Impact of 1,3-D Restrictions in California after a Ban on Methyl Bromide

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The use of 1,3-dichloropropene (1,3-D) in California was suspended in April 1990 after air quality monitoring detected levels above air quality standards in Merced County. In December 1994, its use was reinstated with several restrictions. Current restrictions include a limit on the total amount of 1,3-D that may be applied within 36 square mile townships. 1,3-D is currently used for a wide variety of crops. Over 2.4 million pounds of 1,3-D were used in California in 1997. (See Table 1.) Carrots accounted for nearly 40% of this use, followed by potatoes as the next largest single crop use. Perennial crops, including grapes, almonds and walnuts also account for a large portion of 1,3-D use.

The limit on the amount of 1,3-D that may be used in each township depends on application depth and timing of applications within each township. A total of 90,250 lbs. of 1,3-D per township is allowed if all applications are made to a depth greater than 18 inches between February and November. The limit is lowered as applications are made at shallow depths or during December or January. The lower limits are calculated by counting each pound applied at a shallow depth during February through November as 1.9 pounds. Similarly, the amount of 1,3-D used is weighted more heavily for applications during December or January. The township caps are just one part of the restrictions on 1,3-D use in California. Growers must also maintain a 300 foot buffer zone around occupied structures and meet soil moisture requirements that may reduce the efficacy of 1,3-D.

The township restrictions have already limited the amount of acreage that is treated with 1,3-D. In 1997, seven townships used over 47,500 lbs. of 1,3-D (the lower limit if all applications are made at a shallow depth from February to November), though none exceeded 90,250 lbs. One township in Fresno County used 90,214 lbs. of 1,3-D in 1997. Three townships are in Kern County, where carrot acreage is concentrated. Monterey, San Joaquin and Stanislaus Counties each had one township exceeding 47,500 lbs. of 1,3-D in 1997. The township restrictions are expected to become even more binding as the phaseout of methyl bromide, another widely used agricultural fumigant, proceeds. For most of the crops using methyl bromide, 1,3-D alone or in combination with other materials, is considered the best available alternative. When methyl bromide is no longer available, demand for 1,3-D is expected to increase.

We present estimates of demand for 1,3-D after a ban on methyl bromide. The California Pesticide Use Database provides detailed spatial information on all pesticide applications, which allows calculation of pesticide use by township. Post-ban demand for 1,3-D by township was estimated using the 1997 pesticide use data for 1,3-D and methyl bromide. All current uses of 1,3-D are included in the calculation. Major crop uses of methyl bromide were assumed to switch to 1,3-D at application rates and depths appropriate to the practices specific to each crop. Application dates were not considered in the

calculation. The impact of buffer zones required for 1,3-D, which are larger than those required for methyl bromide applications are also not considered due to the site specific nature of those restrictions. Crops assumed to switch to 1,3-D include strawberries, perennials, sweet potatoes, nurseries, watermelons, peppers, tomatoes, carrots and lettuce. Over 90% of areas treated with methyl bromide are assumed to switch to 1,3-D and are included in the calculations presented here. Two sets of calculations have been performed, one assumes strawberry growers switch to 1,3-D and the other assumes they chose another alternative such as chloropicrin to methyl bromide.

Demand for 1,3-D is estimated to increase from 2.4 million pounds in 1997 to over 15 million pounds if strawberry growers choose to use 1,3-D, and 11 million pounds if strawberry growers do not use 1,3-D. However, under current restrictions, use will be limited to 9.9 million (64% of total demand) or 8.8 million pounds (80% of total demand) with and without strawberries, respectively. The restrictions will be binding in 53 or 36 townships with and without strawberries. Table 2 shows the number of townships in each county that will reach the limits on 1,3-D use, as well as the amount of 1,3-D demand that is over the limit. When strawberry growers are assumed to use 1,3-D, Monterey County has the most townships with demand in excess of the current limits. Monterey County has the largest acreage in strawberry production in the state. Kern County is also estimated to have nine townships where demand is over the limit.

It remains unclear how the use of 1,3-D will be distributed in areas where the restrictions on use will be binding. Assuming the available 1,3-D is distributed by crop in proportion to its demand within each township, an estimate of which crops are most affected by the restrictions may be obtained. The crops that are expected to be most affected are strawberries, sweet potatoes, almonds, nurseries, carrots and perennial crops. Table 3 shows the number of acres in each crop that are estimated to be demand 1,3-D and the number of acres over the limit.

