



# *Risk Assessment For Soil Fumigants*

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# *Overview*

- Soil Fumigant Use
- Risk Assessment Process
- Factors That Influence Emissions
- Characterization of Tarps



# *Application Methods and Equipment*





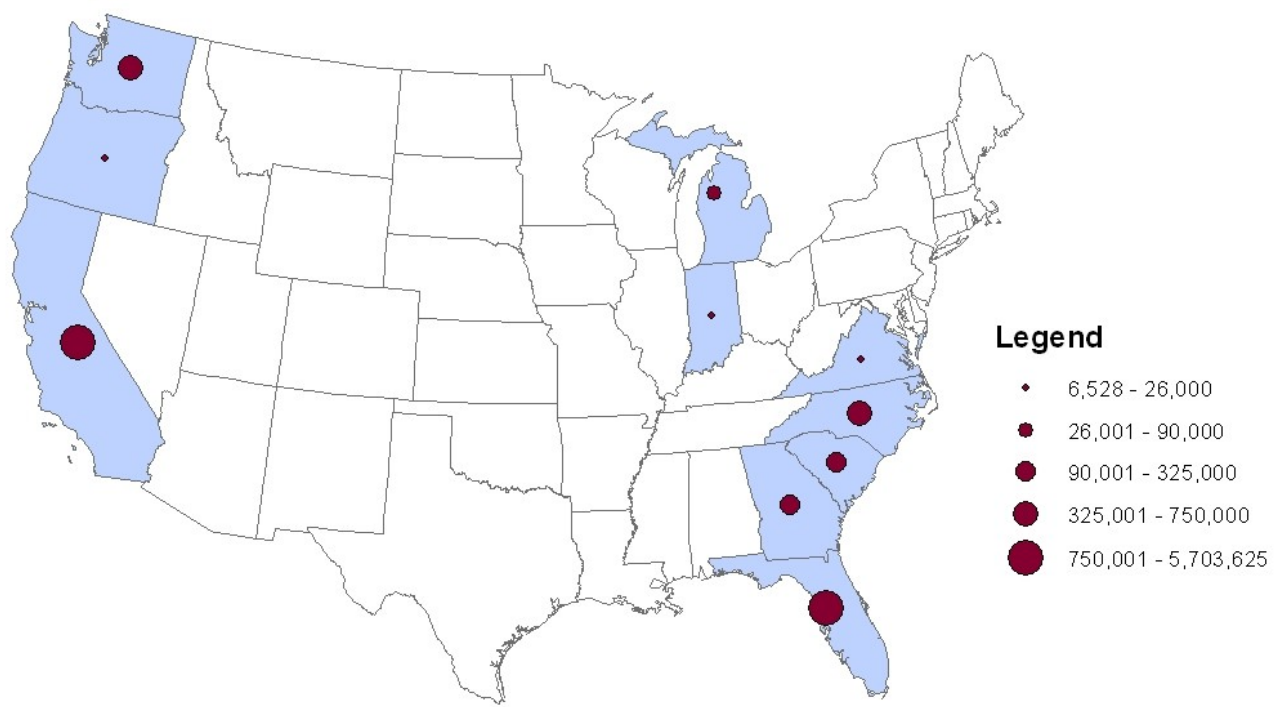
# Soil Fumigant Use By Crop

Crop	Chloropicrin		Metam Sodium Metam Potassium		Methyl Bromide		1,3- Dichloropropene		Methyl Iodide		Total Pounds
	Pounds	PCT	Pounds	PCT	Pounds	PCT	Pounds	PCT	Pounds	PCT	
Potatoes	300,000	2	32,500,000	20			12,700,000	10			45,500,000
Strawberries	3,500,000	60	200,000	2	4,400,000	50	500,000	5			8,600,000
Tomatoes	1,400,000	10	3,100,000	10	3,700,000	10	200,000	<1	200,000	<1	8,600,000
Carrots			7,400,000	50			1,100,000	10			8,500,000
Tobacco	1,600,000	20			60,000	<1	4,800,000	20			6,460,000
Onions	300,000	5	3,400,000	15			1,400,000	5			5,100,000
Peppers	1,100,000	20	1,900,000	15	1,300,000	15	600,000	10			4,900,000
Watermelons	400,000	5	1,600,000	10	700,000	5	600,000	10			3,300,000
Cotton	20,000	<1	60,000	<1			2,900,000	<1			2,980,000
Cucumbers	500,000	5	200,000	2	300,000	2	1,200,000	15			2,200,000
Peanuts	50,000	<1	300,000	<1			1,700,000	5			2,050,000

