Transitioning to Methyl Bromide Alternatives: A Current U.S. Assessment

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U.S. fruit and vegetable growers, who have continued to rely on existing and internationally approved CUE supplies of methyl bromide, painfully recognize an increase in price, a near future of diminishing supply (**Figure 1**), and the limits to which methyl bromide use rates can be reduced, both as an overall rate and as a percent of formulation with chloropicrin, without loss of pesticidal efficacy and crop yield. In some states and commodities, growers have been reluctant to increasingly transition to new integrated pest management strategies, which for most alternative scenarios, includes co-application of different fumigants and herbicides, and adoption of other alternative cultural practices to achieve pest control efficacy and crop yield response similar to that of methyl bromide.

The transition to alternatives has forced growers to implement significant changes in current production practices, including integration of new fumigant distribution and soil injection technologies, new tillage and or drip irrigation / fumigation practices to enhance the performance of alternatives, and new products and practices to reduce potential fumigant emissions from treated fields. Since all currently registered fumigant alternatives will have further label restrictions placed on them after implementation of EPA's Reregistration Eligibility Documents (RED's), these may ultimately limit and or redefine their future use. New emission reduction strategies, including virtually impermeable films (VIF) may be mandated in some commodity uses to reduce overall field application rates and buffer zone requirements. Grower transition to these new IPM methods are now being incrementally driven by reduced methyl bromide supply, higher product price, and by many other on-farm, within field, pest, soil, crop, and economic considerations.

Clearly the time has arrived in which a significant transition and implementation of the alternatives has and is occurring. To the grower, the adoption of different methyl bromide transition strategies still appears to be to schedule adoption over time to minimize risks associated with changes to the crop production system and performance inconsistency of alternatives. This presentation will characterize the different timelines, levels of adoption, and treatment combinations of alternatives used in various methyl bromide dependent crops and commodities within the U.S.A.. Assessments of alternatives used, methods and rates of application, and proportionate levels of adoption were derived from many sources including published literature, statewide pesticide use records, and direct communication and interview of appropriate statewide commodity, university, regulatory, and or agricultural chemical expert.

CALIFORNIA: California strawberry growers, strongly influenced by state imposed regulatory restrictions on methyl bromide, initiated the adoption of methyl bromide alternatives prior to the 2005 phase-out. By 2007, 55% of the states strawberry acreage of 34,442 acres were utilizing fumigant alternatives to methyl bromide. These alternatives currently consist primarily of drip applied Telone Inline, and to a lesser extent Chloropicrin EC. Metam sodium is also being used to for weed management as a sequential drip applied fumigant 7 days after Telone Inline or Chloropicrin EC application. With high levels of production and pest control efficacy maintained, California has set an encouraging precedent for drip applications of the soil fumigants as an effective alternative approach to methyl bromide and chloropicrin soil fumigation. Unfortunately, current township caps on total 1,3-D use will restrict further expansion of Telone product use in California. Increasing restrictions for use of bed shank fumigations, and resultant emissions, and uncertainties whether VIF and TIF mulches will allow significant rate reductions to reduce buffer zones and or expansion of 1,3-D acreage also appears to be significant limiting factors restriction further increases in alternative fumigant uses in California.

GEORGIA: Georgia tomato, pepper and eggplant growers are approaching a near complete transition to a coapplication approach of a variety of different methyl bromide alternative fumigants. By fall 2009, as much as 85 to 90% of the 7,896 acres of tomatoes, peppers, and eggplant are expected to utilize the Georgia '3-way' fumigant system. In this systems approach, Telone II is applied prebed in advance of bedding, followed by chloropicrin at bed formation, followed by delivery of metam sodium or metam potassium through minicoulters 4 inches deep into the bed top just prior to mulch installation. The near complete transition to alternatives has been driven by needs to reduce production and pest control costs.

NORTH CAROLINA: North Carolina strawberry growers are not currently utilizing alternatives to methyl bromide soil fumigation to any appreciable extent. As much as 30% of the North Carolina tomato and pepper acreage is estimated to be using primarily Telone C35 or Pic Clor 60 as alternatives to methyl bromide chloropicrin soil fumigation. The high cost of methyl bromide and with distributors making available only formulations with 50% or more chloropicrin by volume were generally acknowledge to be the determining factors for adoption of the various alternatives.

