

Survey & Estimation Procedures

Statistical Methodology

Name of Survey: Vegetable Chemical Usage

Name of Summary: Agricultural Chemical Usage 2010 Vegetable Crops Summary:
(Access at USDA-NASS Quick Stats 2.0: <http://quickstats.nass.usda.gov/>. See Program: Survey, Sector: Environmental, Groups: Vegetables, Commodity: Vegetable Crop)

To access the strawberry data go under Program, click "Survey", under Sector, click "Environmental", under Group, click "Fruit & Tree Nuts", under Commodity, click "Strawberries"

Data Collection Period: September 2010 to January 2011

Sample Size, Sampling Frames and Methods: There were 4,193 samples drawn from the NASS List Sampling Frame for the Vegetable Chemical Usage Survey. This extensive sampling frame covers all types of farms and accounts for about 90 percent of all land in farms in the United States. Samples were selected from States with the largest production for the selected vegetable crops. The sample design for the Vegetable Chemical Use Survey (VCUS) uses a Multivariate Probability Proportional to Size (MPPS) design. The probability of being selected for the sample was based on the percentage of acreage for a given crop that a grower had on a State's list frame. The maximum of these probabilities was selected to draw the sample. The general idea is to assure that the total acreage of all targeted vegetable crops that a grower has on the list frame was included when determining a grower's probability of selection.

Data collection for the survey occurred during the months of September 2010 through January 2011. The ARMS Phase II survey is a list sampling frame only survey. The operator of the sampled farm was personally interviewed to obtain information on chemical applications made to each targeted vegetable crop on the farm.

Modes of Data Collection: Personal interview

Selected Terms and Definitions:

Active Ingredient: The specific pesticide ingredient which kills or controls the target pest(s) or other target material(s), or otherwise results in the pesticide effect(s). All pesticide-use estimates in report are at the active ingredient level; one or more active ingredients are present in known amounts in the pesticide products reported in survey.

Estimates of active ingredient use were reported in a single unit of equivalence, per ingredient. For salt, ester, or amine active ingredients, estimates were reported in the parent acid equivalents. For example, the acid derivatives glyphosate isopropylamine salt and 2,4-D, 2-ethylhexyl ester were reported in the glyphosate and 2,4-D equivalents, respectively. For copper compounds, estimates were reported in the metallic copper equivalent.

Active Ingredient Code: A unique code assigned to each active ingredient upon registration with the Environmental Protection Agency's Office of Pesticide Programs, to facilitate pesticide regulation.

Area Applied, Percent: Percent of total planted acres which received one or more applications of a specific fertilizer nutrient or pesticide active ingredient. (*In Quick Stats: Treated, Measured as Percent of Area Planted*)

Avoidance: A strategy in which the detrimental effects of pests on crops are mitigated or eliminated solely through various cultural practices. Avoidance is one of four classes of pest-management practices for which data are included in report.

Beneficial Insects: Insects (small invertebrate animals, mostly of arthropod classes Insecta and Arachnida), which are collected and introduced onto crop acres because of their value in biological control as predators on harmful insects and parasites.

Chemigation: Application of agricultural chemicals, including pesticide products, by injection into irrigation water.

Crop Year: The period starting immediately after harvest of the previous year's crop and ending at harvest of the current year's crop.

Farm: Any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the year. Government payments are included in sales.

Fertilizer: A soil-enriching agricultural input which contains one or more plant nutrients. Data for three primary macronutrients nitrogen (N), phosphate (P), potash (K), and the secondary macronutrient sulfur (S) are included in report.

Fungi: Various organisms of the kingdom Fungi, which obtain nutrients by decomposing plant or other organic life. This pest group includes mushrooms, molds, mildews, smuts, rusts, and yeasts. Fungal infestations have the potential to reduce crop production and/or lower the grade quality of the host crop.

Mechanism of Action (MOA): The method or biological pathway by which the pesticide or active ingredient kills or controls the target pest(s) or other target material(s).

Monitoring: A strategy involving the observance or detection of pests through systematic sampling, counting, or other forms of scouting. Monitoring may include prediction of pest population levels through the observance of environmental factors such as weather or soil and crop quality. Monitoring is one of four classes of pest-management practices for which data are included in report.