EPA proprietary data, Average usage 2006 through 2008



# Methyl Bromide Pounds Applied



EPA proprietary data, Average usage 2006 through 2008

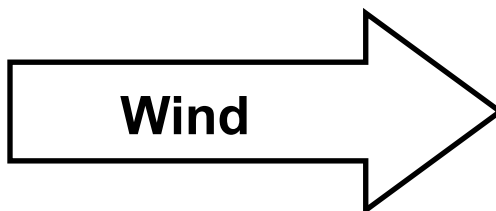


# ***Risk Assessment Process***

- Strong scientific foundation using recognized methods
- Public peer review processes under FACA rules
  - SAB on RfC inhalation risk methodology (1998)
  - SAP on exposure modeling (2004)
- Multi-agency collaboration
  - USDA
  - DPR
  - FDACS
- Based on multiple lines of evidence
  - Toxicity, Monitoring, Modeling, Incidents
- Refined, multiple public comment periods



# *Focus Is On Acute Risks to Bystanders*



**Wind blows emissions from an application to a receptor of concern (e.g., house or school)**





# *Target Air Concentrations for Bystanders*

- Methyl Bromide  
0.33 ppm (developmental rabbit study)
- Chloropicrin  
0.15 ppm (human study)
- MITC  
0.022 ppm (human study)





# *Defining Exposures*

- Monitoring studies
  - Concentrations measured in/around fields and within handler breathing zone
- Modeling
  - Predict concentrations under different weather and field conditions
- Information from exposure incidents
  - Effects observed are consistent with risk assessment predictions
  - Causes of exposure



# *Sampling Strategies*

## **Multiple Methods**

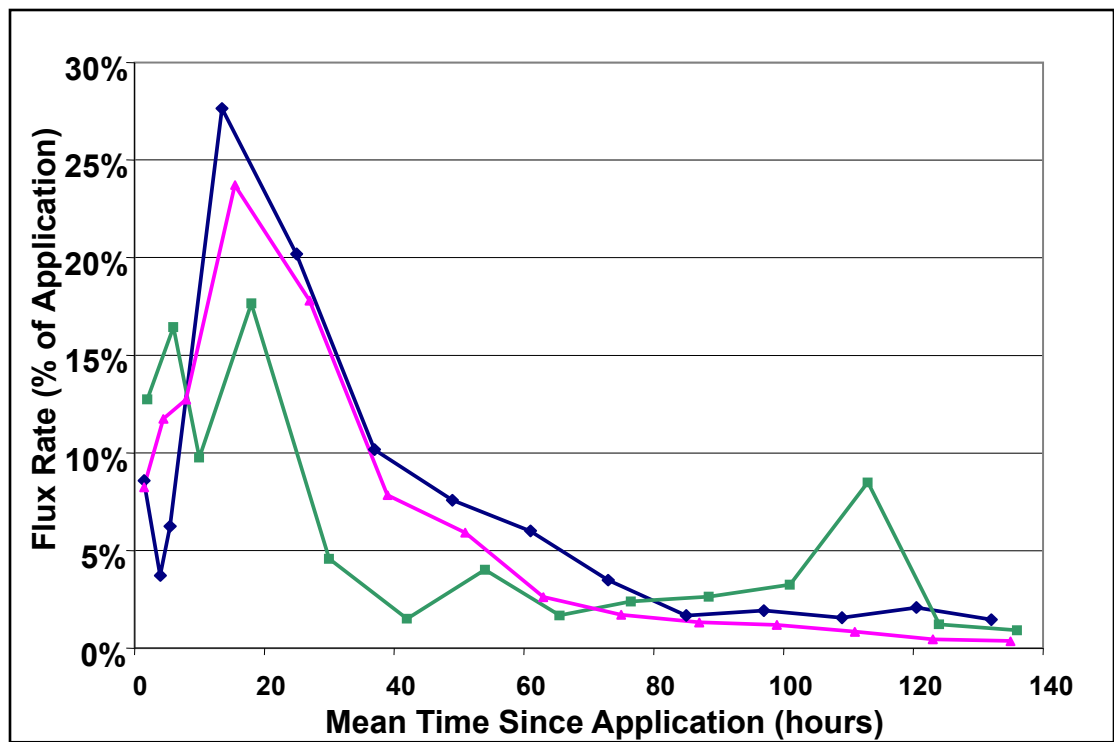
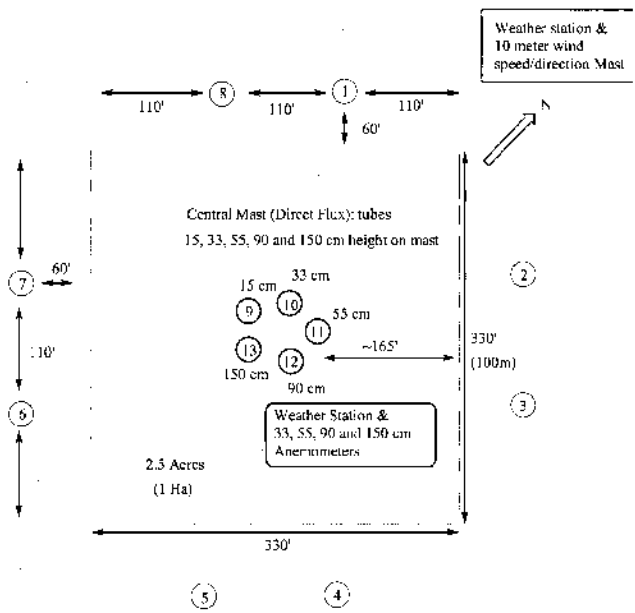
***Indirect*** – samplers around a field

