Fludioxonil	8	10	21	23
Pyraclostrobin	15	6	(Z)	6

(Z) Less than half of the unit shown.

Tangelos: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Glyphosate iso. salt	42	27	28	51
Insecticides				
Abamectin	37	52	29	26
Fungicides				
Copper hydroxide	32	38	17	45
Other Chemicals				
Mineral oil	34	7	12	10
Spirodiclofen	48	17	13	8

Tangerines: Agricultural Chemical Distribution Table – Program States: 2011

Active ingredient	Precent of acres treated	Number of applications	Rate per application	Rate per crop year
	(CV percent)	(CV percent)	(CV percent)	(CV percent)
Herbicides				
Diuron	76	71	67	15
Glyphosate iso. salt	64	14	16	23
Glyphosate pot. salt	91	67	33	68
Insecticides				
Abamectin	138	83	39	76
Chlorpyrifos	178	12	332	345
Diflubenzuron	29	17	68	82
Fenpropathrin	225	67	70	10
Imidacloprid	216	99	51	111
Spinetoram-J	81	6	161	161
Spinetoram-L	81	6	161	161
Spirotetramat	38	10	11	18
Sulfur	30	27	15	21
Zeta-cypermethrin	21	12	3	14
Fungicides				
Copper hydroxide	301	211	123	93
Other Chemicals				
Mineral oil	137	78	183	246
Spirodiclofen	119	16	59	64

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