IMPACT OF EPA'S PROPOSED FUMIGANT RE-REGISTRATION ELIGIBILITY DECISIONS ON PRODUCTION OF FRESH FRUITS AND VEGETABLES IN GEORGIA AND POTENTIAL SOLUTIONS TO MINIMIZE THESE IMPACTS

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SUMMARY

Current proposed US Environmental Protection Agency (EPA) Re-registration Eligibility Decisions for fumigants, including chloropicrin, metam potassium, metam sodium and methyl bromide, will cripple vegetable production in Georgia. The adoption of these regulations in Georgia vegetable plasticulture production, at a minimum, would 1) reduce farmer income by $20.94 million or 15.3% of their total income; 2) reduce sales value or output impact by $73.13 million; 3) reduce labor income by $35.1 million; and 4) would eliminate at least 775 workers. In bareground vegetable production, these proposed regulations would completely eliminate fumigant use. Similar reductions in farmer income, labor income, loss of jobs and loss of fumigate use will also occur in Georgia's fruit production (peach, blueberry, & strawberry).

The EPA's objective to make fumigation safe for workers and bystanders is a goal that we share and value; however, this objective can be achieved in the absence of these overly restrictive regulations. Realistically, Georgia fruit and vegetable growers that depend upon these fumigants for crop production will have only two options if these regulations are passed into law: 1) going out of business or 2) keep producing their crops following current practices while ignoring the law assuming fumigant manufacturers, distributors, and applicators are able to remain in business in light of the additional operating cost burden and reduction in fumigate demand resulting if these rules are implemented.

Proposed regulations are developed from fumigant emission studies that were conducted using cultural practices common for the application of methyl bromide. As methyl bromide is being removed from the market place, alternative systems are being adopted that utilize different and often more intense management practices requiring that fumigation applicators understand soil texture, soil moisture, soil temperature, and soil compaction . Research from 2008 shows that cultural and management practices have a tremendous impact on fumigant emissions (often a reduction of over 50%). Reduced fumigant emissions indicate increased fumigant retention, which would likely improve pest control. Improved pest control should lead to reduced fumigant rates with time. Adopting these practices would be extremely economical for the grower and effective at protecting agricultural workers and bystanders from fumigant exposure. These results are in stark contrast to the impact that the proposed EPA regulations would have on fumigant use and vegetable production in the United States.

In light of the changes in cultural practices, coupled with the on-going research focusing on mitigating fumigant gas emissions by using soil texture, soil moisture, soil temperature and soil compaction, the Georgia Fruit and Vegetable Growers Association (GFVGA) and The University of Georgia (UGA) are requesting changes be made to the proposed regulations. Regulations that are of concern include the following: 1) buffer zones distances to homes or occupied structures; 2) right-of-way buffer zones distances; 3) buffer zones adjacent to field areas treated the previous day; 4) respiratory requirements for handlers; 5) warning zones; 6) notification of state agency; and 7) and the fumigant management plan. Concerns with these regulations and potential solutions to these regulations are discussed throughout this document. The UGA and GFVGA are willing to fully cooperate with the EPA in any means necessary to obtain or develop research needed by the EPA in an effort to protect agricultural workers and bystanders while sustaining a vibrant fresh fruit and vegetable industry in Georgia.

INTRODUCTION

Vegetable production using fumigants to manage pests in Georgia currently accounts for a farm gate value of over $445 million (Table 1). Through 2007, methyl bromide was the standard means of pest control for many of these crops.

Table 1. Georgia Farm Gate Value

Georgia Farm Gate Values – State Wide				
	------- Bareground -------		------- Plasticulture -------	
Crop	Acres	Farm Gate Value	Acres	Farm Gate Value
Banana Pepper	55	$552,053	105	$1,053,919
Bell Pepper	777	$13,242,969	5,078	$86,548,003
Broccoli	539	$3,971,568	50	$368,420
Cabbage	8,783	$33,801,411	391	$1,504,765
Cantaloupe	1,603	$7,775,488	3,305	$16,031,184
Cucumber	4,096	$33,192,939	3,923	$31,790,991
Eggplant	206	$2,216,075	722	$7,767,019
Hot Pepper	79	$792,949	503	$5,048,776
Strawberry	0	$0	277	$5,118,430
Squash	3,310	$14,374,697	2,291	$9,949,375
Tomato	457	$5,827,896	3,437	$43,830,371
Watermelon	8,754	$37,815,634	15,461	$66,788,614
Winter Squash	246	$1,068,331	105	$455,995
Zucchini	2,345	$10,157,470	1,125	$4,872,986
Total	**31,195**	**$164,237,426**	**36,668**	**$281,128,847**

Source: *2007 Georgia Farm Gate Value Report, The University of Georgia, Center for Agribusiness and Economic Development*

Although cooperative efforts between the EPA, GFVGA, and UGA have produced successful critical use exemption packages for methyl bromide since 2005, Georgia farmers and the UGA have worked tirelessly in an effort to find alternatives to methyl bromide. One of the more common methyl bromide alternative systems adopted in Georgia includes Telone II (1,3-dichloropropene) followed by chloropicrin followed by metam sodium (hereafter this system is referred to as the "3-WAY"). This system is being rapidly adopted by commercial growers. Approximately 25 and 50% of Georgia's commercial vegetable plasticulture acreage was treated with this system during the 1st (2007) and 2nd (2008) year of recommendation by UGA, respectively. These efforts were facilitated by on-farm research trials, field days, and county extension delivery methods (e.g. grower meetings and development and distributing of a DVD that demonstrates to growers the proper application procedures for these alternative fumigants). Because of these efforts in research and outreach, methyl bromide was no longer the dominate fumigant system used in Georgia vegetables during 2008.

