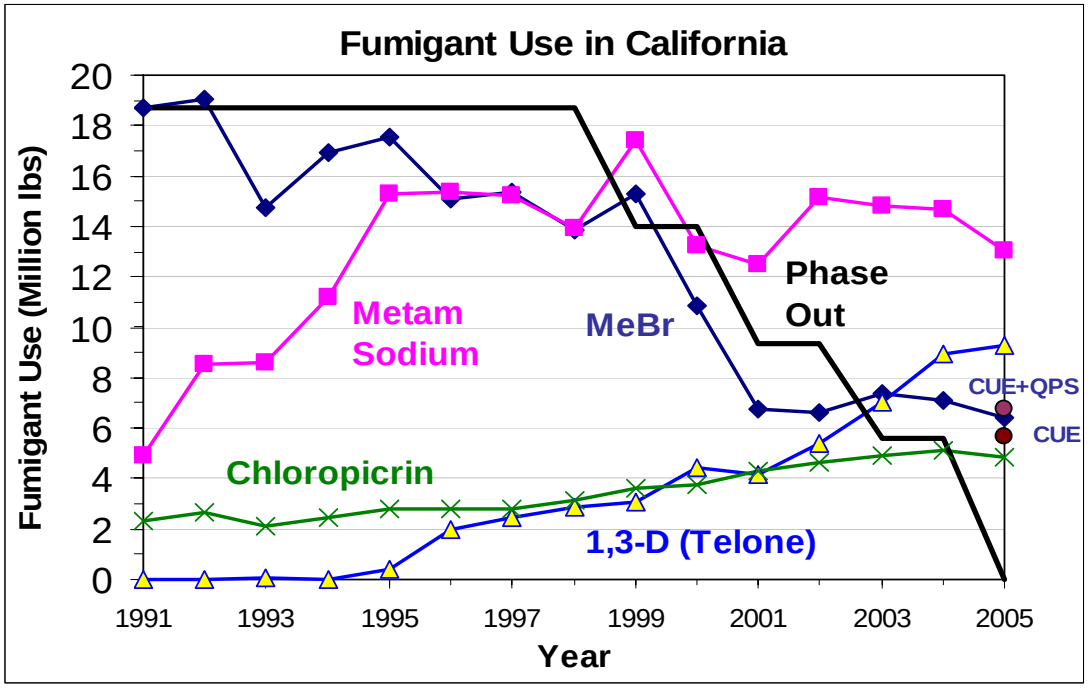
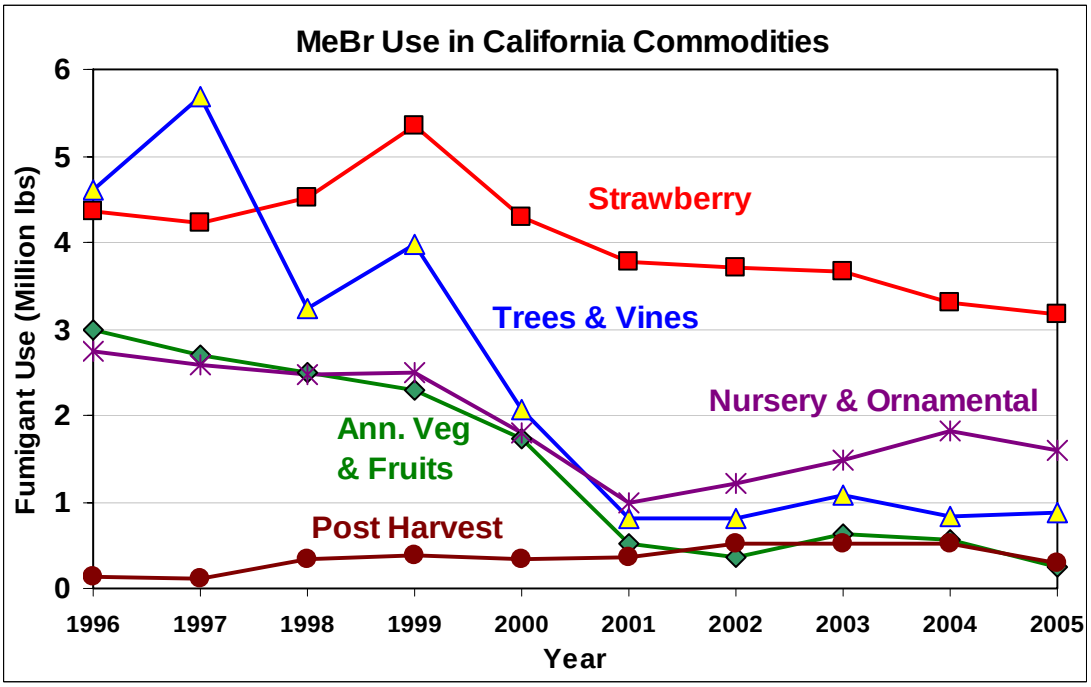
FUMIGANT USE IN CALIFORNIA – RESPONSE TO THE PHASE-OUT