FLORIDA: Florida tomato, pepper and eggplant growers are increasingly transitioning to a variety of different methyl bromide alternative treatment regimes. By Fall 2009, as much as 35 to 40% of 50,500 acres of tomatoes, peppers, and eggplant are expected to utilize some combination of Telone, Chloropicrin, methyl iodide, and metam sodium or metam potassium treatment. Of this total acreage, 20 to 25 percent is expected to utilize the '3-way' fumigant system in which Telone II is applied prebed in advance of bedding, followed by chloropicrin at bed formation, followed by delivery of metam sodium or metam potassium through minicoulters 4 inches deep into the bed top just prior to mulch installation. As much as 6000 acres (10%) of the total tomato, pepper, and eggplant acreage within Florida is expected to utilize the formulation of methyl iodide

(50%) and chloropicrin (50%) as the alternative fumigant treatment to that of methyl bromide chloropicrin. Finally, as much as 5% of this total acreage is expected to use a diversity of drip fumigants such as Telone Inline, Pic Clor 60EC and or metam sodium or metam potassium. Coming off a marginally profitable season, many Florida vegetable growers have indicated a need to reduce production costs and have indicated their reluctance to incur the higher costs of methyl bromide chloropicrin.

After a previous year of high productivity but low market pricing, Florida strawberry growers are quickly transitioning to various methyl bromide alternative tactics which minimize crop production and pest control costs. In as much as 30 to 35% of the 8,400 acres of Florida strawberries, growers have elected to double crop strawberry after strawberry, utilizing the same bed, plastic mulch, and drip irrigation system for the two consecutive crops. For double cropped strawberry with an existing bed and plastic mulch cover, the choice for method of fumigant application becomes very simplified because now only a drip, rather than chisel applied fumigant can be used for bed treatment. In most of these fields, a crop termination drip fumigant treatment was applied in April at the conclusion of the harvest season with different fumigant such as metam sodium, metam potassium, or Telone EC. These 2008-09 strawberry cropped fields were then left to summer fallow with periodic herbicide treatments made to the existing bed and row middles for weed control. At the end of the summer fallow, the herbicide treatments are being followed by a preplant drip fumigant treatment during fall 2009. The fall 2009 drip fumigant treatments include either metam sodium, metam potassium, Telone EC, Telone Inline or Chloropicrin EC. Another 10 to 15% of total Florida strawberry acreage will utilize shank applications of Telone C35, Pic Clor 60, metam sodium or metam potassium to replace methyl bromide soil fumigation.

In conclusion, many similarities were observed at state and commodity levels with regard to methyl bromide transition strategy. In most cases, these formerly methyl bromide dependent crops and commodities are expected to utilize some combination of Telone, Chloropicrin, and metam sodium or metam potassium treatment to replace the broad spectrum pest control efficacy of methyl bromide chloropicrin soil fumigation. The degree to which these alternatives have been adopted is largely economic. The decreased supply of methyl bromide with possibility of shortages, coupled with the increased price of $5.70 to $6.00 per pound for a formulation of 50% methyl bromide and 50% chloropicrin (which some growers don’t seem to care for in first place) has finally incentivized growers to try something different and more economical.

Figure 1. Timeline of approved CUE levels of new Methyl bromide production, (as a percentage of 1991 baseline levels), plotted against average price per pound of available methyl bromide chloropicrin formulation to central Florida fruit and vegetable growers.