***Direct*** – samplers on a field



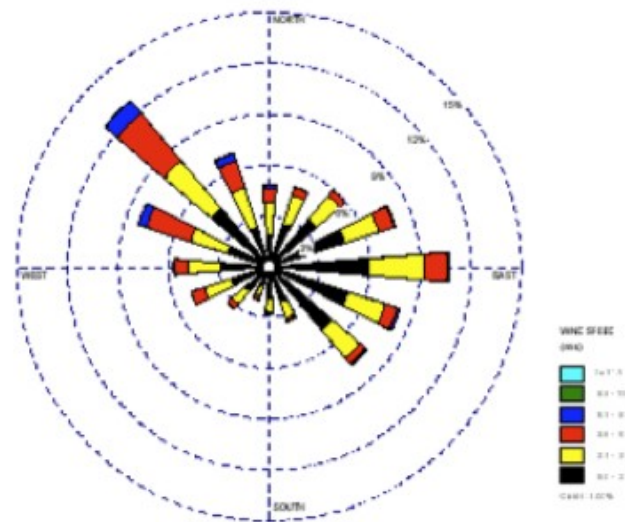
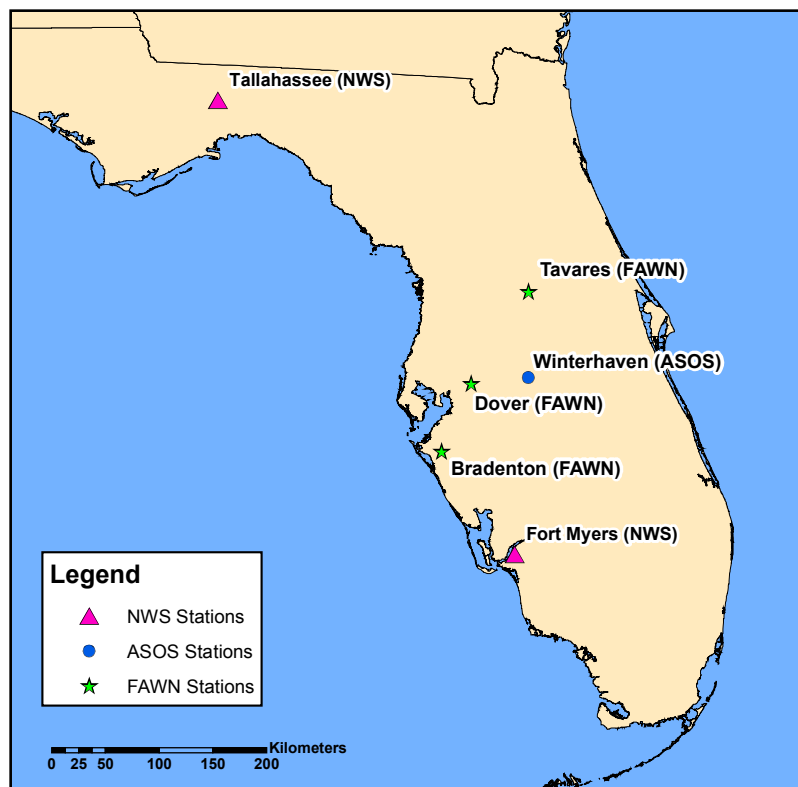