Although adoption of the 3-WAY has been successful, issues that could limit the implementation of this alternative have arisen. Clearly the most limiting and potentially devastating issue facing the adoption of the 3-WAY, or any other potential fumigant system, is the proposed fumigant re-registration eligibility regulations. The UGA and GFVGA are confident that, in cooperation with the EPA, regulations to ensure the safety for handlers and bystanders can be achieved without enforcing the current proposed restrictions and regulations.

BUFFER ZONES TO HOMES OR OCCUPIED STRUCTURES

Background (Plasticulture): A buffer zone is an area that provides distance between the application site and residential areas and other occupied structures. In ***plasticulture*** production systems, buffer restrictions for the 3-WAY would most often range from 200 to 400 feet depending on the number of acres treated in a day. The authors do not disagree with the EPA on the need for a buffer between fumigated fields and residences or occupied buildings; however, we do disagree with the distances that are proposed. Research data used by the EPA to generate these buffer restrictions was conducted during a time period when methyl bromide was the fumigant of choice. At that time, methyl bromide application procedures were not as stringent as those needed for the current fumigants. The efficacy of methyl bromide under a multitude of environmental conditions, coupled with economical application costs at that time, allowed growers to make applications under soil conditions that were less-than-ideal. The current suite of alternative fumigants is not as efficacious as methyl bromide under sub-optimal environmental conditions and their costs are limiting fumigant use rates. Failure to understand these critical factors will have serious financial implications. Therefore, buffer zone distances calculated by gas emission flux studies from the methyl bromide era of the past should be adjusted by results generated from studies where applicators are certain of the appropriate soil conditions in which current fumigants must be applied. Additionally, new research results generated during 2008 and additional research results expected to be conducted during 2009 and 2010 should be included in the EPA's base buffer distance calculations as well as the potential credits being offered.

Impacts from the EPA's proposed buffers for Georgia are shown in Tables 2 through 5[*]. These regulations in Georgia vegetable plasticulture production, <u>at a minimum</u>, would: 1) reduce farmer income $20.94 million or 15.3% of their total income; 2) reduce sales value or output impact by $73.13 million, 3) reduce labor income $35.1 million, and 4) would eliminate at least 775 workers.

Background (Bareground): As with plasticulture, the authors do not disagree with the EPA on a need for a buffer between fumigated bareground fields and residences or occupied buildings; however, we do disagree on the distances that are proposed. Current proposed buffer restrictions for the use of the 3-WAY in plasticlture range from 200 to 400 feet while this same fumigant program would have a buffer restriction exceeding 1450 feet in bareground production. Fumigant use in bareground production would be eliminated by these buffer restrictions (Tables 2-5)!

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[*] *To see the full materials and methods discussing how these economic impacts were developed visit the presentation by Rucker et al. titled "Economic Impact of Proposed Buffers in EPA's Fumigant Re-registration Eligibility Decision on Georgia Vegetable Production" which will be uploaded to the docket by October 30, 2008.*

Table 2. Farmer Income Impact of Fumigation Buffer, by Buffer Type and Width, GA, 2007.*

Type of Buffer (distance)	Farmer Income Impact	Percent of Total Farmer Income
Structures (200 feet) plasticulture	$ 3,387,778	2.5 %
Structures (400 feet) plasticulture	$ 17,261,208	12.6 %
Structures (1,475 feet) bareground	$ 63,032,748	78.7 %
ROW** (200 feet) plasticulture	$ 19,174,548	14.0 %
ROW (400 feet) plasticulture	$ 39,946,976	29.1 %
ROW (1,475 feet) bareground	$ 67,503,896	84.3 %
Combined (200 feet) plasticulture	$ 20,937,018	15.3 %
Combined (400 feet) plasticulture	$ 46,098,472	33.6 %
Combined (1,475 feet) bareground	$ 71,838,832	89.7 %

*Data generated by: The University of Georgia, Center for Agribusiness and Economic Development by applying input-output analysis using IMPLAN.
**ROW = right-of-way

Table 3. Output Impact of Fumigation Buffer, by Buffer Type and Width, GA, 2007.*

Type of Buffer (distance)	Direct Impact	Indirect Impact	Total Impact
Structures (200 feet) plasticulture	$6,943,883	$4,888,802	$11,832,685
Structures (400 feet) plasticulture	$35,380,065	$24,909,135	$60,289,200
Structures (1,475 feet) bareground	$129,197,371	$90,960,671	$220,158,042
ROW** (200 feet) plasticulture	$39,301,813	$27,670,217	$66,972,030
ROW (400 feet) plasticulture	$81,878,777	$57,646,293	$139,525,070
ROW (1,475 feet) bareground	$138,361,819	$97,412,865	$235,774,684
Combined (200 feet) plasticulture	$42,914,319	$30,213,586	$73,127,905
Combined (400 feet) plasticulture	$94,487,406	$66,523,330	$161,010,736
Combined (1,475 feet) bareground	$147,247,064	$103,668,481	$250,915,545

*Data generated by: The University of Georgia, Center for Agribusiness and Economic Development by applying input-output analysis using IMPLAN.

**ROW = right-of-way

Note: Output is equal to sales value.

