SECTION 7.4

AGRICULTURAL LAND PREPARATION

(Revised January 2003)

EMISSION INVENTORY SOURCE CATEGORY
Miscellaneous Processes / Farming Operations

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
620-614-5400-0000 (47332) Agricultural Land Preparation

METHODS AND SOURCES

The land preparation source category includes estimates of the airborne soil particulate emissions produced during the preparation of agricultural lands for planting and after-harvest activities. Operations included in this methodology are discing, shaping, chiseling, leveling, and other mechanical operations used to prepare the soil. Dust emissions are produced by the mechanical disturbance of the soil by the implement used and the tractor pulling it. Soil preparation activities tend to be performed in the early spring and fall months. Table 1 shows the estimated soil preparation particulate emissions for each California county.

Particulate emissions from land preparation are computed by multiplying a crop specific emission factor by an activity factor. The crop specific emission factors are calculated using operation specific (i.e., discing or chiseling) emission factors developed by UC Davis researchers[1], which are combined with the number of operations provided in the crop calendars. The activity factor is based on the harvested acreage of each crop for each county in the state. In addition, acre-passes are computed, which are the number of passes per acre that are typically needed to prepare a field for planting a particular crop. By combining the crop acreage and the operation specific emission factor, we estimate the particulate matter produced by agricultural land preparation operations.

The particulate dust emissions from agricultural land preparation are estimated for each crop in each county in California using the following equation.

$$\text{Emissions}_{\text{crop}} = \text{Emission Factor}_{\text{crop}} \times \text{Acres}_{\text{crop}}$$

The crop emissions for each county are summed to produce the county and statewide particulate matter (PM) and PM_{10} emission estimates. The remainder of this section discusses each component of and related to the above equation.

Acres. The acreage data used for estimating land preparation emissions are from the California Department of Food and Agriculture's (CDFA) summary of crop acreage harvested in 2000. The acreage data are subdivided by county and crop type for the entire state, and are compiled from individual county agricultural commissioner reports. Acres for more than 200 crop commodities were reported by CDFA. Complete listings of individual county crop acreage are provided in the land preparation background document.

Crop Calendars & Acre-Passes. Acre-passes are the total number of passes typically performed to prepare land for planting during a year. Acre-passes are used in computing crop specific emission factors for land preparation. These land preparation operations may occur following harvest or closer to planting, and can include discing, tilling, land leveling, and other operations. Each crop is different in the type of soil operations performed and when they occur. To get the best estimates available, staff of the ARB met with producers of the various commodities to gather the most realistic and current information available on agricultural practices. Focusing on the largest acreage crops, we were able to gather updated information for about 90 percent of California's crop acreage. For the crops that were not explicitly updated, we either applied an updated crop profile from a similar crop, or used one of the existing ARB profiles. Table 2.a provides a listing of the land preparation operations of all crop profiles and their emission factors used in California.

For updating acre-pass data, we also collected specific information on when agricultural operations occur. Using these data, it was possible to create detailed temporal profiles that help to indicate when PM emissions from land preparations may be highest. The more detailed background document includes detailed crop calendars for each crop with updated information. For all the acre-pass and crop calendar information, the farmers and other agricultural experts of the San Joaquin Valley were instrumental in helping us to update our crop information.

The crop calendar consists of twenty representative crop profiles. To make better emission estimates for the over 200 crop commodities reported by CDFA, we assigned each crop to the profile with the highest similarity. The complete listings of individual crop commodities and the assigned profiles are provided in Table 3.

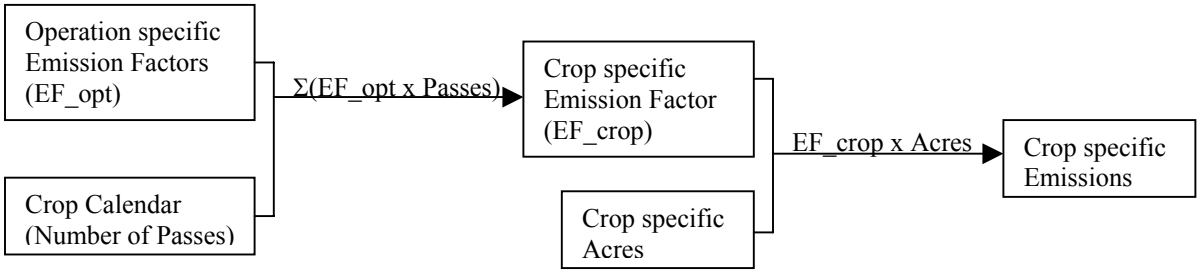
Emission factor. The operation specific emission factors used to estimate the crop specific emission factor for agricultural land preparations were initially from a report of University of California at Davis and their subsequent supplementary data analysis [4]. After discussions with regulators, researchers, and industry representatives, the emission factors were adjusted based on a combination of scientific applicability, general experience and observations. The initial emission factors were developed based on 1995-1998 test data measured in cotton and wheat fields in California. The operations tested include root cutting, discing, ripping and subsoiling, land planing and floating, and weeding, which are summarized in Table A below.

Table A. Land Preparation Operation Emission Factor

Land Preparation Operations	**Emission Factor** (lbs PM_{10}/acre-pass)
Root cutting	0.3
Discing, Tilling, Chiseling	1.2
Ripping, Subsoiling	4.6
Land Planing & Floating	12.5
Weeding	0.8

There are more than thirty different land preparation operations commonly used in California. With five emission factors available, the other operations were assigned "best-fit" factors based on similar potential emission levels. The assignment of emission factors for operations was based on the expertise and experience of regulators, researchers, and industry representatives. The complete list of land preparation operations and the assigned operation categories are provided in Table 2.b.

For each crop, the emission factor is the sum of acre-pass weighted emission factor for each land preparation operation. Table 2.a provides the emission factors for each representative crops in the crop calendar. The figure below illustrates the entire emissions estimation process.