Nematodes: Unsegmented, parasitic worms of the phylum Nematoda. Prominent animal pest of wheat and other field crops with the potential to be highly destructive, lowering crop production and grade quality significantly.

Number of Applications: The average number of times a treated acre received a specific fertilizer nutrient or pesticide active ingredient. (*In Quick Stats: Applications, Measured in Number*)

Pesticide: Defined by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as “(1) any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest, (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant, and (3) any nitrogen stabilizer...”(*Title 7, U.S. Code, 136*). Under FIFRA, pesticides are registered and regulated through the Environmental Protection Agency’s Office of Pesticide Programs. Four classes of pesticides are included in report: (1) herbicides targeting weeds, (2) insecticides targeting insects (3) fungicides targeting fungi, and (4) other chemicals targeting all other pests or other materials (including extraneous crop foliage).

Pheromone: A chemical substance produced by an insect which serves as a stimulus to other individuals of the same species for one or more behavioral responses.

Prevention: A strategy in which a pest population is kept from infesting a crop or field, by taking various preceding actions. Prevention is one of four classes of pest-management practices for which data are included in report.

Rate per Application: Ratio indicating pounds (lbs) of a fertilizer primary nutrient or pesticide active ingredient applied, per single application, per planted acre. (*In Quick Stats: Applications, Measured in Lb/Acre/Application*)

Rate per Crop Year: Ratio indicating pounds (lbs) of a fertilizer primary nutrient or pesticide active ingredient applied, counting all applications per crop year, per planted acre. (*In Quick Stats: Applications, Measured in Lb/Acre/Year*)

Suppression: A strategy which involves the control or reduction of existing pest populations in order to mitigate crop damage. May include physical or biological controls, or management of resistance build-up through pesticide rotation. Suppression is one of four classes of pest management practices for which data is included in report.

Data Review and Estimation Procedures: Chemical usage estimates were verified through the cooperative efforts of the USDA-NASS Environmental and Demographics Section and Program-State Field Offices. The initial review of Program-State level pesticide product usage data, as well as the conversion of pesticide product usage data to the equivalent active ingredient levels for publication, was accomplished through the use of NASS-maintained chemical use databases which contain both product recommended use ranges and active ingredient concentrations per product. Review and finalization of all data proceeded with assessment of reasonableness and consistency at the record, State, and U.S. levels.

The reported application rate data is not forced or adjusted to fall within the label rates (or edit limits) and we do not edit out an application just because the label does not approve it for a crop. The data reflects what growers used, only misreported data is fixed. If the field office and headquarter survey statisticians determine that the reported data was correct then no adjustment were to the data. However, these decisions are based on concrete evidence such as enumerator notes, respondent re-contacts, comments by Extension specialists, etc.

Estimates of the total amount of active ingredient applied are based on the acreage estimates published in the annual NASS report **Vegetables - 2010 Summary** [ISSN: 0884-6413] released on January 27, 2011. Please note that the estimates for total amounts of an active ingredient will not be revised even if there are subsequent revisions to acreage for a given crop.

Indications were published if five or more reports were received and summarized for a given variable and if the indication was greater than or equal to one half of the pre-determined rounding unit for that variable. Distribution and reliability measures were published if 30 or more reports were received and summarized for a given variable.

Reliability: Estimates were subject to sampling variability; sampling variability was measured by the coefficient of variation (cv), expressed as a percent of the estimate. Coefficients of variation differed considerably by variable, chemical, and crop. The narrower the numerical range of responses per variable, and the larger the number of positive responses per variable, the smaller the sampling variability. For these reasons, cv's were generally lower for active ingredient *Rate of Application* estimates, and for estimates associated with the most often reported active ingredients (application rates reported almost always fell within the manufacturer's relatively narrow recommended usage range, and a relatively large number of reports were received for the most widely used active ingredients).

Estimates were additionally subject to non-sampling errors during the 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 done on an as needed basis.

Revision Policy: Estimates are final at first publication, and are not subject to revision.