Table 4. Labor Income Impact of Fumigation Buffer, by Buffer Type and Width, GA, 2007.*

Type of Buffer (distance)	Direct Impact	Indirect Impact	Total Impact
Structures (200 feet) plasticulture	$4,131,414	$1,551,344	$5,682,758
Structures (400 feet) plasticulture	$21,050,136	$7,904,319	$28,954,455
Structures (1,475 feet) bareground	$76,868,776	$28,864,202	$105,732,978
ROW** (200 feet) plasticulture	$23,383,464	$8,780,483	$32,163,947
ROW (400 feet) plasticulture	$48,715,552	$18,292,679	$67,008,231
ROW (1,475 feet) bareground	$82,321,360	$30,911,641	$113,233,001
Combined (200 feet) plasticulture	$25,532,804	$9,587,559	$35,120,363
Combined (400 feet) plasticulture	$56,217,328	$21,109,589	$77,326,917
Combined (1,475 feet) bareground	$87,607,832	$32,896,718	$120,504,550

*Data generated by: The University of Georgia, Center for Agribusiness and Economic Development by applying input-output analysis using IMPLAN.
**ROW = right-of-way
Note: Labor income is earnings by hired employees and proprietors (Direct includes farmers).

Table 5. Employment Impact of Fumigation Buffer, by Buffer Type and Width, GA, 2007.*

Type of Buffer (distance)	Direct Impact (Jobs)	Indirect Impact (Jobs)	Total Impact (Jobs)
Structures (200 feet) plasticulture	83	43	126
Structures (400 feet) plasticulture	421	218	639
Structures (1,475 feet) bareground	1,537	797	2,334
ROW** (200 feet) plasticulture	468	242	710
ROW (400 feet) plasticulture	974	505	1,479
ROW (1,475 feet) bareground	1,646	854	2,500
Combined (200 feet) plasticulture	511	264	775
Combined (400 feet) plasticulture	1,124	583	1,707
Combined (1,475 feet) bareground	1,752	909	2,661

*Data generated by: The University of Georgia, Center for Agribusiness and Economic Development by applying input-output analysis using IMPLAN.
**ROW = right-of-way
Note: Employment is jobs for hired employees and proprietors (Direct includes farmers).
Jobs include full-time and part-time jobs.
Jobs include jobs and job equivalents (summation of hrs worked in a sector that totals to a job).

Potential Solution (Plasticulture): Research at the UGA demonstrates that fumigant gas emission is a function of soil moisture (Figures 1-3) and bed compaction (Figure 4). Soil water content needed to obtain excellent pest control by methyl bromide often ranges from 5 to 9%, with many growers making applications in the 5 to 6% water content range. With alternatives to methyl bromide, soil water content must be at least 7%, with ideal conditions being 8% in South Georgia. Chloropicrin gas emission rates decreased as soil water increased. Gas emission rates at 8% water content were 51.2% lower than rates at 5% water content on a sand soil (Figures 1 and 3). Similar trends were observed for loamy sand soils (Figures 2 and 3).

Research on the impact of using bed compaction to reduce chloropicrin emissions was initiated during September of 2008, thus the research is still in its infancy. In the first experiment, two compaction levels were established by changing the distance of the tractor's top link bar. It took five turns of the top link and eight seconds to make the adjustment allowing the comparison of two compaction levels. Compaction density levels were taken with multiple devices but results were not available in time for this report. This change in compaction led to a 20% reduction in chloropicrin emissions (Figure 4).

Although this research has just begun, the results clearly show growers can mitigate fumigant gas emissions through cultural practices, which will in turn, improve pest control and overall crop production for all producers. With improved cultural practices reducing gas emissions, growers will likely be able to reduce fumigant rates applied overtime.

Figure 1. Impact of soil moisture on emissions of chloropicrin in sand soil.