ASSUMPTIONS

1. The land preparation emission factors for discing, tilling, etc., are assumed to produce the same level of emissions, regardless of the crop type.

2. The land preparation emission factors do not change geographically for counties.

3. A limited number of emission factors are assigned to all land preparation activities.

4. Crop calendar data collected for San Joaquin crops and practices were extrapolated to the same crops in the remainder of the State. Existing crop profiles were used for the small percentage of crops in which update information was not collected.

5. In addition to the activities provided in the crop calendars, it is also assumed that field and row crop acreage receive a land planing pass once every five years.

6. UC Davis directly measured PM_{10} emissions. To compute TSP emissions, multiply the PM_{10} by 2.22, which is the ARB's soil size speciation value for agricultural tilling dust.

TEMPORAL ACTIVITY

Temporal activity for harvesting is derived by summing, for each county, the monthly emissions from all crops. For each crop, the monthly emissions were calculated based on its monthly crop calendar profile, which reflects the percentage of harvesting activities that occurs in that month. Below is an example of the monthly profile for almonds, cotton, and wheat. Because the crop composite differs by county, the monthly profiles for counties are different. An example of some composite county monthly profiles is shown below in Tables B-1 through B-3. Table 3 lists the composite temporal data for every county. The background document provides details on how the monthly temporal profiles were developed.

Table B-1. Temporal Profiles

CES	Hours	Days	Weeks
47332	24	7	52

Table B-2. Monthly Activity Profile of Selected Crops

Crops	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Almonds	0	0	0	0	0	0	0	0	0	0	50	50
Cotton	0	9	9	0	0	0	0	0	0	0	41	41
Grapes-wine	0	0	0	4	16	16	12	12	12	28	0	0

Table B.3 County Land Preparation Profile Composite

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	3	6	6	2	2	1	3	4	2	12	30	29

COMMENTS AND RECOMMENDATIONS

Studies are ongoing by the University of California, Davis, to analyze field test data from 70 to 90 additional land preparation tests. As the UCD results become available, they will be incorporated to the emission estimation methodology. If possible, future updates could include county specific crop calendars and crop-pass information instead of being based on San Joaquin Valley practices.

CHANGES IN METHOD AND EMISSION ESTIMATES

There were significant improvements to the land preparation emissions estimates for this update. These include:

- Incorporation of new operation specific land preparation emission factors;
- Development of new crop specific emission factors;

- Use of updated 2000 crop acreage data from the California Department of Food and Agriculture.

These changes produced an emissions reduction of about 50% from the previous 1997 published emission inventory estimates for agricultural land preparation.

GROWTH PARAMETERS

Growth in this category is based on the crop acreage projection estimated by the Department of Water Resources. The growth varies by regions.

SAMPLE CALCULATIONS

The instructions and table below summarizes the data computations necessary to estimate the PM10 emissions from agricultural land preparations in Fresno County. The following steps are performed:

Step 1: Crop Acreage. The acres harvested for a few of the crops in Fresno County are shown in the 'Acres' column of the table. These data are available from the county agricultural commissioner annual reports or the CDFA. The 2000 acreage data are summarized in the agricultural tilling background document.

Step 2: Insert emission Factor for Crop. Using the crop profile in Table 2.a to get the appropriate crop emission factor.

Step 3: Compute Crop Emissions. Multiply the annual harvested acreage for each crop by the emission factor and divide by 2000 lbs/ton to get the annual PM_{10} emissions.
Emissions = (Acres x Emission Factor) / 2000

Step 4: Compute County Total Emissions. Sum the crop PM_{10} emissions for each county to compute the total county agricultural soil preparation particulate matter emissions.

Step 5: Compute TSP. Divide the PM_{10} emissions by a factor of 0.4543.

Table C. Estimating Agricultural Land Preparation PM_{10} Emissions in Fresno County

Crop	Crop Profile	Acres	Emission Factor (lbs PM_{10}/acre)	PM_{10} Emissions (tons/yr)	TSP Emissions (tons/yr)
Wheat all	Wheat	69500	3.7	128.6	283.1
Rice Milling	Rice	6160	20	61.6	135.6
Cotton lint pima	Cotton	33400	8.9	148.6	327.1
Apples All	Citrus	3205	0.07	0.1	0.2
Etc…	…	…	…	…	
Total	…	…	…	…	

REFERENCES

1. Flocchini, R.G., James, T.A., et al. Sources and Sinks of PM10 in the San Joaquin Valley (Interim Report), a study for United States Department of Agriculture Special Research Grants Program. Contract Nos. 94-33825-0383 and 98-38825-6063. August 10, 2001.

2. California Agricultural Statistics Service. 2000 acreage extracted from agricultural commissioner's reports. Sacramento, CA.

3. Gaffney, P.H., Yu, H. Agricultural Harvest: Geologic Particulate Matter Emission Estimates, Background Document. California Air Resources Board. December 2002.

4. Terry Cassel, Informal write-up for SJV Ag Tech Committee, Evaluation of ARB application of UCD emission factors, July 12, 2002.

UPDATED BY

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TABLE 1
2000 Agricultural Land Preparation PM10 and TSP Emissions
EIC: 620-614-5400-0000; CES: 47332; Activity: Acre-Passes

