# Determine Fumigant Emission Reduction Using Totally Impermeable Film and Waiting Period for Tarp Cutting in a Large Field Trial

**Husein Ajwa[1], D. Sullivan[2], S. Gao[3], R. Segawa[4], and M. Stanghellini[5]**

[1]Department of Plant Sciences, University of California, Davis, CA 93905. (831) 755-2823, haajwa@ucdavis.edu;
[2]Sullivan Environmental; [3]USDA-ARS; [4]California EPA-DPR; [5]TriCal, Inc.

## Introduction

Soil fumigants, such as 1,3-dichloropropene (1,3-D) and chloropicrin, are used for pre-plant soil disinfestation. Current methods of soil fumigation can result in unintended fumigant escape into the atmosphere and stringent regulations are being imposed by the USEPA to reduce fumigant emissions.

Fumigation practices and methods that can reduce fumigant volatilization losses are needed to ensure the continued use of soil fumigants. The use of less permeable film (such as totally impermeable film, TIF) instead of standard tarpaulin can reduce fumigant volatilization losses into the atmosphere. However, there is concern about worker exposure when cutting the tarps, and whether the cumulative emissions are really reduced in terms of reducing VOC emissions.

Earlier research found that TIF can reduce or eliminate early emission rates for shank applied 1,3-D (Figures 1 and 2). However, total mass loss was the same under TIF and standard film due to cutting the tarp too early (after 6 days). Research is needed to determine the optimum waiting time for tarp cutting to avoid large emissions rates.

The objectives of this study are to:

- Determine the emissions of soil fumigants when using a TIF to cover treated fields.
- Determine when the tarp can be cut to avoid high worker and by-stander exposures to off-gassed fumigants collected under tarp.
- Compare the ambient air monitoring method with flux chamber monitoring at the surface methods.
- Provide data to regulatory authorities to assess whether TIF tarps can be used to reduce fumigant emissions and protect workers and by-standers.

## Materials and Methods

- This study will be conducted in May or June of 2011. Chloropicrin plus 1,3-D (50:50 formulation) will be shank applied at 300 lbs/ac to three fields. The size of each field will be one acre.
- Fumigant concentrations under the film will be measured continuously and tarp cutting and removal will be done when the concentrations under the film becomes negligible.
- Eight air sampling stations will be used to continuously sample the air at 1.5 m height around each field.
- Charcoal(ORBO-32) and XAD-4(ORBO-613) sorbents will be used to trap 1,3-D and chloropicrin, respectively.
- The sorbent tubes will be replaced every 6 or 12 hours and analyzed by gas chromatography.
- The Industrial Source Complex Short Term dispersion model (ISCT3) will be used to back-calculate emissions rates from each field.
- Flux chambers will be installed on field to measure fumigant concentrations above the film.


**Shank application of fumigants under TIF.**

## Previous Research Results

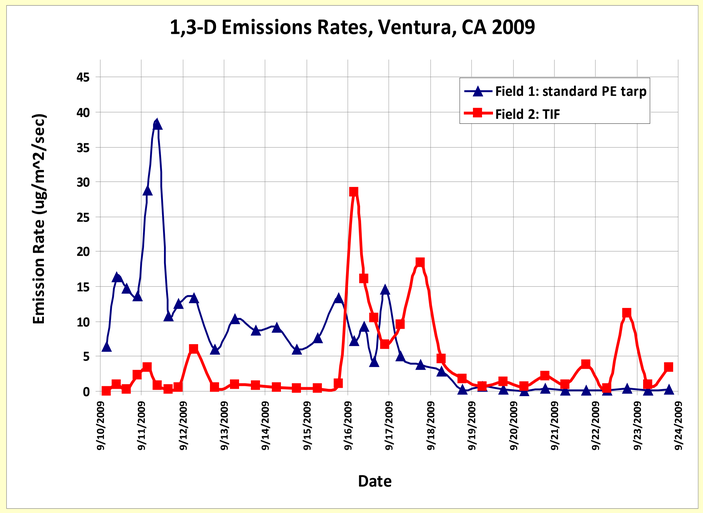


**Figure 1. 1,3-dichloropropene emissions rates. Tarpaulin was cut on Nov. 16.**

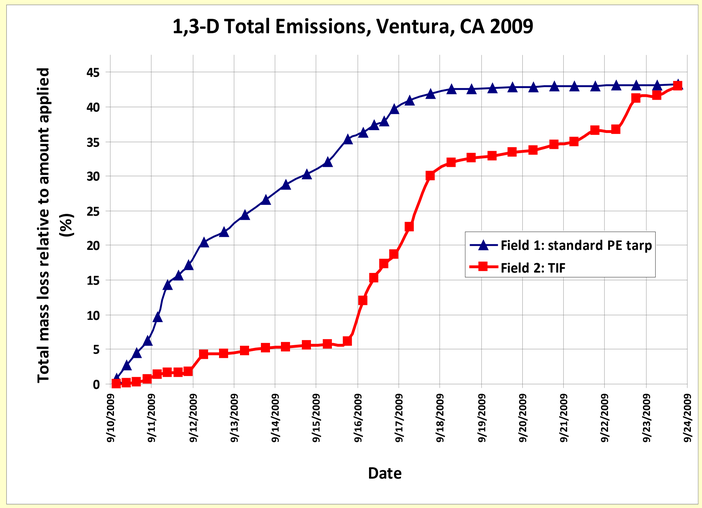


**Figure 2. Total mass loss of 1,3-dichloropropene.**

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