**Agricultural Pesticide Application (2461850000)**

***a. Source Category Description***

Pesticides are substances used to control nuisance species and can be classified by targeted pest group: weeds (herbicides), insects (insecticides), fungi (fungicides), and rodents (rodenticides). They can be further described by their chemical characteristics: synthetics, non-synthetics (petroleum products), and inorganics. Different pesticides are made through various combinations of the pest-killing material, also called the active ingredient (AI), and various solvents (which serve as carriers for the AI). Both types of ingredients contain volatile organic compounds (VOC) that may be emitted to the air during application or after application as a result of evaporation.

Approximately 68 to 75 percent of pesticides used in the United States are applied to agricultural lands, both cropland and pasture. Agricultural pesticides continue to be a cost-effective means of controlling weeds, insects, and other threats to the quality and yield of food production. Since application rates for a particular pesticide may vary from crop to crop and from region to region, the crop-specific, regional application rates should be considered when estimating potential VOC emissions.

For this source category, the following SCC was assigned:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SCC** | **SCC Level One** | **SCC Level Two** | **SCC Level Three** | **SCC Level Four** |
| 2461850000 | Solvent Utilization | Miscellaneous Non-industrial: Commercial | Pesticide Application: Agricultural | All Processes |

***b. Emissions Factor***

The default emissions factor for pesticide application (0.751) is expressed as the pounds of VOC that evaporate per pound of pesticide active ingredient (AI) applied and was calculated using the following equation:

EF = ER × VOC

where: EF = emissions factor (lb VOC / lb AI)

ER = evaporation rate of applied pesticide (expressed as a fraction)

VOC = weighted pesticide VOC content (lb VOC / lb AI)

The evaporation rate was assumed to be 0.9 (or 90 percent) and is based on EPA recommendations provided in the Emissions Inventory Improvement Program guidance.1 As discussed below in the section on activity data, The Crop Life Foundation (CLF) has compiled a state-level dataset of fungicide, herbicide, and insecticide use based on survey data from 1999 to 2004.2 A default VOC content was calculated as the weighted average VOC content for all pesticides reported in the Crop Life Foundation database for which there were pesticide matches to the California Department of Pesticide Regulation's (DPR) Pesticide Product Emission Potential database (see Table 1 on page 4).3 Each record in the DPR database is for a specific pesticide product, and provides product name, primary active ingredient, emission potential (EP), registration number, and method used to estimate the EP. The pesticide specific VOC EP of reactive organic gases (i.e., the weight percentage of product that contributes to VOC emissions) and the weight percent of active ingredient from the DPR database were used to calculate the weighted average VOC content.

VOC = Σpesticides[((AI/(%AI/100))\*(EP/100))/AI]\*[(AI/(%AI/100))/T]

where: VOC = weighted pesticide VOC content (lb VOC / lb AI)

AI = active ingredient applied (lb)

%AI = weight percent of AI in pesticide mixture

EP = emissions potential of reactive organic gases (expressed as % of pesticide weight)

T = total weight of all pesticides applied (lb)

The active ingredient applied (AI) was calculated from the active ingredient application rates reported in the CLF database and the harvested acres reported in the 2007 Census of Agriculture.4 The national pesticide usage (T), reported as pounds of pesticides applied, was calculated using the following equation:

T = Σpesticides AI/(%AI/100)

***c. Activity***

The activity for pesticide application is the pounds of active ingredient applied and is calculated using the following equation:

A = HA × R × I × AT

where: A = pounds of active ingredient applied by pesticide by county

HA = crop-specific harvested acres in county

R = crop-specific pounds of pesticide applied per year per harvested acre

I = pounds of active ingredient per pound of pesticide

AT = percent of crop acres in the state treated with the active ingredient

The application rate, R x I, is simply the pounds of active ingredient per harvested acre per year. This rate data, as well as the percent of crop acres in a state treated with the active ingredient, are available in the CLF database.2 The county-level harvested acres per crop in 2007 are available in the Department of Agriculture’s 2007 Census of Agriculture.4 In cases where there was not a direct match between the crop type provided in the CLF and the Census of Agriculture databases, the crop type from the CLF database was matched to a general crop category from the Census of Agriculture using the crosswalk provided in Table 2 (see page 9). This crosswalk enabled the assignment of pesticides to certain crops or crop types and allowed estimation of the quantity of pesticide applied by crop at the county level by linking the rate and AT data from the CLF database with the harvested acreage data from the Census of Agriculture.