Air Basin	ID#	County	Acreage	AcrePass	PM_{10} Emissions (tons/year)	TSP Emissions (tons/year)
GBV	2	ALPINE	0	0	0	0
	14	INYO	4,660	7,230	10.1	22.3
	26	MONO	10,935	20,972	33.2	73.1
LC	17	LAKE	18,457	13,503	21.8	48.0
LT	9	EL DORADO	396	221	0.2	0.5
	31	PLACER	2,233	9,702	16.9	37.2
MC	3	AMADOR	6,196	8,514	8.7	19.1
	5	CALAVERAS	1,880	1,485	2.3	5.2
	9	EL DORADO	2,908	1,620	1.7	3.8
	22	MARIPOSA	1,239	3,785	3.1	6.8
	29	NEVADA	303	308	0.2	0.5
	31	PLACER	13,624	59,183	103.0	226.8
	32	PLUMAS	12,950	18,778	25.9	57.0
	46	SIERRA	4,500	6,525	9.0	19.8
	55	TUOLUMNE	770	1,117	1.5	3.4
MD	15	KERN	280,668	775,461	771.9	1,699.1
	19	LOS ANGELES	13,790	44,740	41.1	90.5
	33	RIVERSIDE	68,678	173,202	184.3	405.7
	36	SAN BERNARDINO	11,171	21,093	22.7	49.9
NC	8	DEL NORTE	2,440	3,538	4.9	10.7
	12	HUMBOLDT	1,600	2,170	3.1	6.8
	23	MENDOCINO	16,301	15,063	11.2	24.7
	49	SONOMA	36,726	39,854	37.1	81.7
	53	TRINITY	175	254	0.4	0.8
NCC	27	MONTEREY	319,356	1,361,021	1,517.3	3,339.8
	35	SAN BENITO	56,726	164,716	193.8	426.7
	44	SANTA CRUZ	19,652	59,829	63.1	138.8
NEP	18	LASSEN	76,895	121,815	171.2	376.8
	25	MODOC	363,716	545,563	773.0	1,701.5
	47	SISKIYOU	103,879	169,712	259.9	572.0
SC	19	LOS ANGELES	9,194	29,827	27.4	60.3
	30	ORANGE	11,328	43,467	36.2	79.7
	33	RIVERSIDE	84,186	212,313	226.0	497.4
	36	SAN BERNARDINO	27,349	51,641	55.6	122.3
SCC	40	SAN LUIS OBISPO	109,106	271,633	288.7	635.5
	42	SANTA BARBARA	115,638	428,580	406.2	894.1
	56	VENTURA	99,157	224,330	241.6	531.9
SD	37	SAN DIEGO	58,006	65,430	61.8	135.9
SF	1	ALAMEDA	8,789	17,848	17.5	38.5
	7	CONTRA COSTA	31,480	97,355	85.3	187.7
	21	MARIN	6,336	9,167	12.6	27.7
	28	NAPA	33,436	34,263	26.4	58.1
	38	SAN FRANCISCO				0.0
	41	SAN MATEO	3,897	13,085	11.6	25.5
	43	SANTA CLARA	21,268	73,223	69.4	152.7
	48	SOLANO	32,379	82,817	82.8	182.2
	49	SONOMA	23,481	25,481	23.7	52.2
SJV	10	FRESNO	1,189,319	4,315,089	3,624.9	7,979.0
	15	KERN	596,420	1,647,854	1,640.2	3,610.5
	16	KINGS	573,639	2,312,623	1,933.0	4,254.9
	20	MADERA	302,610	514,663	530.4	1,167.4
	24	MERCED	503,793	1,385,331	1,463.4	3,221.2
	39	SAN JOAQUIN	548,940	1,368,065	1,469.9	3,235.5
	50	STANISLAUS	386,435	845,789	933.5	2,054.8
	54	TULARE	761,224	1,505,110	1,450.5	3,192.8
SS	13	IMPERIAL	589,996	1,412,555	1,917.8	4,221.4
	33	RIVERSIDE	68,678	173,202	184.3	405.7
SV	4	BUTTE	198,477	672,571	1,174.5	2,585.4
	6	COLUSA	292,410	1,320,937	1,950.7	4,293.9
	11	GLENN	224,816	777,154	1,220.0	2,685.5
	31	PLACER	6,477	28,136	49.0	107.8
	34	SACRAMENTO	132,613	377,036	409.2	900.8
	45	SHASTA	26,401	52,022	78.3	172.4
	48	SOLANO	129,514	331,268	331.1	728.7
	51	SUTTER	262,736	974,087	1,487.0	3,273.1
	52	TEHAMA	52,769	52,858	82.5	181.5
	57	YOLO	325,147	1,137,427	1,202.5	2,646.9
	58	YUBA	74,329	231,120	401.9	884.6
		STATE TOTAL	**9,374,598**	**26,766,332**	**29,499.9**	**64,934.9**

Fraction of PM10 = 0.45 (PM_{10} Emissions = TSP x 0.4543)

TABLE 2.a
Summary of Crop Profile, Acre-Pass, and Emission Factor

Crop profile	Land Preparation Operations	Category	Acre-Pass	Emission Factor	
				Operation (lbs/Acre-pass)	Crop (lbs/Acre/year)
Alfalfa	Unspecified	Discing	1.25	1.2	
	Land Maintenance	Land Planing	0.2	12.5	4
Almonds	Float	Land Planing	0.25	12.5	3.13
Citrus	Unspecified	Discing	0.06	1.2	0.07
Corn	List & Fertilize	Weeding	1	0.8	
	Mulch Beds	Discing	1	1.2	
	Finish Disc	Discing	1	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
	Stubble Disc	Discing	1	1.2	6.9
Cotton	Land Preparation	Discing	4	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
	Seed Bed Preparation	Weeding	2	0.8	8.9
DryBeans	Land Maintenance	Land Planing	0.2	12.5	
	Chisel	Discing	1	1.2	
	Shaping	Weeding	1	0.8	
	Disc	Discing	2	1.2	
	Listing	Weeding	1	0.8	7.7
Garbanzo	Chisel	Discing	1	1.2	
	Listing	Weeding	1	0.8	
	Shaping	Weeding	1	0.8	
	Disc	Discing	2	1.2	
	Land Maintenance	Land Planing	0.2	12.5	7.7
Garlic	Land Maintenance	Land Planing	0.2	12.5	
	Disc & Roll	Discing	1	1.2	
	Chisel	Discing	1	1.2	
	List	Weeding	1	0.8	
	Shape Beds	Weeding	1	0.8	6.5
Grapes-Raisin	Terrace	Weeding	1	0.8	
	Spring Tooth	Weeding	0.2	0.8	
	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	1	1.2	
	Level (new vineyard)	Land Planing	0.02	12.5	2.6
Grapes-Table	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	0.5	1.2	0.83
Grapes-Wine	Level (new vineyard)	Land Planing	0.02	12.5	
	Spring Tooth	Weeding	0.2	0.8	
	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	0.75	1.2	1.5
Lettuce*	Land Maintenance	Land Planing	0.2	12.5	
	Disc & Roll	Discing	2/2	1.2	
	Chisel	Discing	2/2	1.2	
	List	Weeding	2/2	0.8	
	Plane	Land Planing	½	12.5	
	Shape Beds & Roll	Weeding	2/2	0.8	12.75
Melon	Plow	Discing	1	1.2	
	Shape Beds	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
	Disc	Discing	1	1.2	5.7
No Land Prep.	Unspecified	Discing	0	1.2	0
Onions	List	Weeding	1	0.8	
	Shape Beds	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
	Chisel	Discing	1	1.2	
	Disc & Roll	Discing	1	1.2	6.5
Rice	Chisel	Discing	1	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
	Post Burn/Harvest Disc	Discing	0.5	1.2	
	Roll	Weeding	1	0.8	
	3 Wheel Plane	Land Planing	1	12.5	
	Harrow Disc	Discing	1	1.2	
	Stubble Disc	Discing	1	1.2	20
Safflower	List	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
	Stubble Disc	Discing	1	1.2	4.5