Tom Trout, USDA-ARS, Parlier, CA

The Pesticide Use Reporting (PUR) requirements in California allow accurate estimation of the use of fumigants in the state. The PUR database compiled by CA Dept of Pesticide Regulation (CDPR) was used to generate the information in this paper. The figure below shows the use trends since 1991 for the 4 primary soil fumigants, methyl bromide (MeBr), 1,3-dichloropropene (1,3-D) (Telone® products), metam sodium, and chloropicrin, along with the MeBr phase out allowances based on reductions from 1991 use in California.

Use of MeBr has declined gradually since 1991. By 1999, the use was about 75% of the 1991 use, as required by the Montreal Protocol. In 2000 and 2001, the use of MeBr dropped dramatically - the result of a price increase to over $3.00 per lb (compared to about $1.00 before 1997) and restrictive California regulations - and remained below phaseout levels through 2002. MeBr use in 2003 and 2004 exceeded the phaseout limit through use of material carryover from prior years and Quarantine and Preshipment (QPS) use. On Jan 1, 2005, manufacture and importation of MeBr ceased for non-exempted uses. California commodities were allowed 5.69 million lbs. for soil Critical Uses (CUE) in 2005. Certified nursery production is currently considered a Quarantine exemption by US EPA and I estimate about 1 million lbs were used under QPS. With exemptions and carryover, use in 2005 was near 2001 – 2004 use levels. The MeBr reduction has been achieved primarily through full or partial substitution of alternative fumigants, and reduced fumigated acreage of some crops. Total fumigant use has remained relatively steady since 1995.





Most MeBr use in California is for preplant soil fumigation; about 6% is for post-harvest commodity fumigation and less than 1% of use is for structural fumigation. In the mid-nineties, strawberries and perennial crops each used about 30% of the CA consumption; other annual fruits and vegetables and nursery crops each used about 20%. As the phase out has progressed and the price increased, strawberry use has continued while use for other fruits and vegetables, orchards and vineyards has declined dramatically. Since 2000, about half of California MeBr use has been for

strawberries.

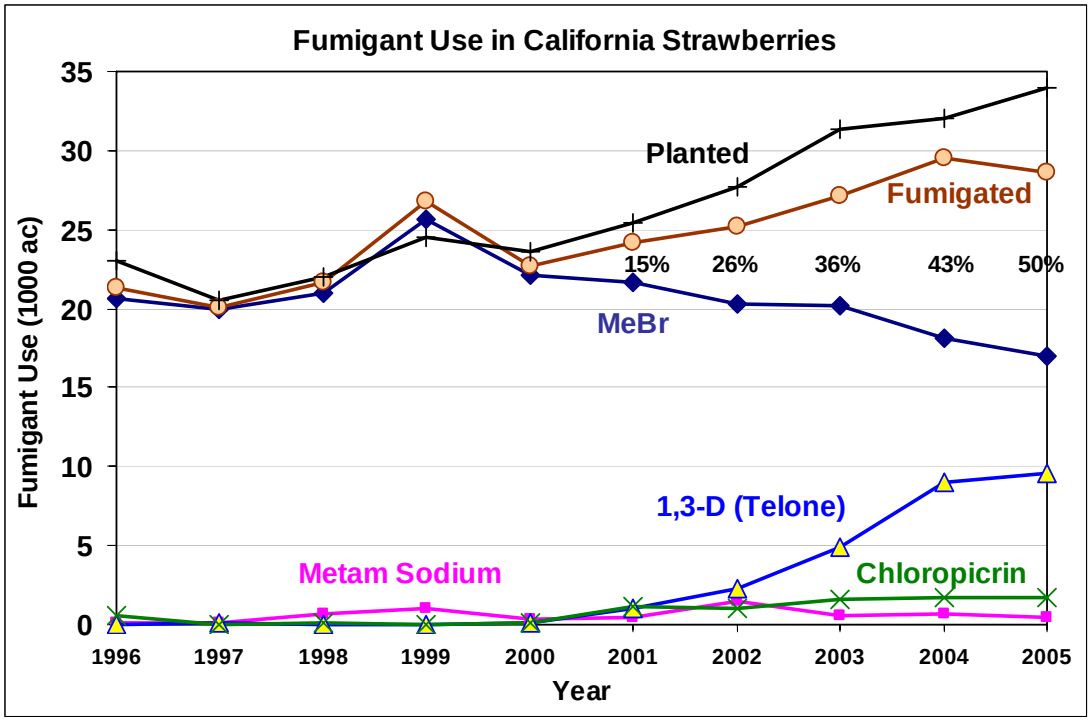
Use of metam sodium increased rapidly from 1991 through 1995 and its total use for soil fumigation was similar to that of MeBr until 2001 when MeBr use decreased. Metam sodium is the most widely used fumigant and it is applied to about twice as many acres as all other fumigants combined. As a low cost fumigant alternative, it is used mainly on annual vegetable and fruit crops such as carrots, processing tomato and potato.