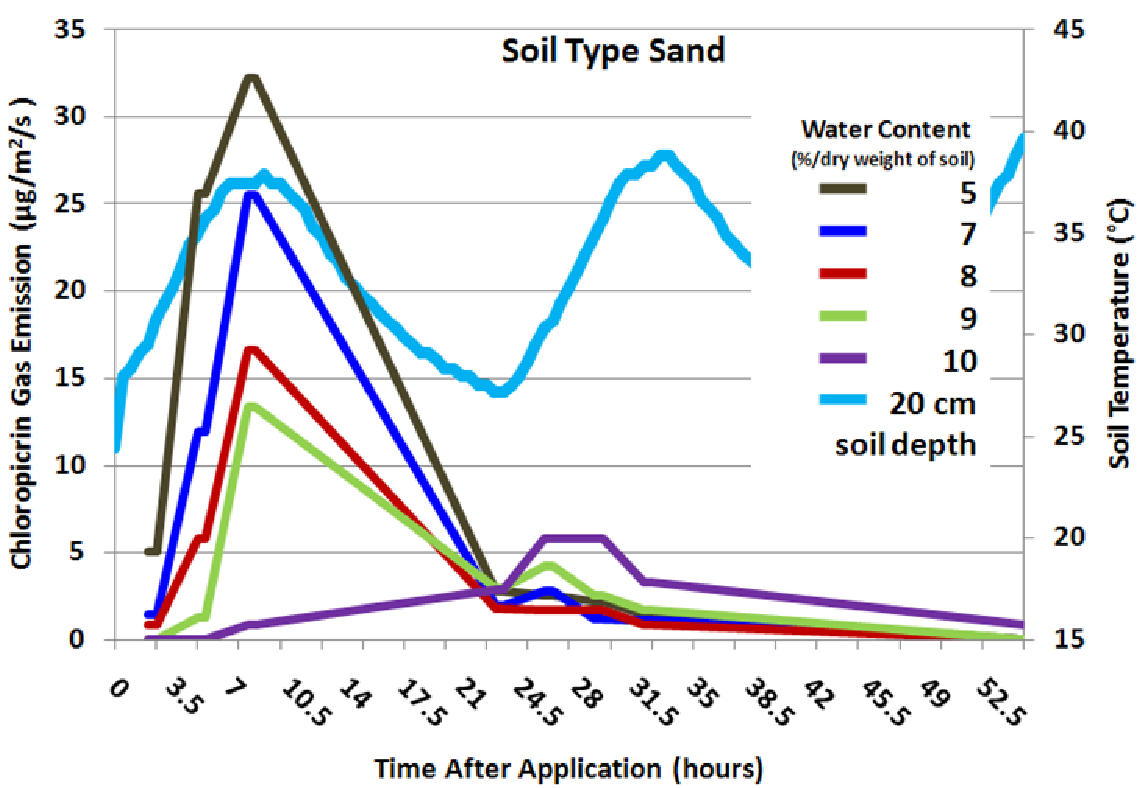


Figure 2. Impact of soil moisture on emissions of chloropicrin in loamy sand soil.

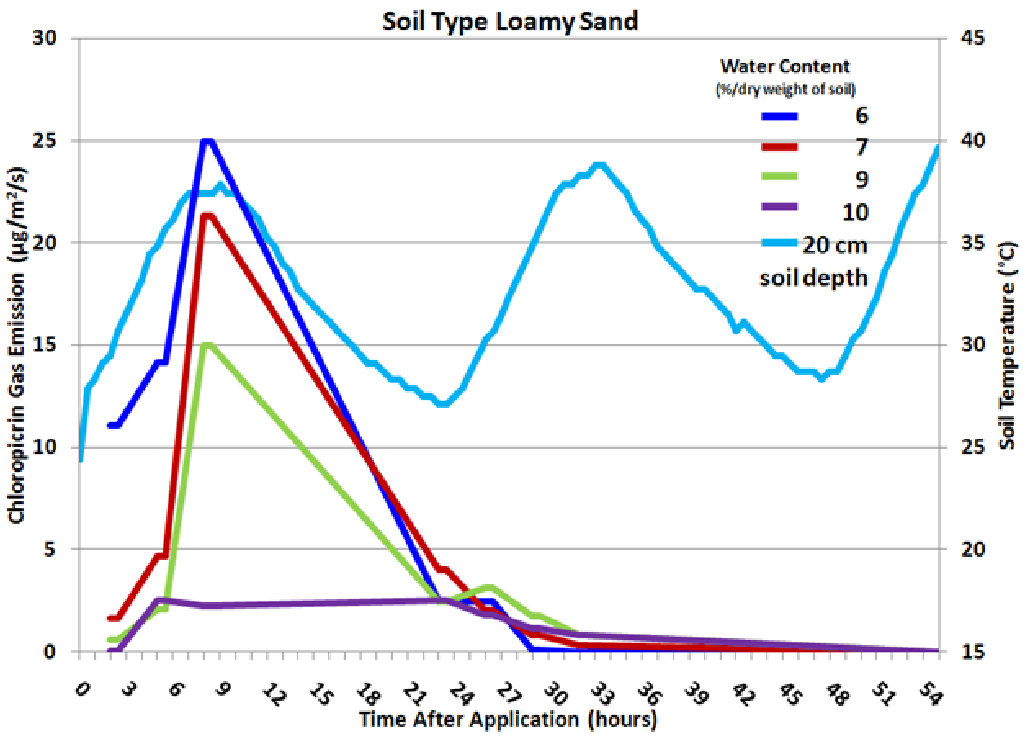


Figure 3. Impact of soil moisture on emissions of chloropcirin in a loamy sand and sand soil.

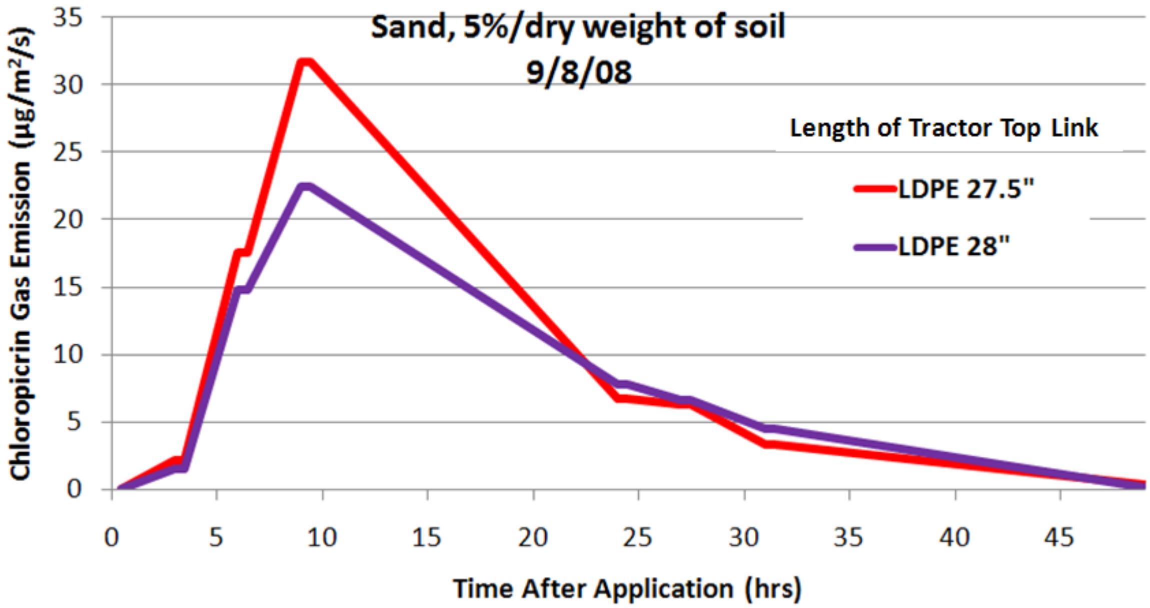
Reduction in total chloropicrin gas emission for loamy sand soil type. Ponder Fall 2008.