Crop profile	Land Preparation Operations	Category	Acre-Pass	Emission Factor	
				Operation (lbs/Acre-pass)	Crop (lbs/Acre/year)
Sugar Beets	Disc	Discing	1	1.2	
	Land Plane	Land Planing	1	12.5	
	Subsoil-deep chisel	Ripping	1	4.6	
	Stubble Disc	Discing	1	1.2	
	List	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	22.8
Tomatoes	Bed Preparation	Weeding	2	0.8	
	Land Preparation	Discing	5	1.2	
	Land Maintenance	Land Planing	0.2	12.5	10.1
Vegetables	Land Maintenance	Land Planing	0.2	12.5	
	Unspecified	Discing	5	1.2	8.5
Wheat	Stubble Disc	Discing	1	1.2	
	Land Maintenance	Land Planing	0.2	12.5	3.7

* Lettuce profile acre-passes are divided by 2 except for land maintenance operation to remove double cropping count because double cropping is accounted for in the 'Harvested Acres' in the emission calculations. (e.g., if the same land is harvested twice in the same year, the same acreage is counted twice in the county Ag. commissioner crop reports)

TABLE 2.b
Summary of Land Preparation Operations and Assigned Operation Categories

Operation	Category	Emission Factor (lbs/Acre-pass)
Chisel	Discing	1.2
Disc	Discing	1.2
Disc & Furrow-out	Discing	1.2
Disc & Roll	Discing	1.2
Finish Disc	Discing	1.2
Harrow Disc	Discing	1.2
Land Preparation	Discing	1.2
Mulch Beds	Discing	1.2
Plow	Discing	1.2
Post Burn/Harvest Disc	Discing	1.2
Stubble Disc	Discing	1.2
Unspecified	Discing	1.2
3 Wheel Plane	Land Planing	12.5
Float	Land Planing	12.5
Land Plane	Land Planing	12.5
Laser Level	Land Planing	12.5
Level	Land Planing	12.5
Level (new vineyard)	Land Planing	12.5
Plane	Land Planing	12.5
Land Maintenance	Land Planing	12.5
Subsoil	Ripping	4.6
Subsoil-deep chisel	Ripping	4.6
Bed Preparation	Weeding	0.8
List	Weeding	0.8
List & Fertilize	Weeding	0.8
Listing	Weeding	0.8
Roll	Weeding	0.8
Seed Bed Preparation	Weeding	0.8
Shape Beds	Weeding	0.8
Shape Beds & Roll	Weeding	0.8
Shaping	Weeding	0.8
Spring Tooth	Weeding	0.8
Terrace	Weeding	0.8
Sulfur Dusting	None	0