Since 1,3-D was re-introduced in California in 1995, use has increased rapidly for certain crops. As an effective nematicide, it is used mainly for replant of perennial fruit and nut trees and vineyards and on high value crops that suffer significant nematode damage (carrot, sweet potato, melon, potato, tomato). Since 2002, twice as many orchards and vineyards and 6 times more fruit and vegetable (other than strawberry) acres were fumigated with 1,3-D than with MeBr, and its use has exceeded MeBr use the last two years.

The growth rate of 1,3-D use slowed in 2005 for several crops. One reason is likely township caps which limit 1,3-D use to 90,250 lb (or 180,500 lbs, temporarily) per township (36 sq mi) in California. In 2005, 26 townships exceeded the lower (1X) limit and 6 townships reached the higher (2X) limit. Two townships have used up their "banked" allotment and will have to limit use to the lower level. Five additional townships will use up the allotment within 3 years. Primary crops that are affected by township caps are strawberries, sweet potato, carrots, and nurseries.

Chloropicrin use remained fairly steady through the years until 1999 when its use increased, due to increasing proportions of chloropicrin in MeBr/chloropicrin mixtures. It is used for preplant control of plant diseases, especially fungi, in strawberry and some other annual crops in combination with MeBr or 1,3-D. Also, at very low concentrations, it acts as a warning agent with methyl bromide for soil fumigation. It was used as the sole or primary fumigant on 5000 acres in 2005 – mostly for strawberries, melon, and peppers.

About 90% of the California strawberry crop is fumigated and strawberry remains the predominate user of MeBr in California. The proportion of MeBr use in strawberry has declined from about 70% to less than 40% of total fumigant use. Chloropicrin is now the most used fumigant as growers have increased the proportion of chloropicrin in their mixtures with MeBr and use the product in combination with 1,3-D or alone. The figure below shows strawberry acres planted (Calif. Strawberry Com. data), the primary fumigant used on each acre, and the percentage of acres on which MeBr was not used. About 50% of acres were fumigated with alternatives or not fumigated in 2005. The predominant alternative is drip applied 1,3-D and chloropicrin (InLine).


Fumigant Use in California Strawberries
Fumigant Use (1000 ac)
35
30
25
20
15
10
5
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Year
Planted
Fumigated
15%
26%
36%
43%
50%
MeBr
1,3-D (Telone)
Metam Sodium
Chloropicrin

In 2001, emulsified formulations of 1,3-D and chloropicrin were registered for application through drip irrigation systems (*InLine, Telone EC, and Tri-Clor EC*). These products were used on 2000 ac. of strawberry, pepper, and melon in 2001, 6000 ac of these crops in 2002, 8000 ac in 2003 and 13,000 ac in 2004 and 2005. About one-third of the CA strawberry crop was drip fumigated in 2005. Nearly all 1,3-D used for strawberries is drip applied.

The following table gives fumigant use in CA before the phaseout began (1996 – 1999) after the phaseout was enacted (2001 – 2004) and in 2005 for each fumigant and crop or crop group. I have assembled the 1996 - 2005 California fumigant data into an ACCESS database and summarized results by fumigant, crop, and year in spreadsheets. The database contains 160,000 individual fumigation records. Some have been modified from original DPR records through error checking routines and by crop assignments. If you desire additional or more detailed information (for example, for certain crops or locations), contact me (Thomas.Trout@ars.usda.gov).