***d. Activity Allocation Procedure***

To prevent disclosing proprietary data, some crop-specific harvested acre information in the Census of Agriculture is withheld. Estimates for these withheld data were developed in a three-step process, starting with estimating values for data withheld at the national-level, then at the state-level and finally at the county-level. Where data are withheld at the national-level for a given crop, the average harvested acres per farm from all disclosed farms at the national-level was multiplied by the total national-level number of undisclosed farms harvesting that crop and added to the national disclosed number of acres to estimate the national total. If a value is withheld at the state-level, the difference between the national total and the sum of disclosed state totals was evenly distributed among withheld states. Similarly, if a value is withheld at the county level, the difference between the state total and the sum of disclosed county totals was evenly distributed among withheld counties.

For example, as shown in Table 2, the data on total harvested acres of bentgrass seed are withheld at the national level. Taking the disclosed harvested acres of bentgrass seed at the national-level (6,374) and dividing by the total number of disclosed harvested farms at the national-level (58) yields an average of ~110 harvested acres per farm. This value was then applied to the total number of undisclosed farms harvesting bentgrass seed at the national level (6) and the result added to the national-level disclosed acres (6,374) to estimate the total number of acres of bentgrass at the national level (7,033). Subtracting the total number of bentgrass acres associated with disclosed state totals (6,809) from the estimated national total (7,033) yields 224 acres which were then distributed evenly across the undisclosed states.

**Table 2.** **Estimation of National-Level Total Harvested Acres of Bentgrass Seed**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Estimated Harvested Acres (Total)** | **Harvested Acres (Disclosed)** | **Farms (Total)** | **Farms (Disclosed)** | **Farms (Undisclosed)** | **Average Harvested Acres per Disclosed Farm** |
| 7,033 | 6,374 | 64 | 58 | 6 | 110 |

Bentgrass seed is only grown in two states (Oregon and Illinois). The allocation procedure for Oregon is discussed and presented in Table 3. The state-level data from the Census of Agriculture indicate that there are 6,809 harvested acres in Oregon associated with 63 total harvested farms. At the county-level there are 6,374 harvested acres associated with 58 disclosed farms. To fill in values for the undisclosed farms, the sum of the disclosed county values (6,374) was subtracted from the total state value (6,809) yielding a difference of 435 harvested acres. Dividing these remaining 435 acres by the 5 undisclosed farms gives an average value of 87 harvested acres per farm.

**Table 3. Estimation of County-Level Harvested Acres of Bentgrass Seed**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **State-level Harvested Acres (Total)** | **County-level Harvested Acres (Disclosed)** | **State-level Farms (Total)** | **County-level Farms (Disclosed)** | **Farms (Undisclosed)** | **Difference** |
| 6,809 | 6,374 | 63 | 58 | 5 | 435 |
| *Note: The difference is then allocated evenly to the undisclosed farms, in this case 87 acres per farm.* | | | | | |

***e. Controls***

No controls were accounted for in the emissions estimation.

***f. Emissions Equation and Sample Calculation***

Emissions were estimated by summing the product of the activity data and the emissions factor for each pesticide and crop type at the county-level:

Total VOC Emissionscounty = Σ (Apesticide,crop × EF)

Taking Autauga County, Alabama as an example, the first step was to determine the amount of active ingredient per pesticide being applied in the county by multiplying each crop type by pesticide specific application rates and the percent of acres treated. For Trifluralin application to green lima beans in Autauga County, there were 5 acres harvested and 50 percent of those acres had pesticide applied. Taking the number of acres to which Trifluralin was applied (2.5) and multiplying by the Trifluralin application rate of 0.5 lbs of AI applied per acre yields 1.25 lbs of AI due to Trifluralin application to green lima beans in Autauga County.

5 acres harvested x 50% (acres treated) x 0.5 (lbs of AI per acre) = 1.25 lbs of AI

This process was then repeated for every crop and pesticide combination present in the county (~600 for Autauga County) and the values were summed to determine the amount of AI applied across the county. For Autauga County this aggregate value was determined to be 60,125 lbs of AI. This value was then multiplied by the emissions factor of 0.751 lb VOC per lb AI to estimate VOC emissions.