# Monitoring Results - Flux





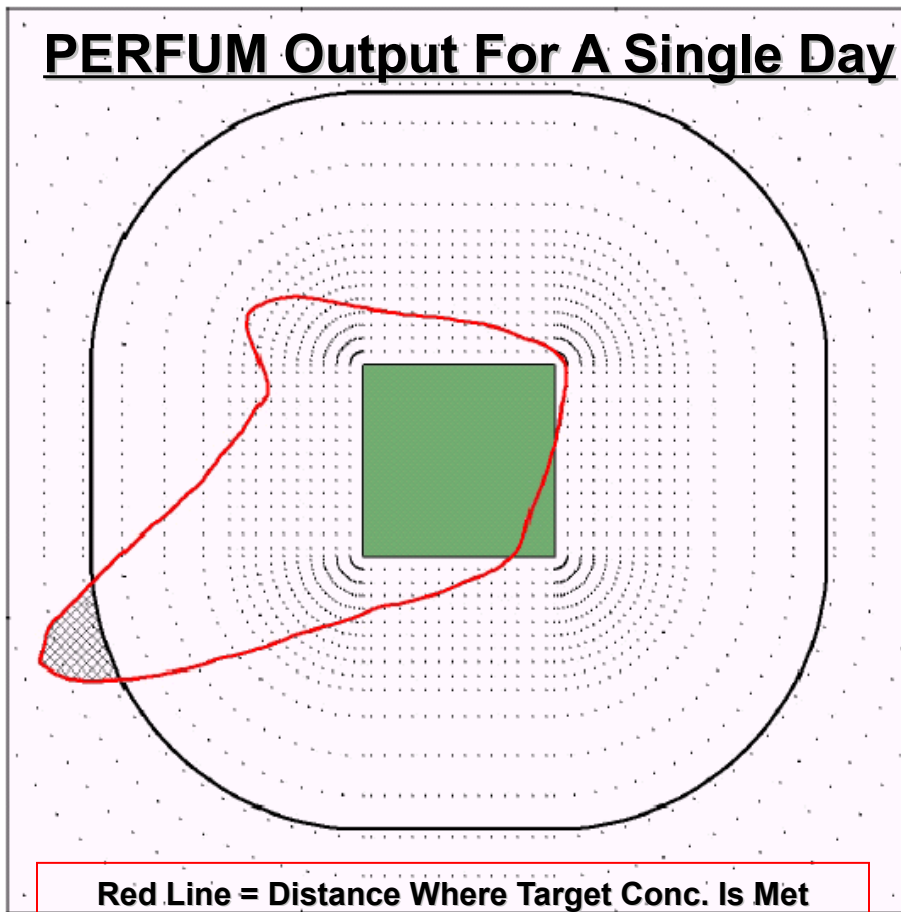
# *Make More Use of Data, Examine Impact of Weather*





# Modeling System – “PERFUM”

## PERFUM Output For A Single Day



### Statistical Outputs

Generated Daily  
For 5 Years (1825 Days)

### “Maximum”

Farthest Point On Red Line

### “Whole Field”

All Points On Red Line For  
Each Receptor “Spoke”