TABLE 3
Summary of CDFA Commodity and Assigned Crop Profile

CDFA Commodity Code	CDFA Crop Name	Crop Profile Used	Emission Factor (lbs/Acre/year)
101999	WHEAT ALL	Wheat	3.70
104999	RYE GRAIN	Wheat	3.70
106199	RICE MILLING	Rice	20.00
106269	FIELD CROP BY-PRODUCTS	Cotton	8.90
108999	FOOD GRAINS MISC.	Corn	6.90
111559	CORN WHITE	Corn	6.90
111991	CORN GRAIN	Corn	6.90
111992	CORN SILAGE	Corn	6.90
112999	OATS GRAIN	Wheat	3.70
113994	BARLEY MALTING	Wheat	3.70
113995	BARLEY FEED	Wheat	3.70
113999	BARLEY UNSPECIFIED	Wheat	3.70
114991	SORGHUM GRAIN	Wheat	3.70
121219	COTTON LINT UPLAND	Cotton	8.90
121229	COTTON LINT PIMA	Cotton	8.90
121299	COTTON LINT UNSPECIFIED	Cotton	8.90
132999	SUGAR BEETS	Sugar Beets	22.80
151999	COTTONSEED	Cotton	8.90
153999	PEANUTS ALL	Safflower	4.50
158269	SAFFLOWER	Safflower	4.50
158316	SUNFLOWER SEED PLANTING	Corn	6.90
158319	SUNFLOWER SEED	Corn	6.90
158499	JOJOBA	Melon	5.70
161131	BEANS LIMA LG. DRY	DryBeans	7.70
161132	BEANS LIMA BABY DRY	DryBeans	7.70
161199	BEANS LIMA UNSPECIFIED	DryBeans	7.70
161717	BEANS KIDNEY RED	DryBeans	7.70
161721	BEANS PINK	DryBeans	7.70
161741	BEANS BLACKEYE (PEAS)	DryBeans	7.70
161742	BEANS GARBANZO	Garbanzo	7.70
162399	BEANS FAVA	DryBeans	7.70
163999	PEAS DRY EDIBLE	DryBeans	7.70
169999	BEANS DRY EDIBLE UNSPEC.	DryBeans	7.70
171019	WHEAT SEED	Wheat	3.70
171049	RYE SEED	Wheat	3.70
171069	RICE SEED	Rice	20.00
171129	OATS SEED	Wheat	3.70
171139	BARLEY SEED	Wheat	3.70
171519	COTTON SEED PLANTING	Cotton	8.90
171582	SAFFLOWER SEED PLANTING	Safflower	4.50
171619	BEANS SEED	DryBeans	7.70
171639	PEAS SEED	DryBeans	7.70
171949	FIELD CROPS SEED MISC.	Corn	6.90
171959	SEED VEG & VINECROP	Vegetables	8.50
172119	SEED ALFALFA	Alfalfa	4.00
172289	SEED CLOVER UNSPECIFIED	Alfalfa	4.00
173079	SEED BERMUDA GRASS	Alfalfa	4.00
173669	SEED SUDAN GRASS	Alfalfa	4.00
173999	SEED GRASS UNSPECIFIED	Alfalfa	4.00
178999	SEED OTHER (NO FLOWERS)	Alfalfa	4.00
181999	HAY ALFALFA	Alfalfa	4.00
188499	HAY GRAIN	Alfalfa	4.00
188799	HAY WILD	Alfalfa	4.00
188899	HAY SUDAN	Alfalfa	4.00
188999	HAY OTHER UNSPECIFIED	Alfalfa	4.00
194599	PASTURE IRRIGATED	No Land Prep.	0.00
194699	PASTURE RANGE	No Land Prep.	0.00
194799	PASTURE FORAGE MISC.	No Land Prep.	0.00
195199	SILAGE	Wheat	3.70
195299	HAY GREEN CHOP	Alfalfa	4.00
195399	STRAW	Alfalfa	4.00
198199	RICE WILD	Rice	20.00
198999	FIELD CROPS UNSPECIFIED	Corn	6.90
201119	ORANGES NAVEL	Citrus	0.07
201519	ORANGES VALENCIA	Citrus	0.07
201999	ORANGES UNSPECIFIED	Citrus	0.07
202999	GRAPEFRUIT ALL	Citrus	0.07

TABLE 3 (continued)
Summary of CDFA Commodity Code and Assigned Crop Profile

CDFA Commodity Code	CDFA Crop Name	Crop Profile Used	Emission Factor (lbs/Acre/year)
203999	TANGERINES & MANDARINS	Citrus	0.07
204999	LEMONS ALL	Citrus	0.07
205999	LIMES ALL	Citrus	0.07
206999	TANGELOS	Citrus	0.07
207999	KUMQUATS	Citrus	0.07
208059	CITRUS BY-PRODUCTS MISC.	Citrus	0.07
209999	CITRUS UNSPECIFIED	Citrus	0.07
211999	APPLES ALL	Citrus	0.07
212199	PEACHES FREESTONE	Citrus	0.07
212399	PEACHES CLINGSTONE	Citrus	0.07
212999	PEACHES UNSPECIFIED	Citrus	0.07
213199	CHERRIES SWEET	Citrus	0.07
214199	PEARS BARTLETT	Citrus	0.07
214899	PEARS ASIAN	Citrus	0.07
214999	PEARS UNSPECIFIED	Citrus	0.07
215199	PLUMS	Citrus	0.07
215399	PLUMCOTS	Citrus	0.07
215999	PLUMS DRIED	Citrus	0.07
216199	GRAPES TABLE	Grapes-Table	0.83
216299	GRAPES WINE	Grapes-Wine	1.50
216399	GRAPES RAISIN	Grapes-Raisin	2.60
216999	GRAPES UNSPECIFIED	Grapes-Wine	1.50
217999	APRICOTS ALL	Citrus	0.07
218199	NECTARINES	Citrus	0.07
218299	PERSIMMONS	Citrus	0.07
218399	POMEGRANATES	Citrus	0.07
218499	QUINCE	Citrus	0.07
218839	CHERIMOYAS	Citrus	0.07
218889	BIOMASS ORCHARD	Almonds	3.13
218899	FRUITS & NUTS UNSPECIFIED	Citrus	0.07
221999	AVOCADOS ALL	Citrus	0.07
224999	DATES	Citrus	0.07
225999	FIGS DRIED	Citrus	0.07
226999	OLIVES	Citrus	0.07
228019	GUAVAS	Citrus	0.07
229999	KIWIFRUIT	Citrus	0.07
230639	BERRIES BLACKBERRIES	Grapes-Table	0.83
230869	BERRIES BOYSENBERRIES	Grapes-Table	0.83
234799	BERRIES LOGANBERRIES	Grapes-Table	0.83
236199	BERRIES RASPBERRIES	Grapes-Table	0.83
237199	BERRIES STRAWBERRIES F MKT	Melon	5.70
237299	BERRIES STRAWBERRIES PROC.	Melon	5.70
237999	BERRIES STRAWBERRIES UNSPEC	Melon	5.70
239999	BERRIES BUSHBERRIES UNSPEC.	Grapes-Table	0.83
261999	ALMONDS ALL	Almonds	3.13
263999	WALNUTS ENGLISH	Almonds	3.13
264999	PECANS	Almonds	3.13
265999	WALNUTS BLACK	Almonds	3.13
266999	CHESTNUTS	Almonds	3.13
267999	MACADAMIA NUTS	Almonds	3.13
268079	PISTACHIOS	Almonds	3.13
268099	ALMOND HULLS	Almonds	3.13
301999	ARTICHOKES	Melon	5.70
302199	ASPARAGUS FRESH MARKET	Melon	5.70
302299	ASPARAGUS PROCESSING	Melon	5.70
302999	ASPARAGUS UNSPECIFIED	Melon	5.70
303999	BEANS LIMA GREEN	DryBeans	7.70
304199	BEANS SNAP FRESH MARKET	DryBeans	7.70
304299	BEANS SNAP PROCESSING	DryBeans	7.70
304399	BEANS FRESH UNSPECIFIED	DryBeans	7.70
304999	BEANS SNAP UNSPECIFIED	DryBeans	7.70
305999	BEETS GARDEN	Sugar Beets	22.80
306999	RAPPINI	Sugar Beets	22.80
307189	BROCCOLI FOOD SERVICE	Vegetables	8.50
307199	BROCCOLI FRESH MARKET	Vegetables	8.50
307299	BROCCOLI PROCESSING	Vegetables	8.50
307919	BROCCOLI UNSPECIFIED	Vegetables	8.50
308999	BRUSSELS SPROUTS	Melon	5.70

