

Statistical Methodology

Name of Survey: Nursery and Floriculture Chemical Use Survey (NFCUS), 2009.

Name of Summary: Agricultural Chemical Usage 2009 Nursery and Floriculture Summary
(Access at USDA-NASS Quick Stats: <http://quickstats.nass.usda.gov/>. See Sector: Environmental, Group: Horticulture)

Data Collection Period: March to August 2010

Sample Size, Sampling Frames and Methods:

The final 2009 NFCUS sample was drawn from a subpopulation of the USDA-NASS list sampling frame, using an enhanced Probability Proportional to Size design.

The initial population consisted of all commercial nursery and floriculture operations on the USDA-NASS list sampling frame which produce and sell, or have the potential to produce and sell, \$10,000 or more of the targeted nursery or floriculture crops in a single production year. Targeted nursery products included: transplants for commercial vegetable and strawberry production, propagation or lining-out stock, broadleaf evergreens, coniferous evergreens, deciduous shade trees, deciduous flowering trees, deciduous shrubs, fruit and nut plants, cut Christmas trees, palms, ornamental grasses and other woody ornamentals and vines. Targeted floriculture products included: cut flowers, flowering plants (potted), bedding plants (flats, potted, or hanging baskets), foliage plants (potted or hanging baskets), propagation material, cut cultivated greens, and herbaceous perennials. Due to the overlap of targeted commodities, the NFCUS population was a subset of the 2009 Census of Horticultural Specialties population.

Optimization of coverage for each of the 19 different production categories, within the sample allocation, was necessary. To meet this requirement, a Multivariate Probability Proportional to Size design, with dollar sales of the targeted commodities as the measure of size, was used to draw the final 2009 NFCUS sample from the initial population. The final 2009 NFCUS sample consisted of 3,662 operations.

Sample Unit and Reporting Unit: The sample unit was the individual operation.

Modes of Data Collection: California chemical use data were provided by the California Department of Pesticide Regulation (CalDPR). California data for pest management, where pesticides were applied, application method, and type of applicator, were collected by personal interview. All other states used personal interviews for all data collection.

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.

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.

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.

Biological Pesticides: Chemicals which are derived from plants, fungi, bacteria, or other non-man-made synthesis and which can be used for pest control. Certain microorganisms including bacteria, fungi, viruses, and protozoa that are effective in controlling target pests.

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

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.

Ground Cover: A fabric used to control moisture loss, warm the soil, control weeds, and/or prevent soil erosion in greenhouses and fields.

Insect Traps: Devices that are used to monitor or directly reduce insect populations. They contain a food, visual lure, chemical attractant, or pheromone to attract pests.

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.

Natural Shade Area: An area of trees or other plants used to prevent sunburn or sun scalding to susceptible floricultural commodities like coleus or impatiens.

Operation: Defined for purposes of this survey as one who produced and sold \$10,000 worth of product in 2009.

Pesticides: 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.

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

Shade Structures: (i.e. Shade Cloth Slats) Structures used to provide some shade from direct sunlight, but do not provide control over temperature and humidity as other types of coverings.

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 are included.

Trap Indicator Plants: Plants that are used strategically to trap or catch and determine the presences of pests before they can harm a commercial crop.

Data Review and Estimation Procedures: The 2009 nursery and floriculture chemical usage estimates were based on data collected, reviewed, and verified through the cooperative efforts of the USDA-NASS Environmental and Demographics Section and Program-State Field Offices.

Historically, non-production chemical use data were published for NFCUS but it was not published in 2009. For 2000, 2003, and 2006, California non-production chemical use data

accounted for an average of 62 percent of the total pounds of active ingredients applied. In 2009, for the first time, the NFCUS data for California came from the CalDPR. Non-production areas were either categorized as part of a field or greenhouse (such as field edges or a walkway in a greenhouse) and the applications were assigned to the commodity grown in the field or greenhouse; or they were given a unique code such as right-of-way or uncultivated field and not included in the California chemical use data. Given the significant reduction in non-production data due to the change in data collection in California, non-production chemical use data will no longer be published.

NASS maintains chemical use databases which contain product recommended use ranges and active ingredient concentrations per product. These databases are used to review pesticide product usage data and to convert pesticide product usage data to the equivalent active ingredient levels for publication. Review and finalization of all data proceeded with assessment of reasonableness and consistency at the record and U.S. levels.

The use of agricultural chemicals in the nursery and floriculture industry is very different when compared with other sectors of agriculture (field crop, fruit, livestock, vegetable, etc.). Chemical applications to nursery and floriculture commodities are predominately made on a "spot" (small area) basis. Chemical applications are frequently made by chemigation, foggers, aerosols, misters, smokers, root dipping, or drenching of soil. Application rates can be based on teaspoon(s) per pot, per 1,000 cubic feet of greenhouse space, per length of row, or per cubic yard of soil. All application rates were converted to rate per acre for all application methods.

The same production area can be used to produce different types of plant material or multiple "turns" of the same plant material within the calendar year. Trees may be planted in rows with significant row widths but the space between trees receives no chemical application. Due to these, and other unique circumstances, estimates on "percent of area applied", "number of applications", and "rate per crop year" are not available. The production categories were aggregated to estimate active ingredient use data at the "All Nursery", "All Floriculture", and "All Nursery and Floriculture" totals.

The percent values for application area, application method, and applicator were calculated as a percentage of operations engaged in the production of the stated category such as "Fruit and Nut Plants", "Cut Flowers", or "All Nursery." The indications for percent of operations using an active ingredient were calculated by a similar method.

Some products are labeled for control of pests across pesticide classes; for example, as an insecticide and as a fungicide. In these instances, the active ingredient is listed under the pesticide class for which it is predominately used.

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. For example, estimates of a commonly used active ingredient such as glyphosate isopropylamine salt will exhibit less variability than a rarely used chemical such as ziram.

Estimates were additionally subject to non-sampling errors. Non-sampling errors result when the target population is mis-defined through list duplication or incompleteness, or sample unit data are mis-recorded through mistakes in reporting, recording, or processing the data. Strict quality controls implemented at each step of the survey and data review process minimized the occurrence and magnitude of non-sampling errors.

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