# *Factors That Impact Emissions*

- **Tarp Use**
    - **Nomenclature;**
    - **Composition;**
    - **Costs and availability;**
    - **Permeability and performance;**
  - Soil Amendments
    - Use of reactive adjuvants & water seals;
    - Organic matter levels;
    - Soil moisture;
    - Field Preparation;
    - Soil compaction;
  - Application Methods
    - Application methods;
    - Application implements;
  - Field Conditions
    - Soil texture;
    - Biological activity;
    - Soil temperature;
    - Localized weather conditions
- Basis for GAPs & Buffer Credits
  - Defined using field data, laboratory studies, and modeling
  - Uncertainty and variability also key considerations

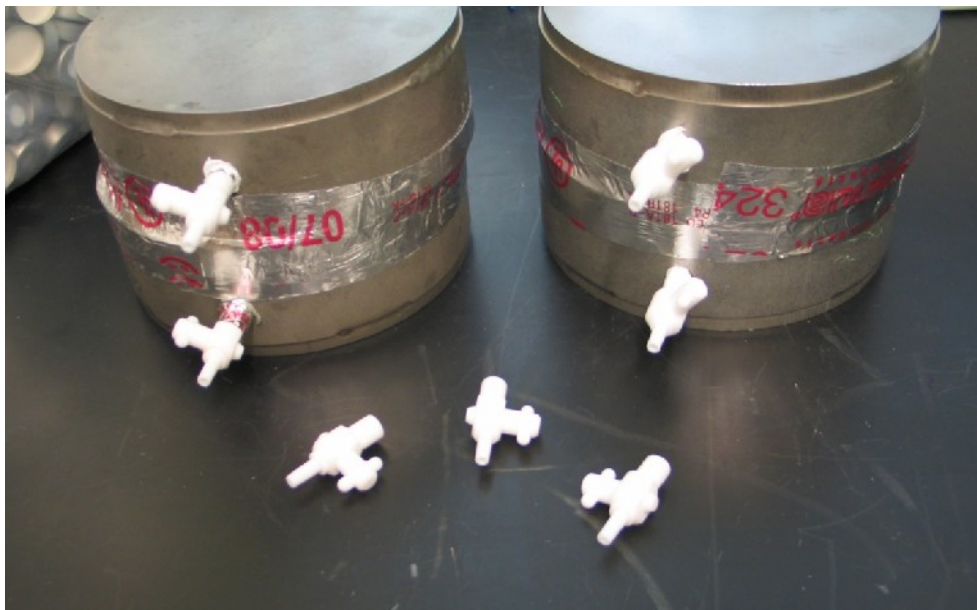


# *Characterization of Tarps*

- Field and laboratory performance considered
  - Lab method yields a measure of permeability expressed as MTCs
  - Developed by USDA/ARS (Yates et al)
  - EPA testing effort
    - Similar results as USDA
    - Additional tarps considered
    - Statistical methods used to group results



# Chamber Testing Method



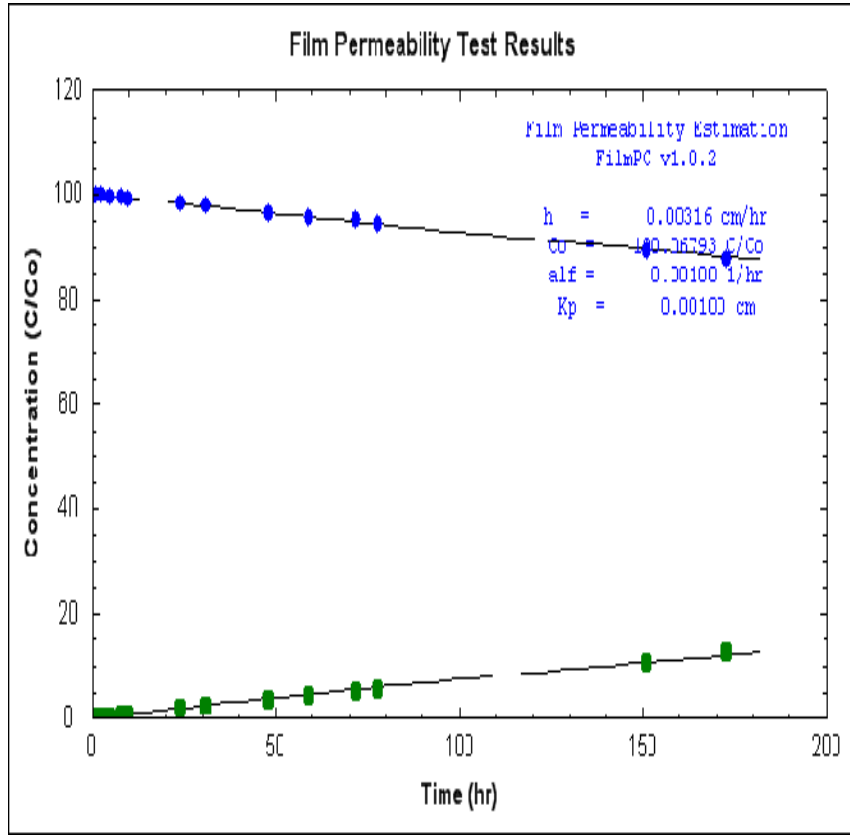
Tarp is sandwiched between each chamber. Fumigant is introduced on 1 side then each chamber is sampled over time