TABLE 3 (continued)
Summary of CDFA Commodity Code and Assigned Crop Profile

CDFA Commodity Code	CDFA Crop Name	Crop Profile Used	Emission Factor (lbs/Acre/year)
309999	CABBAGE CH. & SPECIALTY	Lettuce	11.50
310999	CABBAGE HEAD	Lettuce	11.50
313189	CARROTS FOOD SERVICE	Sugar Beets	22.80
313199	CARROTS FRESH MARKET	Sugar Beets	22.80
313299	CARROTS PROCESSING	Sugar Beets	22.80
313999	CARROTS UNSPECIFIED	Sugar Beets	22.80
314189	CAULIFLOWER FOOD SERVICE	Vegetables	8.50
314199	CAULIFLOWER FRESH MARKET	Vegetables	8.50
314299	CAULIFLOWER PROCESSING	Vegetables	8.50
314999	CAULIFLOWER UNSPECIFIED	Vegetables	8.50
316189	CELERY FOOD SERVICE	Lettuce	11.50
316199	CELERY FRESH MARKET	Lettuce	11.50
316299	CELERY PROCESSING	Lettuce	11.50
316999	CELERY UNSPECIFIED	Lettuce	11.50
318999	RADICCHIO	Lettuce	11.50
320999	CHIVES	Lettuce	11.50
322999	COLLARD GREENS	Lettuce	11.50
323999	CORN SWEET ALL	Corn	6.90
325999	CUCUMBERS	Vegetables	8.50
330999	EGGPLANT ALL	Vegetables	8.50
331999	ENDIVE ALL	Lettuce	11.50
332999	ESCAROLE ALL	Lettuce	11.50
333999	ANISE (FENNEL)	Lettuce	11.50
335999	GARLIC ALL	Garlic	6.50
337999	KALE	Lettuce	11.50
338999	KOHLRABI	Lettuce	11.50
339196	LETTUCE BULK SALAD PRODS.	Lettuce	11.50
339999	LETTUCE UNSPECIFIED	Lettuce	11.50
340999	LETTUCE HEAD	Lettuce	11.50
341999	LETTUCE ROMAINE	Lettuce	11.50
342999	LETTUCE LEAF	Lettuce	11.50
343999	MELONS CANTALOUPE	Melon	5.70
348999	MELONS HONEYDEW	Melon	5.70
354299	MELONS UNSPECIFIED	Melon	5.70
354999	MELONS WATERMELON	Melon	5.70
355999	MUSHROOMS	No Land Prep.	0.00
356999	MUSTARD	Lettuce	11.50
357999	OKRA	Lettuce	11.50
358999	ONIONS	Onions	6.50
359999	PARSLEY	Lettuce	11.50
361299	PEAS GREEN PROCESSING	DryBeans	7.70
361999	PEAS GREEN UNSPECIFIED	DryBeans	7.70
363999	PEPPERS BELL	Tomatoes	10.10
364999	PEPPERS CHILI HOT	Tomatoes	10.10
366999	PUMPKINS	Melon	5.70
367999	RADISHES	Sugar Beets	22.80
368999	RHUBARB	Lettuce	11.50
370999	RUTABAGAS	Sugar Beets	22.80
372999	ONIONS GREEN & SHALLOT	Onions	6.50
374189	SPINACH FOOD SERVICE	Lettuce	11.50
374199	SPINACH FRESH MARKET	Lettuce	11.50
374299	SPINACH PROCESSING	Lettuce	11.50
374999	SPINACH UNSPECIFIED	Lettuce	11.50
375999	SQUASH	Melon	5.70
376999	SWISS CHARD	Lettuce	11.50
378199	TOMATOES FRESH MARKET	Tomatoes	10.10
378299	TOMATOES PROCESSING	Tomatoes	10.10
378999	TOMATOES UNSPECIFIED	Tomatoes	10.10
380999	TURNIPS ALL	Sugar Beets	22.80
381999	GREENS TURNIP & MUSTARD	Lettuce	11.50
387999	LEEKS	Onions	6.50
391999	POTATOES IRISH ALL	Sugar Beets	22.80
392999	POTATOES SWEET	Sugar Beets	22.80
393999	HORSERADISH	Onions	6.50
394199	SALAD GREENS NEC.	Lettuce	11.50
394999	PEAS EDIBLE POD (SNOW)	DryBeans	7.70
395999	VEGETABLES ORIENTAL ALL	Vegetables	8.50
396999	SPROUTS ALFALFA & BEAN	Lettuce	11.50