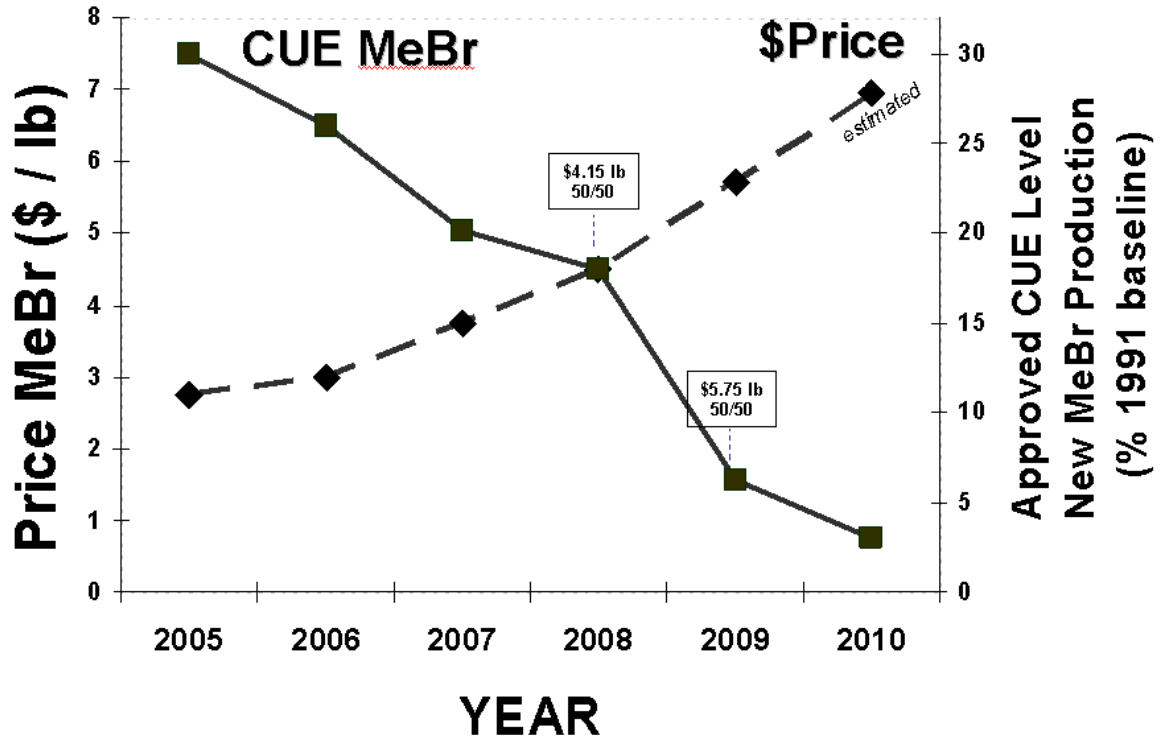

Figure 2. Fall 2009 assessment of currently implemented alternatives to methyl bromide soil fumigation in various U.S. regions and crop commodities. Estimates of percent adoption based on published records or personal interview of appropriate experts with region and or commodity. All rates of fumigant usage based on weights or volumes applied on a per treated acre (43,560 ft^2) basis.

	USAGE RATES PER TREATED ACRE			Estimated % Adoption
	Chloropicrin	1,3-D	Vapam / K-PAM	
California strawberry				
Inline - 25-30 gal (280-336 lb)	93-112 lb	15-18 gal	75 or 60 gal[2]	55%
Pic EC – 300-350 lb	300-350 lb	----	75 or 60 gal[2]	
Florida Tomato, Pepper, Eggplant				
3 way (Telone II, PIC, Vapam)	150 lb	10 gal	75 or 60 gal	35-40%
Pic Chlor 60 (250 lb/a-20.7 gal)	150 lb	9.8 gal		
Florida Strawberry				
Telone II / EC + (Inline 35 gal)	130 lb	10-12[1] + 10-12 gal	75 or 60 gal	45-50%
Telone II / EC +Pic Chlor 300 lbs	179 lb	10-12[1] + 9.7 gal	75 or 60 gal	
Telone II / EC PIC EC (150-200 lb/a)	150-200lb	10-12[1] + 10-12 gal	75 or 60 gal	
Georgia Tomato,Pepper				
3 way (Telone II, PIC, Vapam)	150 lb	10 gal	75 or 60 gal	85%
North Carolina Tomato, Pepper				
C35 (26 gal/ta) 294 lb	102 lb	16.6 gal	----	30%
250 lb (25 gal Pic Chlor 60)	149 lb	9.8 gal	----	
North Carolina Strawberry	----	----	----	<5%

[1] Crop termination or summer broadcast treatment of Telone II or Telone EC (10-12 gal/a), followed in the fall with Inline, Pic EC, or Pic Chlor 60
[2] Rates of Inline or Chloropicrin EC can be reduced (%) when sequential drip applications of Vapam or K-Pam are made to the bed