- Tested 24 agricultural tarps
  - 12 manufacturers and various tarp types (e.g., LDPE, metallized, VIF, and TIF tarps)
- Tested 8 fumigants
  - 1,3-D, MeBr, MeI, MITC, Pic, DMDS, SF, and PPO

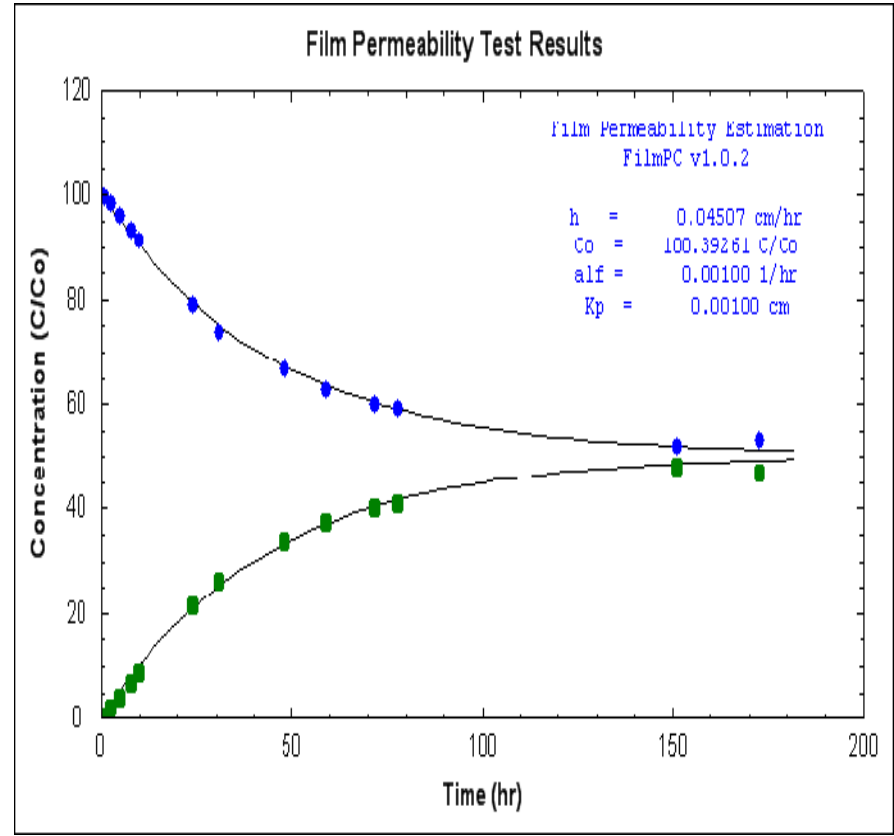




# Example - Tarp #6 (VIF), 25°C



MeBr



MITC



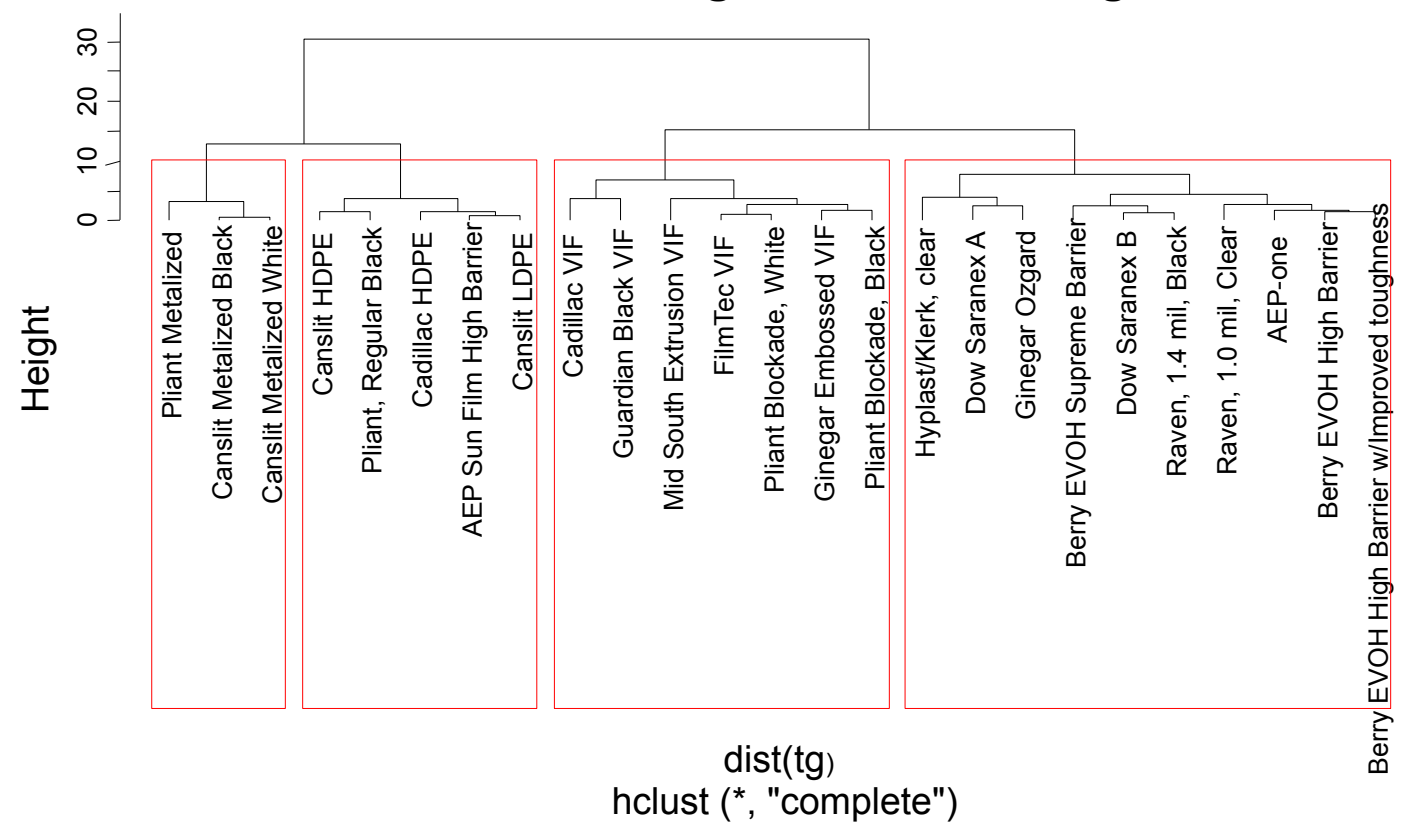
# *Statistical Method/Results Summary*

- Performed a number of statistical analyses to determine how tarps should be grouped
  - Individual fumigant basis
  - Across all of the tested fumigants combined
- All analyses show 4 distinct groups
  - Tarps included in individual fumigant groups differ slightly from combined fumigant groups
  - Tracks well with perceived notion based on knowledge of materials used and construction