TABLE 3 (continued)
Summary of CDFA Commodity Code and Assigned Crop Profile

CDFA Commodity Code	CDFA Crop Name	Crop Profile Used	Emission Factor (lbs/Acre/year)
398199	CUCUMBERS GREENHOUSE	No Land Prep.	0.00
398299	TOMATOES GREENHOUSE	No Land Prep.	0.00
398399	TOMATOES CHERRY	Tomatoes	10.10
398499	TOMATILLO	Tomatoes	10.10
398559	CILANTRO	Lettuce	11.50
398599	SPICES AND HERBS	Lettuce	11.50
398899	VEGETABLES BABY	Vegetables	8.50
398999	VEGETABLES UNSPECIFIED	Vegetables	8.50
832919	POTATOES SEED	Sugar Beets	22.80
824999	NURSERY FRT/VINE/NUT N-BEAR	None	
825379	NURSERY PLANTS STRAWBERRY	None	
834999	NURSERY PLANTS VEG. BEDDING	None	
851999	CHRISTMAS TREES & CUT GREENS	None	
861999	NURSERY FLOWER SEEDS	None	
862480	NURSERY BULBS LILY	None	
862999	NURSERY FL BLBS./CRMS./RHZ.	None	
863999	NURSERY FL. PROPG. MTRLS	None	
864663	NURSERY PLANTS ROSE	None	
864999	NURSERY PLANTS BEDDING	None	
866209	FLOWERS MUMS POTTED	None	
866559	NURSERY PLANTS ORCHID	None	
866605	FLOWERS POINSETTIA POTTED	None	
866999	NURSERY PLANTS POT'D UNSP	None	
867055	FLOWERS ASTERS CUT	None	
867170	FLOWERS CARNATION CUT STD.	None	
867171	FLOWERS CARNATION CUT MIN.	None	
867179	FLOWERS CARNATION UNSPEC.	None	
867205	FLOWERS CHRYSNTH. CUT STD.	None	
867206	FLOWERS CHRYSNTH. CUT POM.	None	
867209	FLOWERS CHRYSNTH. UNSPEC.	None	
867360	FLOWERS GARDENIAS CUT	None	
867435	FLOWERS IRISES CUT	None	
867559	FLOWERS ORCHIDS CUT ALL	None	
867663	FLOWERS ROSES CUT STANDARD	None	
867664	FLOWERS ROSES CUT MIN.	None	
867669	FLOWERS ROSES UNSPECIFIED	None	
867899	FLOWERS DECORATIVE DRIED	None	
867999	FLOWERS CUT UNSPECIFIED	None	
868999	FLOWERS FOLIAGE CUT ALL	None	
876130	FLOWERS CACTI SUCCULENTS	None	
879999	FLOWERS FOLIAGE PLANTS	None	
892999	NURSERY TURF	No Land Prep.	0.00
894999	NURSERY HERBAC. PRRNLS	None	
895999	NURSERY WOODY ORNAMNTALS	None	
898999	NURSERY HORT. SPECMN. MISC.	None	
899999	NURSERY PRODUCTS MISC.	None	
933179	FOREST PRODUCTS FIREWOOD	None	

TABLE 4
2000 Agricultural Land Preparation PM_{10} emissions and Seasonal Profile