Annual Fumigant Use in California Compiled and Edited by Tom Trout, USDA-ARS; based on CA Dept. of Pesticide Regulation Pesticide Use Reports Data

(Annual fumigant use (1000 pounds) (averages given for multiyear periods)

	Methyl Bromide			1,3-D (Telone)			Metam Sodium			Chloropicrin			Total Fumigant Use		
	1996-1999	2001-2004	2005	1996-1999	2001-2004	2005	1996-1999	2001-2004	2005	1996-1999	2001-2004	2005	1996-1999	2001-2004	2005
Crop															
Grape	1,739	138	160	230	828	1,403	40	53	69	15	8	19	2,024	1,027	1,651
Tree Fruit (Prunus)	971	109	75	184	710	754	5	2	0	9	12	21	1,162	833	850
Citrus	135	26	4	24	121	143	34	35	3	1	5	0	194	188	149
Almond	767	211	82	123	699	1,408	16	33	0	4	21	7	910	964	1,497
Walnut	459	144	244	53	193	283	5	6	0	3	11	8	520	354	536
Bushberry	81	181	153	1	24	31	2	4	1	43	145	131	126	354	316
Other Perennial	224	70	154	30	177	944	16	3	1	8	8	19	274	258	1,118
Total Perennial Fruits and Nuts	**4,377**	**879**	**873**	**645**	**2,751**	**4,965**	**117**	**135**	**74**	**82**	**211**	**205**	**5,208**	**3,977**	**6,117**
Strawberry	**4,609**	**3,614**	**3,174**	**4**	**750**	**1,599**	**80**	**241**	**303**	**2,118**	**3,158**	**3,435**	**6,811**	**7,763**	**8,510**
Sweet Potato	596	5	1	155	582	538	281	209	241	4	1	1	1,036	797	781
Pepper	410	120	41	50	166	160	286	669	511	51	190	112	796	1,143	823
Melons	475	87	10	161	229	185	647	740	370	25	99	108	1,309	1,156	673
Tomato	336	150	14	118	69	158	3,546	2,792	1,916	103	183	51	4,104	3,195	2,138
Carrot	137	1	0	861	987	915	5,700	5,494	5,918	21	51	57	6,719	6,532	6,890
Potato	0	0	0	176	138	121	1,538	1,455	1,617	0	0	6	1,715	1,618	1,745
Leafy Vegetables	382	90	105	75	122	106	634	732	812	128	91	73	1,219	1,034	1,096
Cole Crops	24	1	11	75	61	53	177	124	71	5	5	4	280	179	139
Misc Vegetables	279	64	58	112	128	120	820	917	400	80	99	93	1,279	1,208	672
Total Annual Fruits and Veg. (not strawberry)	**2,639**	**518**	**240**	**1,784**	**2,483**	**2,356**	**13,630**	**13,132**	**11,856**	**416**	**720**	**505**	**18,456**	**16,863**	**14,957**
Field Crops	**69**	**10**	**41**	**45**	**35**	**57**	**1,247**	**273**	**106**	**4**	**4**	**8**	**1,365**	**321**	**212**
Nursery - Outdoor	1,484	614	866	89	316	283	139	213	322	144	218	264	1,855	1,361	1,735
Nursery - Greenhouse	10	10	0	0	0	0	0	7	0	1	3	2	11	20	2
Nursery - Strawberry	423	456	450	2	5	0	0	0	69	217	216	269	641	677	788
Cut Flowers	521	211	114	17	17	16	35	65	73	82	93	49	656	386	252
Ornamentals	136	74	160	4	1	0	89	28	10	4	12	36	233	114	206
Misc Agriculture	78	12	29	17	3	6	60	12	82	17	4	38	171	31	155
Misc Not-Agriculture	25	30	30	4	1	0	69	152	118	2	1	4	99	184	152
Total Soil Fumigation	**14,369**	**6,428**	**5,975**	**2,611**	**6,361**	**9,282**	**15,466**	**14,258**	**13,013**	**3,087**	**4,639**	**4,816**	**35,507**	**31,695**	**33,086**
Post Harvest	248	472	289	0	0	0	3	14	0	0	0	0	251	486	289
Structural	178	18	21	1	1	0	2	2	0	0	2	2	180	22	23
Misc Fumigation	99	52	121	0	2	9	5	9	23	0	0	0	104	64	153
Total Fumigation	**14,894**	**6,970**	**6,406**	**2,612**	**6,364**	**9,291**	**15,476**	**14,283**	**13,036**	**3,087**	**4,641**	**4,818**	**36,042**	**32,267**	**33,551**