60,125 (lbs of AI applied in Autauga County) x 0.751 (lb VOC per lb AI) = 45,179 lb of VOC

Or approximately 23 tons of VOC emitted due to agricultural pesticide application in Autauga County.

***e. References***

1. United States Environmental Protection Agency, “*Pesticides - Agricultural and Nonagricultural*”, Vol. 3, Ch. 9, Section 5.1, p. 9.5-4, Emissions Inventory Improvement Program, June 2001.

2. Crop Life Foundation, “*National Pesticide Use Database*”, <http://www.croplifefoundation.org/cpri_npud2002.htm> (accessed July 2011).

3. California Department of Pesticide Regulation, “*Pesticide Emission Potential Database*”, <http://www.cdpr.ca.gov/docs/emon/vocs/vocproj/voc_ep.htm> (accessed August 5, 2011).

5. United States Department of Agriculture, “*Census of Agriculture 2007*”, <http://www.agcensus.usda.gov/Publications/2007/index.asp> (accessed July 2011).

**Table 1. Pesticide Matches Between the Crop Life Foundation Database and the California Department of Pesticide Regulation Database**

| **Crop Life Foundation** | **California Department of Pesticide Regulation** |
| --- | --- |
| 1,3-D | 1,3-DICHLOROPROPENE |
| 2,4-D | 2,4-D |
| 2,4-DB | 2,4-DB ACID |
| ABAMECTIN | ABAMECTIN |
| ACEPHATE | ACEPHATE |
| ACETAMIPRID | ACETAMIPRID |
| ACIFLUORFEN | ACIFLUORFEN, SODIUM SALT |
| ALACHLOR | ALACHLOR |
| ALDICARB | ALDICARB |
| AMETRYN | AMETRYNE |
| AMITRAZ | AMITRAZ |
| ANILAZINE | ANILAZINE |
| ASULAM | ASULAM, SODIUM SALT |
| ATRAZINE | ATRAZINE |
| AZADIRACHTIN | AZADIRACHTIN |
| AZINPHOS-METHYL | AZINPHOS-METHYL |
| AZOXYSTROBIN | AZOXYSTROBIN |
| BENEFIN | BENEFIN |
| BENOMYL | BENOMYL |
| BENSULFURON | BENSULFURON METHYL |
| BENSULIDE | BENSULIDE |
| BENTAZON | BENTAZON, SODIUM SALT |
| BIFENAZATE | BIFENAZATE |
| BIFENTHRIN | BIFENTHRIN |
| BISPYRIBAC | BISPYRIBAC-SODIUM |
| BROMACIL | BROMACIL |
| BROMOXYNIL | BROMOXYNIL OCTANOATE |
| BT | BACILLUS THURINGIENSIS SUBSPECIES |
| BUPROFEZIN | BUPROFEZIN |
| BUTYLATE | BUTYLATE |
| CACODYLIC ACID | CACODYLIC ACID |
| CAPTAN | CAPTAN |
| CARBARYL | CARBARYL |
| CARBOFURAN | CARBOFURAN |
| CARBOXIN | CARBOXIN |
| CARFENTRAZONE | CARFENTRAZONE-ETHYL |
| CHLORAMBEN | CHLORAMBEN |
| CHLOROPICRIN | CHLOROPICRIN |
| CHLOROTHALONIL | CHLOROTHALONIL |
| CHLORPYRIFOS | CHLORPYRIFOS |
| CHLORSULFURON | CHLORSULFURON |
| CLETHODIM | CLETHODIM |
| CLOFENTEZINE | CLOFENTEZINE |
| CLOMAZONE | CLOMAZONE |
| CLOPYRALID | CLOPYRALID, MONOETHANOLAMINE SALT |
| COPPER | COPPER |
| CRYOLITE | CRYOLITE |
| CYANAZINE | CYANAZINE |
| CYCLOATE | CYCLOATE |
| CYFLUTHRIN | CYFLUTHRIN |