Water Content (%/dry weight of soil)	Total Emission (mg/m²)	Reduction - 6% Base (%)	Reduction - 7% Base (%)	Reduction - 9% Base (%)
6	1868.8			
7	1489.1	20.3		
9	1115.6	40.3	25.1	
10	293.4	84.3	80.3	73.7

Reduction in total chloropicrin gas emission for sand soil type. Ponder Fall 2008.

Water Content (%/dry weight of soil)	Total Emission (mg/m²)	Reduction - 5% Base (%)	Reduction - 7% Base (%)	Reduction - 8% Base (%)	Reduction - 9% Base (%)
5	2542.458				
7	1907.0	25.0			
8	1240.9	51.2	34.9		
9	1096.5	56.9	42.5	11.6	
10	531.6	79.1	72.1	57.2	51.5

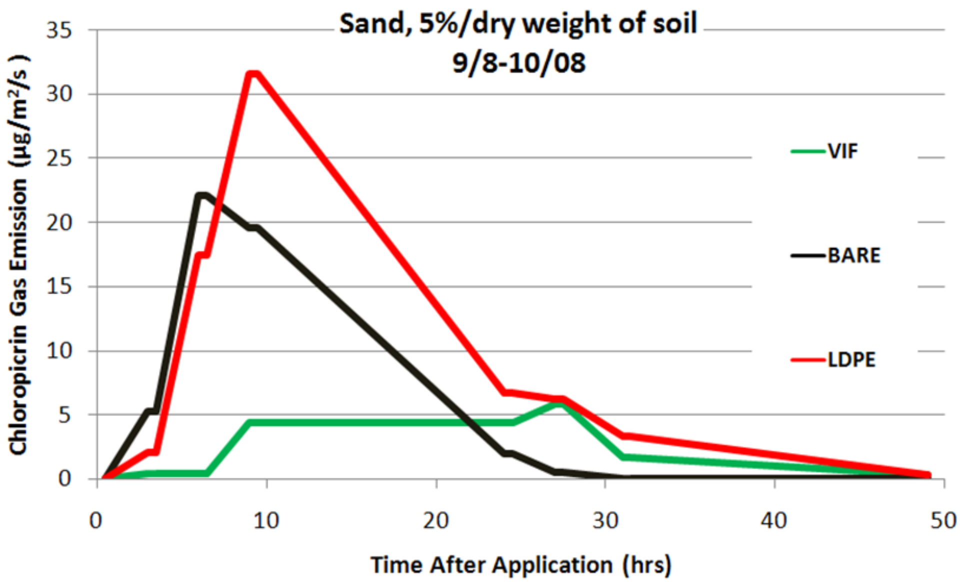
Figure 4. Impact of compaction on chloropicrin emission



20% reduction due to increased bed compaction

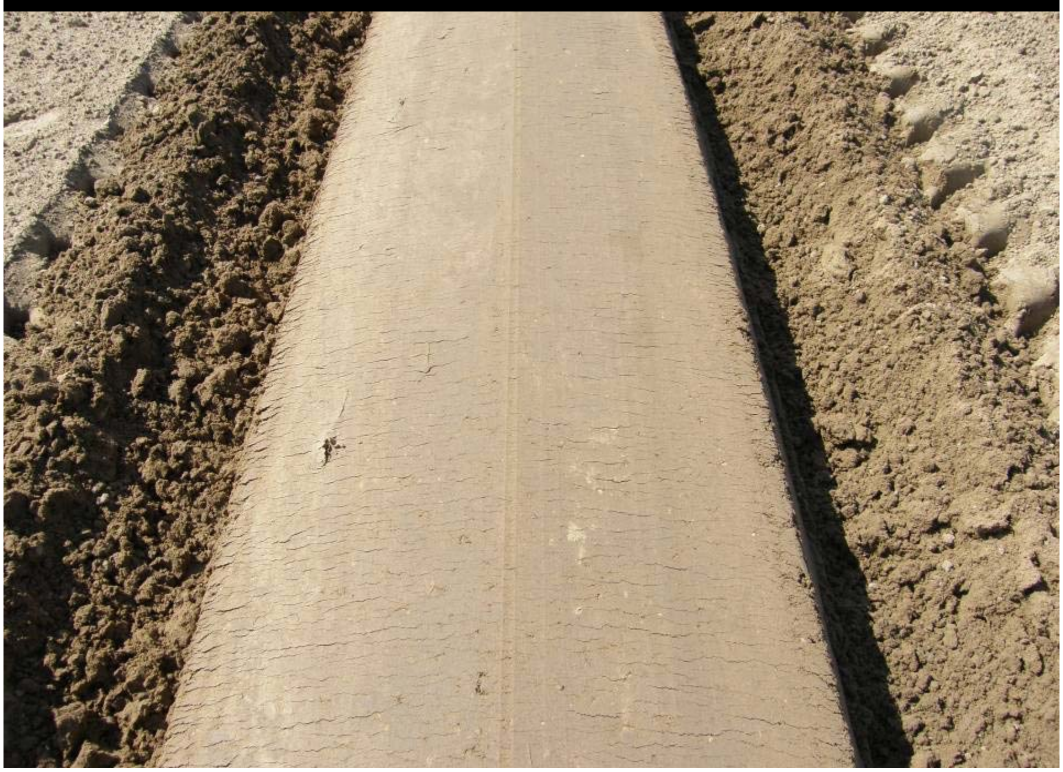
Potential Solution (Bareground): Research conducted in the fall of 2008 by the UGA that questions the EPA's buffer zone calculations for bareground production. Although this data was derived from a single experiment, which will be repeated in time, this research shows that it may be possible to mitigate gas emissions, effectively, in bareground production providing ample soil moisture and compaction. Gas emissions were actually lower in the bareground production as compared to plasticulture production when using low density polyethylene mulch (Figures 5 and 6). These results were likely in response to the bareground soil crusting thereby reducing gas emissions. Results from this experiment shows the need for more research to be conducted on gas emission in bareground production before regulations are imposed that will eliminate this practice. The authors do stress the results from this research are preliminary from one experiment and must be repeated as the environment may have been a factor in shaping the results.