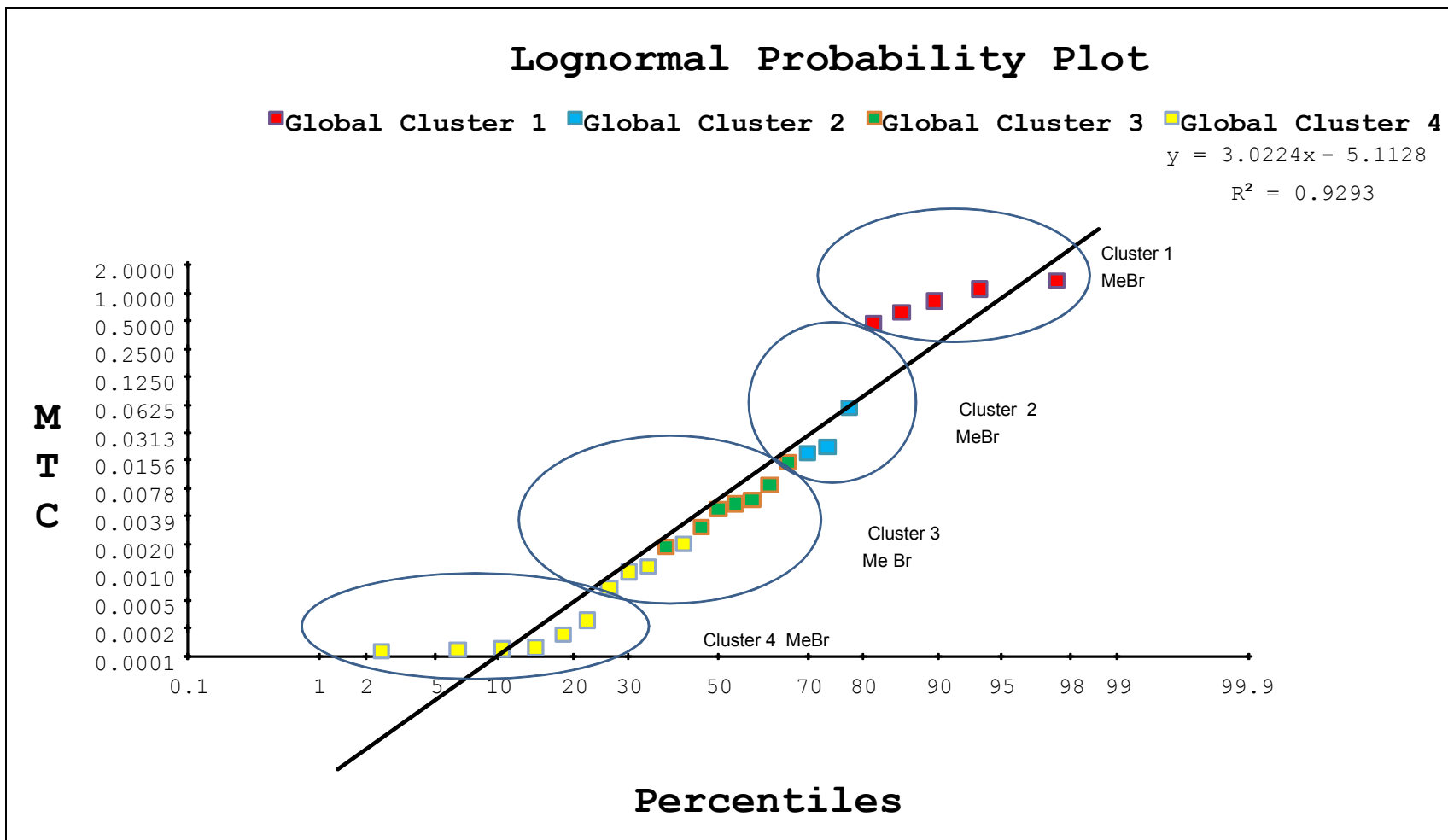
# Statistical Analysis - All

Cluster Dendrogram for All Fumigants





# Statistical Analysis - MeBr





# *Summary*

- Extensive risk assessment and public participation process

[http://www.epa.gov/pesticides/reregistration/soil\\_fumigants/index.htm](http://www.epa.gov/pesticides/reregistration/soil_fumigants/index.htm)

- Agricultural plastics play key role in proper fumigant use
  - Cultural needs to achieve efficacy
  - Means to manage possible risks
- Tarp permeability data allows for
  - Assigning buffer credits
  - Eventual development of performance standard (e.g., ASTM)