AB	CO	County	JANT	FEBT	MART	APRT	MAYT	JUNT	JULT	AUGT	SEPT	OCTT	NOVT	DECT
GBV	2	ALPINE												
	14	INYO	0.090	0.007	0.007	0.007	0.007	0.007	0.009	0.013	0.013	0.281	0.281	0.277
	26	MONO	0.083	0.030	0.030	0.030	0.030	0.030	0.037	0.044	0.044	0.217	0.217	0.210
LC	17	LAKE	0.048	0.000	0.000	0.005	0.021	0.021	0.016	0.016	0.016	0.194	0.331	0.331
LT	9	EL DORADO	0.033	0.000	0.000	0.016	0.071	0.071	0.055	0.055	0.055	0.240	0.203	0.203
	31	PLACER	0.005	0.000	0.076	0.415	0.415	0.000	0.000	0.000	0.000	0.026	0.031	0.031
MC	3	AMADOR	0.077	0.000	0.069	0.011	0.048	0.048	0.037	0.037	0.037	0.198	0.220	0.220
	5	CALAVERAS	0.047	0.000	0.043	0.005	0.024	0.024	0.019	0.019	0.019	0.113	0.344	0.344
	9	EL DORADO	0.033	0.000	0.000	0.016	0.071	0.071	0.055	0.055	0.055	0.240	0.203	0.203
	22	MARIPOSA	0.170	0.000	0.284	0.001	0.003	0.003	0.002	0.002	0.002	0.006	0.264	0.264
	29	NEVADA	0.000	0.000	0.000	0.035	0.159	0.159	0.123	0.123	0.123	0.276	0.000	0.000
	31	PLACER	0.005	0.000	0.076	0.415	0.415	0.000	0.000	0.000	0.000	0.026	0.031	0.031
	32	PLUMAS	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.302	0.302	0.302
	46	SIERRA	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.302	0.302	0.302
	55	TUOLUMNE	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.302	0.302	0.302
MD	15	KERN	0.031	0.054	0.057	0.016	0.016	0.016	0.020	0.021	0.021	0.081	0.337	0.332
	19	LOS ANGELES	0.063	0.033	0.047	0.032	0.032	0.032	0.056	0.054	0.054	0.204	0.198	0.194
	33	RIVERSIDE	0.055	0.047	0.069	0.020	0.017	0.017	0.073	0.021	0.021	0.162	0.254	0.242
	36	SAN BERNARDINO	0.094	0.015	0.060	0.014	0.015	0.015	0.023	0.015	0.015	0.221	0.257	0.256
NC	8	DEL NORTE	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.302	0.302	0.302
	12	HUMBOLDT	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.194	0.373	0.373
	23	MENDOCINO	0.008	0.008	0.008	0.038	0.144	0.144	0.114	0.114	0.114	0.261	0.024	0.024
	49	SONOMA	0.030	0.003	0.009	0.021	0.086	0.086	0.067	0.067	0.067	0.226	0.169	0.169
	53	TRINITY	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.302	0.302	0.302
NCC	27	MONTEREY	0.022	0.029	0.030	0.020	0.023	0.023	0.293	0.025	0.025	0.330	0.110	0.070
	35	SAN BENITO	0.036	0.011	0.015	0.004	0.005	0.005	0.248	0.009	0.009	0.345	0.173	0.139
	44	SANTA CRUZ	0.013	0.048	0.048	0.017	0.013	0.013	0.250	0.013	0.013	0.278	0.166	0.128
NEP	18	LASSEN	0.078	0.000	0.008	0.042	0.042	0.000	0.017	0.000	0.000	0.270	0.271	0.269
	25	MODOC	0.088	0.006	0.006	0.006	0.006	0.006	0.008	0.009	0.009	0.273	0.291	0.291
	47	SISKIYOU	0.066	0.018	0.018	0.018	0.018	0.018	0.030	0.026	0.026	0.187	0.288	0.287
SC	19	LOS ANGELES	0.063	0.033	0.047	0.032	0.032	0.032	0.056	0.054	0.054	0.204	0.198	0.194
	30	ORANGE	0.035	0.139	0.147	0.007	0.007	0.007	0.080	0.007	0.007	0.188	0.214	0.160
	33	RIVERSIDE	0.055	0.047	0.069	0.020	0.017	0.017	0.073	0.021	0.021	0.162	0.254	0.242
	36	SAN BERNARDINO	0.094	0.015	0.060	0.014	0.015	0.015	0.023	0.015	0.015	0.221	0.257	0.256
SCC	40	SAN LUIS OBISPO	0.033	0.036	0.041	0.018	0.024	0.024	0.155	0.022	0.024	0.244	0.205	0.176
	42	SANTA BARBARA	0.036	0.058	0.065	0.033	0.028	0.028	0.183	0.028	0.028	0.255	0.147	0.109
	56	VENTURA	0.022	0.048	0.052	0.012	0.012	0.012	0.273	0.015	0.015	0.317	0.134	0.089
SD	37	SAN DIEGO	0.063	0.064	0.043	0.024	0.025	0.025	0.054	0.028	0.028	0.209	0.222	0.215
SF	1	ALAMEDA	0.120	0.000	0.132	0.004	0.018	0.018	0.014	0.014	0.014	0.162	0.253	0.253
	7	CONTRA COSTA	0.118	0.021	0.160	0.005	0.006	0.006	0.006	0.006	0.006	0.096	0.286	0.284
	21	MARIN	0.056	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.179	0.367	0.367
	28	NAPA	0.006	0.000	0.000	0.033	0.146	0.146	0.114	0.114	0.114	0.275	0.026	0.026
	38	SAN FRANCISCO												
	41	SAN MATEO	0.027	0.133	0.133	0.014	0.014	0.014	0.014	0.023	0.023	0.126	0.257	0.219
	43	SANTA CLARA	0.058	0.036	0.043	0.008	0.010	0.010	0.140	0.017	0.017	0.283	0.202	0.177
	48	SOLANO	0.075	0.039	0.089	0.003	0.004	0.004	0.004	0.004	0.004	0.128	0.328	0.318
	49	SONOMA	0.030	0.003	0.009	0.021	0.086	0.086	0.067	0.067	0.067	0.226	0.169	0.169
SJV	10	FRESNO	0.033	0.062	0.062	0.016	0.021	0.014	0.034	0.035	0.020	0.119	0.297	0.287
	15	KERN	0.031	0.054	0.057	0.016	0.016	0.016	0.020	0.021	0.021	0.081	0.337	0.332
	16	KINGS	0.047	0.059	0.117	0.003	0.003	0.003	0.003	0.004	0.003	0.036	0.363	0.359
	20	MADERA	0.038	0.024	0.059	0.009	0.025	0.025	0.020	0.047	0.020	0.091	0.322	0.321
	24	MERCED	0.060	0.044	0.089	0.022	0.023	0.010	0.012	0.012	0.012	0.087	0.316	0.313
	39	SAN JOAQUIN	0.073	0.051	0.109	0.032	0.037	0.019	0.020	0.022	0.022	0.116	0.255	0.244
	50	STANISLAUS	0.064	0.056	0.113	0.015	0.016	0.005	0.014	0.005	0.005	0.113	0.307	0.286
	54	TULARE	0.065	0.034	0.115	0.008	0.008	0.008	0.007	0.012	0.007	0.062	0.341	0.334
SS	13	IMPERIAL	0.068	0.035	0.045	0.026	0.026	0.026	0.069	0.035	0.035	0.191	0.225	0.219
	33	RIVERSIDE	0.055	0.047	0.069	0.020	0.017	0.017	0.073	0.021	0.021	0.162	0.254	0.242
SV	4	BUTTE	0.005	0.004	0.081	0.387	0.387	0.001	0.001	0.001	0.001	0.015	0.060	0.058
	6	COLUSA	0.009	0.016	0.079	0.355	0.355	0.002	0.002	0.002	0.002	0.035	0.074	0.070
	11	GLENN	0.018	0.013	0.094	0.331	0.331	0.003	0.004	0.004	0.004	0.028	0.087	0.082
	31	PLACER	0.005	0.000	0.076	0.415	0.415	0.000	0.000	0.000	0.000	0.026	0.031	0.031
	34	SACRAMENTO	0.078	0.014	0.123	0.117	0.123	0.016	0.016	0.016	0.016	0.071	0.205	0.205
	45	SHASTA	0.051	0.000	0.028	0.152	0.152	0.000	0.039	0.000	0.000	0.208	0.188	0.182
	48	SOLANO	0.075	0.039	0.089	0.003	0.004	0.004	0.004	0.004	0.004	0.128	0.328	0.318
	51	SUTTER	0.011	0.012	0.086	0.362	0.362	0.001	0.001	0.001	0.001	0.028	0.071	0.067
	52	TEHAMA	0.051	0.024	0.083	0.054	0.054	0.000	0.000	0.000	0.000	0.083	0.331	0.320
	57	YOLO	0.062	0.021	0.088	0.136	0.137	0.003	0.003	0.003	0.003	0.095	0.223	0.223
	58	YUBA	0.006	0.000	0.082	0.405	0.405	0.000	0.000	0.000	0.000	0.015	0.043	0.043