Figure 5. Comparing chloropicrin emission on bareground and mulch raised compacted beds



40 % less emission in bareground compared to LDPE mulch

Figure 6. Bareground raised compacted bed study.



RIGHT-OF-WAY BUFFER ZONES:

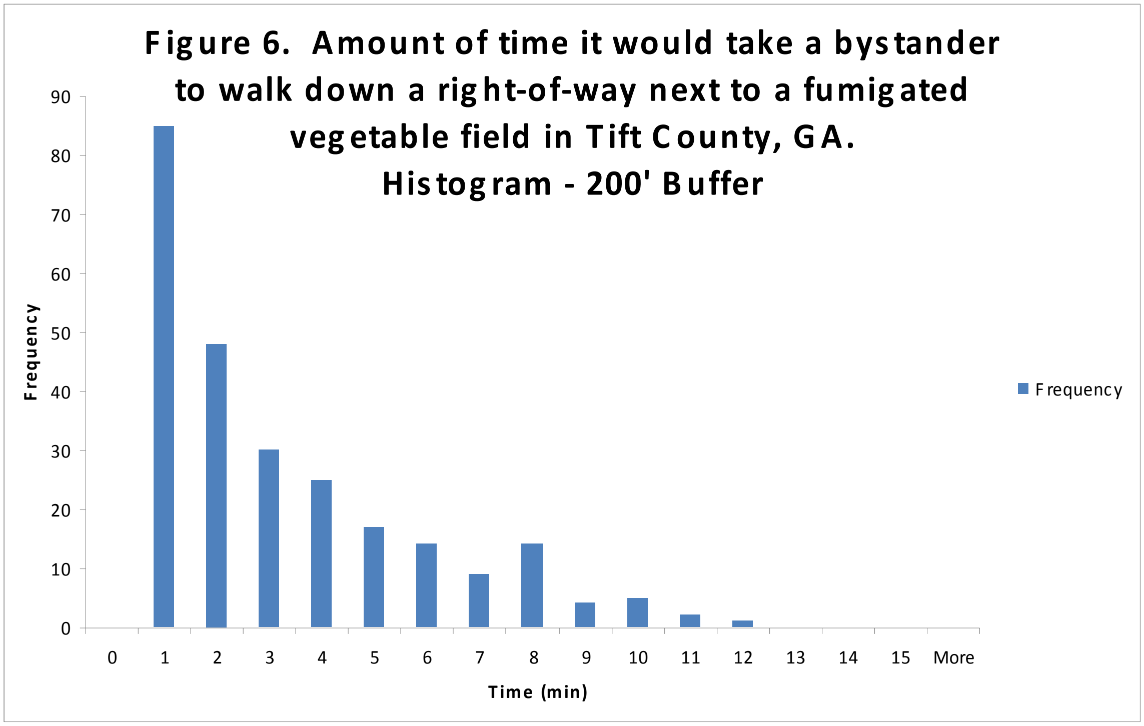
Background: Although the authors agree a buffer between fumigated areas and occupied structures are valid, we disagree that buffers should be implemented between treated areas and right-of-ways. Proposed buffer restrictions related to the right-of-ways account for over 90% of the economic loss for the state of Georgia (Tables 2-5).

Potential Solution: In Georgia, growers often fumigate once every two years. Thus, for 2 out of 730 days, or 0.27% of the time, the buffer zone might overlap with a right-of-way. Rarely, if ever, do bystanders walk down sides of a road that would be adjacent to a vegetable production field. In the rare situation when a person might walk down the side of a road, the individual would spend on average 2.72 minutes over a two year time period walking within the proposed buffer zone[**] (Table 6, Figure 6). Thus, it is unlikely that significant exposure to fumigants is occurring within the right-of way. Right-of-ways should be eliminated from buffer restrictions; if the EPA must insist on the inclusion of right-of-ways, then we propose that only right-of-ways with paved sidewalks that are designated for pedestrian traffic should be considered.

Table 6. Statistical information on the length of roads and the time required to walk that length of road at 3 MPH for roads segments intersecting field boundary buffers in Tift County, Georgia.

	----------200 Foot Buffer----------				----------400 Foot Buffer----------			
	Frequency	Mean	Min	Max	Frequency	Mean	Min	Max
Length (Ft)	255	719	6	2954	461	617	<1.0	4085
Time (Min)	255	2.72	0.02	11.19	461	2.34	0	15.47

[**] Calculations were made for Tift County, Georgia using a Geographical Information System (GIS) model. A GIS dataset was created in 2006 and 2007 which located field boundaries for every field planted in commercial vegetables in Tift County that might have received fumigation during the 2006 growing season. Buffers were created around each field boundary in the GIS at 200, 400 and 1475 foot intervals. Using a public road data set, we next determined each section of a public road that intersected a field buffer. The length of each road section within the buffer zone of a field was calculated and the time required to walk that length of road was calculated assuming that a person was walking at 3 miles per hour.