For many crops, whether or not strawberry growers choose to use 1,3-D has little impact on how the restrictions will affect the amount of acreage they are allowed to treat, since these crops are generally grown in areas where strawberries are not grown. This is the case for crops grown primarily in the interior valleys such as almonds, carrots and sweet potatoes. However, some crops would be in direct competition with strawberries for allotted 1,3-D use. These crops are grown in proximity to strawberries, including broccoli, brussels sprouts, lettuce and tomatoes.

New application methods for 1,3-D which decrease emissions, may allow the easing of the restrictions on 1,3-D use in California. Application of 1,3-D through drip irrigation systems, for instance, may reduce emissions from treated fields. Though not currently available for widespread use, an emulsified version of Telone C-35 (1,3-D+chloropicrin) recently received a federal Experimental Use Permit that will allow strawberry growers to treat up to 800 acres for the 1999-2000 growing season. Methods to reduce emissions during 1,3-D application for perennial crops are also being investigated.

Table 1. 1,3-D Use by Crop in California in 1997

Crop	Pounds of 1,3-D
Carrots	929,297
Potatoes	264,134
Grapes	221,108
Soil Application[1]	144,061
Nurseries	114,375
Melons	113,790
Sweet Potato	75,080
Brussels Sprouts	72,516
Cantaloupe	71,999
Broccoli	56,417
Almond	56,052
Tomatoes	42,176
Walnuts	26,291
Peaches	25,474
STATE TOTAL[2]	**2,400,930**

[1] Reported unspecified as to crop. Majority of this acreage is located in Fresno and Tulare Counties.

[2] Sum does not equal total. Not all crops shown.

Source: California Pesticide Use Database

Table 2. Counties Where 1,3-D Township Restrictions are Expected to Limit Acreage Treated

	With strawberries		Without strawberries	
County	**# of Townships Over Limit**	**Lbs. of 1,3-D Over Limit[1]**	**# of Townships Over Limit**	**Lbs. of 1,3-D Over Limit[1]**
Del Norte	1	4,760	1	4,760
Fresno	2	67,784	2	67,784
Kern	8	915,863	8	915,863
Merced	6	1,702,351	6	1,622,026
Monterey	9	2,687,809	1	29,593
Riverside	1	64,227	1	64,227
San Diego	1	123,162	1	28,771
San Joaquin	3	115,288	3	115,288
Santa Barbara	2	970,649	0	0
Santa Cruz	4	743,407	0	0
Shasta	1	28,936	1	28,936
Sonoma	1	26,768	1	26,768
Stanislaus	4	154,580	4	152,347
Sutter	1	31,821	1	31,821
Tulare	3	94,420	3	94,420
Ventura	6	1,855,946	3	105,815
STATE TOTAL	**53**	**9,587,769**	**36**	**3,288,420**

[1] Adjusted pounds where pounds of 1,3-D applied to a depth less than 18 inches count as 1.9 lbs.

Table 3. Estimated Acreage Over 1,3-D Township Limit After Methyl Bromide Ban by Crop

Crop	With Strawberries Acres Over Limit	Without Strawberries Acres Over Limit	Total Acres With 1,3-D Demand
Almonds	2,310	2,293	5,068
Broccoli	315	109	616
Brussels Sprouts	296	0	792
Carrots	1,219	1,136	10,297
Grapes	228	216	4,638
Lettuce	293	31	1,206
Nurseries	2,080	1,508	7,004
Parsley	189	71	282
Peach	109	106	1,013
Peppers	558	339	1,904
Potatoes	229	229	2,053
Prune	21	21	618
Soil Application[1]	389	388	6,050
Spinach	59	24	199
Strawberries	12,962	16	19,029/62[2]
Sweet Potatoes	3,722	3,684	5,941
Tomatoes	354	147	1,972
Watermelons	180	180	1,334
STATE TOTAL[3]	**25,739**	**10,584**	**75,923/56,938[2]**

[1] Reported unspecified as to crop. The areas over the limits are located primarily in Fresno and Tulare Counties and are assumed to be perennial crops.

[2] With and without assuming strawberry growers switch to 1,3-D, respectively.

[3] Sum does not equal total. Not all crops shown.