| CYHALOFOP | CYHALOFOP BUTYL |
| CYMOXANIL | CYMOXANIL |
| CYPERMETHRIN | CYPERMETHRIN |
| CYPRODINIL | CYPRODINIL |
| CYROMAZINE | CYROMAZINE |
| DELTAMETHRIN | DELTAMETHRIN |
| DESMEDIPHAM | DESMEDIPHAM |
| DIAZINON | DIAZINON |
| DICAMBA | DICAMBA |
| DICHLOBENIL | DICHLOBENIL |
| DICLOFOP | DICLOFOP-METHYL |
| DICOFOL | DICOFOL |
| DICROTOPHOS | DICROTOPHOS |
| DIETHATYL ETHYL | DIETHATYL-ETHYL |
| DIFENZOQUAT | DIFENZOQUAT METHYL SULFATE |
| DIFLUBENZURON | DIFLUBENZURON |
| DIMETHIPIN | DIMETHIPIN |
| DIMETHOATE | DIMETHOATE |
| DIMETHOMORPH | DIMETHOMORPH |
| DINOCAP | DINOCAP |
| DIPHENAMID | DIPHENAMID |
| DIQUAT | DIQUAT DIBROMIDE |
| DISULFOTON | DISULFOTON |
| DIURON | DIURON |
| DODINE | DODINE |
| DSMA | DSMA |
| EMAMECTIN | EMAMECTIN BENZOATE |
| ENDOSULFAN | ENDOSULFAN |
| ENDOTHALL | ENDOTHALL, DIPOTASSIUM SALT |
| EPTC | EPTC |
| ESFENVALERATE | ESFENVALERATE |
| ETHALFLURALIN | ETHALFLURALIN |
| ETHEPHON | ETHEPHON |
| ETHION | ETHION |
| ETHOFUMESATE | ETHOFUMESATE |
| ETHOPROP | ETHOPROP |
| FENAMIPHOS | FENAMIPHOS |
| FENARIMOL | FENARIMOL |
| FENBUCONAZOLE | FENBUCONAZOLE |
| FENBUTATIN OXIDE | FENBUTATIN-OXIDE |
| FENHEXAMID | FENHEXAMID |
| FENOXAPROP | FENOXAPROP-ETHYL |
| FENPROPATHRIN | FENPROPATHRIN |
| FENPYROXIMATE | FENPYROXIMATE |
| FENVALERATE | FENVALERATE |
| FERBAM | FERBAM |
| FIPRONIL | FIPRONIL |
| FLUAZIFOP | FLUAZIFOP-P-BUTYL |
| FLUDIOXONIL | FLUDIOXONIL |
| FLUMIOXAZIN | FLUMIOXAZIN |
| FLUOMETURON | FLUOMETURON |
| FLUROXYPYR | FLUROXYPYR |
| FLUTOLANIL | FLUTOLANIL |
| FONOFOS | FONOFOS |
| FORAMSULFURON | FORAMSULFURON |
| FORMETANATE HCL | FORMETANATE HYDROCHLORIDE |
| FOSETYL-AL | FOSETYL-AL |
| GIBBERELLIC ACID | GIBBERELLINS |
| GLUFOSINATE | GLUFOSINATE-AMMONIUM |
| GLYPHOSATE | GLYPHOSATE |
| HALOSULFURON | HALOSULFURON-METHYL |
| HEXAZINONE | HEXAZINONE |
| HEXYTHIAZOX | HEXYTHIAZOX |
| IMAZAMETHABENZ | IMAZAMETHABENZ |
| IMAZAMOX | IMAZAMOX, AMMONIUM SALT |
| IMAZAPYR | IMAZAPYR, ISOPROPYLAMINE SALT |
| IMAZETHAPYR | IMAZETHAPYR |
| IMIDACLOPRID | IMIDACLOPRID |
| INDOXACARB | INDOXACARB |
| IPRODIONE | IPRODIONE |
| KAOLIN | KAOLIN |
| KRESOXIM | KRESOXIM-METHYL |
| LAMBDACYHALOTHRIN | LAMBDA-CYHALOTHRIN |
| LINDANE | LINDANE |
| LINURON | LINURON |
| MALATHION | MALATHION |
| MALEIC HYDRAZIDE | MALEIC HYDRAZIDE, DIETHANOLAMINE SALT |
| MANCOZEB | MANCOZEB |
| MANEB | MANEB |
| MCPA | MCPA |
| MCPB | MCPB, SODIUM SALT |
| MCPP | MCPP |
| MEFENOXAM | MEFENOXAM |
| MEPIQUAT CHLORIDE | MEPIQUAT CHLORIDE |
| METALAXYL | METALAXYL |
| METALDEHYDE | METALDEHYDE |