BUFFER ZONES ADJACENT TO AREAS TREATED THE PREVIOUS DAY:
Background: With the proposed buffer zone regulations, a grower who does not finish fumigating an entire field in a day will not be able to return to finish fumigating that field during the following 48 hours, because of the no-entry requirement in regulations. The theory that any given field can be carved up into small sections and fumigated whenever buffer restrictions expire is simply not practical or economical. Additionally, it is not practical to adjust field size, shape, or row orientation because of obligations to erosion management programs with NRCS as well as the permanently buried irrigation pipes. Irrigation pipes and zones have been developed in such a way that each zone has identical water pressure to provide the required amount of water as efficiently and economically as possible. Changing row orientation would destroy both erosion management programs and watering (fertilizing) of the crop.

If growers abide by the regulations requiring them to start fumigating in a different field each morning, the cost to move equipment for one of Georgia producers would be $847 per day for a yearly cost of $20,328 (the specific farming operation information has been provided to the EPA). The need to move equipment can increase the total number of days spent fumigating by 33%. Furthermore, the need for additional signage over an extended fumigation season can cost a grower another $600 per year.

These regulations will delay fumigation which will have a significant impact on soil moisture. Once a grower enters a field and prepares that field for fumigation with heavy tillage, it is essential the field be fumigated within 18 hours. By delaying this process, the soil will lose moisture and the optimum conditions for fumigation will be lost. When a grower does not fumigate under ideal moisture conditions, the fumigants will pass quickly through the soil (Figures 1-3) and exposure to handlers and bystanders will be greatly increased. This regulation will in essence, 1) increase fumigant gas emission; 2) increase worker exposure to gas emission; 3) increase bystander exposure to gas emissions; 4) reduce pest control efficacy; 5) reduce vegetable production and 6) increase the fumigant rate needed in order to offset the fumigant loss that is not available for pest control.

Potential Solution: Growers will return to a field early in the morning following a previous day's fumigation. Research has shown that fumigant emissions occur at very low levels during the early morning hours; thus, fumigating beside an area fumigated the previous day poses minimal concern (Figures 1 and 2). If needed, one could monitor gas emissions in the buffer zone adjacent the area fumigated the previous day. If fumigant concentration levels in the air exceed the allowed tolerance, then respirators should be worn while fumigating, as is the case with the general fumigation process. If air concentrations do not exceed the allowed tolerance, then fumigation without respirators should continue as normal. The fumigation process is rapid and the amount of time the handlers would be within 200 foot of the previous days fumigation in the *average Georgia field*[***] is approximately 28 minutes.

RESPIRATORY REQUIREMENTS:

Background: Proposed regulations require air monitoring samples for chloropicrin to be collected at least every two hours in the breathing zone of a handler. If at anytime, concentrations are greater than the acceptable tolerance, or if the handler experiences sensory irritation, then an air-purifying respirator must be worn by all handlers at the handling site. The EPA is requiring that the respirator is fit-tested, that proper respirator training occurs, and an annual medical evaluation and clearance is done for each handler. Additionally, at least one air rescue device (SCBA) must be on site.

Potential Solutions: The authors agree with the EPA that in situations where air concentrations exceed safe levels, half-mask respirators should be provided for field personnel. As previously discussed, research has shown the need to sample for gas emission occurs in the afternoon and not every two hours throughout the day (Figures 1 and 2). Samples should be taken once during the afternoon period when peak gas emissions occur. Growers often have handlers at three or four locations across the field. Monitoring should not be required at each of these sites. Rather, monitoring should occur at a single location where gas emissions are most likely to occur, usually the downwind position in the field. If sensory irritation is felt by any handler, emission monitoring should be taken at that time.

[***] Using the GIS dataset of vegetable fields in Tift County, Georgia, the average vegetable fumigated field length was calculated to be 718 feet. Growers will lay polyethylene mulch at 5 mph fumigating a swath of 15 feet (½ fumigate and ½ non-treated). A total of 13.3 passes (200 divided by 15) through the field before handlers are no longer within 200 feet of the previous days fumigation. Thus, 13.3 passes by 718 feet in length will equal 9,570 feet (or 1.8 miles) of travel by the application equipment and handlers. If traveling at a speed of 5 mph, then the handlers will be within 200 feet of the previous day's fumigation for only 21.8 minutes. It takes about ½ minute to turn the equipment around on the field end; thus 13.3 turnarounds by ½ minute equals an additional 6.7 minutes in the buffer zone. Traveling time, plus turn around time, within the 200 foot buffer would be approximately 28 minutes.

It is likely, through research, one could correlate soil temperatures, air temperatures, and potential exposure levels for handlers. This process could be extremely effective and replace the need and expense for sampling. Historical soil and air temperatures are already known.

The authors agree that individuals should be fit-tested and fit-checked using a program that conforms to OSHA's requirements but we do not agree on the proposed process. Requiring each handler to be tested by a third party would cost an average Georgia farm $1,700 per year. Registrants should train and certify one individual from each farming operation on the proper processes. Once these individuals from each farm are trained, they can in turn train their fumigant handlers.

Medical exams would cost an average Georgia farm $1,700 per year and should not be required. There is no justification why a fumigant handler should require a medical exam when compared to any other position on the farm or in other industries. Additionally, these medical test are often not detailed enough to diagnose any significant issues. Growers and crew leaders should be allowed to determine if their employees are capable of being a fumigant handler.