| METAM SODIUM | METAM-SODIUM |
| METHAMIDOPHOS | METHAMIDOPHOS |
| METHIDATHION | METHIDATHION |
| METHOMYL | METHOMYL |
| METHOXYCHLOR | METHOXYCHLOR |
| METHOXYFENOZIDE | METHOXYFENOZIDE |
| METHYL BROMIDE | METHYL BROMIDE |
| METHYL PARATHION | METHYL PARATHION |
| METIRAM | METIRAM |
| METOLACHLOR | METOLACHLOR |
| METRIBUZIN | METRIBUZIN |
| METSULFURON | METSULFURON-METHYL |
| MEVINPHOS | MEVINPHOS |
| MOLINATE | MOLINATE |
| MSMA | MSMA |
| MYCLOBUTANIL | MYCLOBUTANIL |
| NAA | NAA |
| NALED | NALED |
| NAPROPAMIDE | NAPROPAMIDE |
| NAPTALAM | NAPTALAM, SODIUM SALT |
| NICOSULFURON | NICOSULFURON |
| NORFLURAZON | NORFLURAZON |
| OIL | OIL OF JOJOBA |
| ORYZALIN | ORYZALIN |
| OXAMYL | OXAMYL |
| OXYDEMETON-METHYL | OXYDEMETON-METHYL |
| OXYFLUORFEN | OXYFLUORFEN |
| OXYTETRACYCLINE | OXYTETRACYCLINE, CALCIUM COMPLEX |
| OXYTHIOQUINOX | OXYTHIOQUINOX |
| PARAQUAT | PARAQUAT DICHLORIDE |
| PCNB | PCNB |
| PEBULATE | PEBULATE |
| PENDIMETHALIN | PENDIMETHALIN |
| PERMETHRIN | PERMETHRIN |
| PHENMEDIPHAM | PHENMEDIPHAM |
| PHORATE | PHORATE |
| PHOSMET | PHOSMET |
| PICLORAM | PICLORAM |
| PROFENOFOS | PROFENOFOS |
| PROHEXADIONE | PROHEXADIONE CALCIUM |
| PROMETRYN | PROMETRYN |
| PROPAMOCARB | PROPAMOCARB |
| PROPANIL | PROPANIL |
| PROPARGITE | PROPARGITE |
| PROPICONAZOLE | PROPICONAZOLE |
| PYMETROZINE | PYMETROZINE |
| PYRACLOSTROBIN | PYRACLOSTROBIN |
| PYRAZON | PYRAZON |
| PYRIDABEN | PYRIDABEN |
| PYRIDATE | PYRIDATE |
| PYRIPROXYFEN | PYRIPROXYFEN |
| PYRITHIOBAC | PYRITHIOBAC-SODIUM |
| QUINCLORAC | QUINCLORAC |
| RIMSULFURON | RIMSULFURON |
| SETHOXYDIM | SETHOXYDIM |
| SIMAZINE | SIMAZINE |
| S-METOLACHLOR | S-METOLACHLOR |
| SODIUM CHLORATE | SODIUM CHLORATE |
| SPINOSAD | SPINOSAD |
| STREPTOMYCIN | STREPTOMYCIN |
| SULFUR | SULFUR |
| SULFURIC ACID | SULFURIC ACID |
| SULPROFOS | SULPROFOS |
| TEBUCONAZOLE | TEBUCONAZOLE |
| TEBUFENOZIDE | TEBUFENOZIDE |
| TERBACIL | TERBACIL |
| THIABENDAZOLE | THIABENDAZOLE |
| THIAMETHOXAM | THIAMETHOXAM |
| THIDIAZURON | THIDIAZURON |
| THIFENSULFURON | THIFENSULFURON-METHYL |
| THIOBENCARB | THIOBENCARB |
| THIODICARB | THIODICARB |
| THIOPHANATE METHYL | THIOPHANATE |
| THIRAM | THIRAM |
| TRALKOXYDIM | TRALKOXYDIM |
| TRALOMETHRIN | TRALOMETHRIN |
| TRIADIMEFON | TRIADIMEFON |
| TRIALLATE | TRIALLATE |
| TRICHLORFON | TRICHLORFON |
| TRIFLOXYSTROBIN | TRIFLOXYSTROBIN |
| TRIFLUMIZOLE | TRIFLUMIZOLE |
| TRIFLURALIN | TRIFLURALIN |
| TRIFLUSULFURON | TRIFLUSULFURON-METHYL |
| TRIFORINE | TRIFORINE |
| VERNOLATE | VERNOLATE |
| VINCLOZOLIN | VINCLOZOLIN |
| ZIRAM | ZIRAM |