SCBA gear will cost each grower at least $1,200. Instead of having a SCBA on site to enter areas with greater than 1.5 ppm chloropicrin, we advise that no one enter the site. If a spill or leak has occurred, individuals should move out of the area and contact the proper authorities if there is concern for off-site movement. For 99+% of the time a drip is due to a check value, it is fixed and the small area dissipates quickly with no problem. The grower should have the option of having a SCBA device or simply not entering the area when infested with such high gas levels.

WARNING ZONES:

Background: A Warning Zone is an area, often 50 to 200 feet, outside of the buffer zone. If an occupied structure is in the Warning Zone, the proposed regulations require that growers 1) obtain a waiver signed from the property owner or 2) monitor the warning zone for a 48 hour period taking hourly samples at the structure. An occupied structure will be within the Warning Zone during 70% of the fumigation events in Georgia.

No property owner would sign the waiver; thus, this option is irrelevant. To monitor the warning zone as currently proposed by the EPA would require an enormous amount of time, resources, and money. In fact, the cost for one Georgia farm (the specific farming operation information has been provided to the EPA) would be an additional $23,644 per year.

Potential Solution: Fumigant gas emissions are at their greatest late in the afternoon when soils are at their warmest (Figures 1 and 2). The buffer zone has been developed to protect workers and bystanders. Fumigators will be sampling within the buffer zone during this time period to ensure handler safety. These same samples will also provide the information needed to determine if the level of emissions is exceeding tolerable levels. If gas emissions are escaping the buffer zone at levels exceeding those tolerable, then nearby residents would be notified by the fumigator or proper authorities. Since a buffer zone will be in place for bystanders, a warning zone is of no value, is extremely costly, and should not be a component of any regulation.

NOTIFICATION OF STATE AGENCY:
Background: The EPA is proposing that an appropriate state agency be notified prior to the initiation of fumigant applications in an effort to assist enforcement agencies in compliance monitoring.

Potential Solution: The authors feel that it is acceptable for growers to notify the Georgia Department of Agriculture (GDA) when fumigation will occur but the process must be simple for both parties and should include only the following:

A. A grower should not have to notify the GDA each day a fumigation will occur. Instead the grower should be able to provide a time period in which they will fumigate. For example, "We will be fumigating 200 acres in Tift County during the last two weeks of February".

B. The agency must provide either a toll free number or a web site where the fumigator can enter this information in less than a five minute time period.

C. The process MUST NOT require conversations with a live individual, as it is essential that growers fumigate when soil moisture conditions are ideal, whether it is during the week or weekend.

D. An approval to fumigate must not be required. This process should be nothing other than sharing with the GDA information regarding when fumigations will occur across the state.

FUMIGANT MANGEMENT PLAN (FMP):
Background: The current proposed fumigant management plan as noted in the docket is overwhelming, requiring information that is not critical for a FMP. For one Georgia farm (the specific farming operation information has been provided to the EPA), it would take 60 hours to create the original FMP document and then an additional 5 hours for every day of fumigation. This expense would be $5,400 per year just to maintain compliance with the FMP.

Potential Solution: A FMP will be beneficial to growers; however, a more user-friendly plan must be developed. The plan should be developed by the agency and registrant having primarily check boxes for growers to mark. The plan should be able to be filled out in less than 10 minutes. The EPA verbally agreed to work with a Georgia grower, Bill Brim from Lewis Taylor farms, to develop a friendlier and less time consuming FMP.

RESEARCH NEEDED IN DETERMINING ACCURATE BUFFER RESTRICTIONS:
Background: It is likely that additional research is needed to accurately determine buffer restrictions for fumigants used by Georgia vegetable producers. Thus, the UGA and GFVGA are willing to cooperate with the EPA if requested.

Possible solutions: During the fall of 2008, four studies were conducted to generate data to be used by the EPA in the determination of fumigant buffer restrictions and buffer credits. The UGA is willing to continue this research past the 2008 season as long as the results from these experiments are considered when buffers are determined. Efforts that might benefit Georgia vegetable and fruit producers and the EPA in assisting in the determination of accurate buffers may include the following:

1. Additional experiments determining the credit that should be given under varying soil temperatures must be further studied for various fumigants. Soil temperature may, in fact, be the most important soil characteristic that can dictate the level of fumigant gas escaping the soil. Growers do have the option to fumigant earlier in the season when soils are cooler; thus, if this research continues to show less emission in cooler soils this practice could be adopted on many acres very rapidly.

2. Additional experiments determining the impact from soil moisture will also be beneficial. Soil moisture (Figures 1-3) has a significant role in regulating gas emissions, but further studies are need to validate these results under numerous environmental conditions and soil textures.

3. Additional experiments determining the credit that should be given by the impact from a tightly pressed soil bed on reducing fumigant emissions must be further studied. Compressed soil beds (Figure 4) could play a significant role in reducing gas emissions; further studies need to determine ways to use compressed soil beds to more effectively mitigate fumigant gas emissions.

4. Experiments must be conducted to determine if EPA proposed credits are additive. For example, should a grower get a 40% credit for using a high barrier mulch plus an additional 15% credit for using raised bed heavy compaction? Or, should a grower get a 15% credit for ideal compaction plus a 20% credit for applying in cooler soils?

5. Experiments need to determine if the impacts of cultural practices that reduce gas emissions relate into better pest management. Research has shown these practices can reduce gas emission but does this reduction in gas emission improve pest management which has the potential to reduce the fumigant rate needed.