**Table 2. Crosswalk Between Crop Types in the CLF Database and the General Categories in the USDA Census of Agriculture**

| **Crop Types from CLF Database** | **General Category from Census of Agriculture** |
| --- | --- |
| ALFALFA | Seeds / Grasses |
| ALMONDS | Fruits and Nuts |
| APPLES | Fruits and Nuts |
| APRICOTS | Fruits and Nuts |
| ARTICHOKES | VPM |
| ASPARAGUS | VPM |
| AVOCADOS | Fruits and Nuts |
| BARLEY | Field Crops |
| BEETS | VPM |
| Berries | Berries |
| BLACKBERRIES | Berries |
| BLUEBERRIES | Berries |
| BROCCOLI | VPM |
| BRUSSEL SPROUTS | VPM |
| CABBAGE | VPM |
| CANOLA | Field Crops |
| CANTALOUPES | VPM |
| CARROTS | VPM |
| CAULIFLOWER | VPM |
| CELERY | VPM |
| CHERRIES | Fruits and Nuts |
| CHERRIES | VPM |
| CITRUS | Fruits and Nuts |
| COLLARDS | VPM |
| CORN | Field Crops |
| CORN | Seeds / Grasses |
| COTTON | Field Crops |
| CRANBERRIES | Berries |
| CUCUMBERS | VPM |
| DATES | Fruits and Nuts |
| DRY BEANS | Field Crops |
| DRY BEANS | VPM |
| DRY PEAS | Field Crops |
| DRY PEAS | VPM |
| EGGPLANT | VPM |
| FALLOWLAND | Seeds / Grasses |
| Field Crops | Field Crops |
| FIGS | Fruits and Nuts |
| FLAX | Field Crops |
| Fruits and Nuts | Fruits and Nuts |
| GARLIC | VPM |
| GRAPES | Fruits and Nuts |
| HAZELNUTS | Fruits and Nuts |
| HAZELNUTS | VPM |
| HOPS | Other Crops |
| KIWI | Fruits and Nuts |
| LETTUCE | VPM |
| MELONS | VPM |
| NECTARINES | Fruits and Nuts |
| OATS | Field Crops |
| OKRA | VPM |
| OLIVES | Fruits and Nuts |
| ONIONS | VPM |
| Other Crops | Other Crops |
| OTHER HAY | Seeds / Grasses |
| PARSLEY | VPM |
| PEACHES | Fruits and Nuts |
| PEANUTS | Field Crops |
| PEARS | Fruits and Nuts |
| PECANS | Fruits and Nuts |
| PISTACHIOS | Fruits and Nuts |
| PLUMS/PRUNES | Fruits and Nuts |
| POMEGRANATES | Fruits and Nuts |
| POTATOES | VPM |
| PUMPKINS | VPM |
| RADISHES | VPM |
| RASPBERRIES | Berries |
| RICE | Field Crops |
| RYE | Field Crops |
| RYE | Seeds / Grasses |
| SAFFLOWER | Field Crops |
| SEED CROPS | Seeds / Grasses |
| SORGHUM | Field Crops |
| SORGHUM | Other Crops |
| SORGHUM | Seeds / Grasses |
| SOYBEANS | Field Crops |
| SPINACH | VPM |
| SQUASH | VPM |
| STRAWBERRIES | Berries |
| SUGARBEETS | Field Crops |
| SUGARCANE | Field Crops |
| SWEET CORN | Other Crops |
| SWEET CORN | VPM |
| SWEET POTATOES | VPM |
| TOBACCO | Field Crops |
| TOMATOES | VPM |
| VPM | VPM |
| WALNUTS | Fruits and Nuts |
| WATERMELONS | VPM |
| WHEAT | Field Crops |
| WILD RICE | Field Crops |