

Future research priorities based on a survey of the attendees at the Department of Pesticide Regulation's symposium on pesticide VOC research, May 22 - 23, 2007.

	Future Research Priority Questions	Votes
1	Understand the sources and generation of VOCs and NO _x .	33
2	Understand the root causes of ozone formation.	26
3	Reduce uncertainty in models, methods, emissions, etc.	24
4	Develop faster & cheaper methods to estimate emissions under field conditions.	22
5	Develop spray technology to deliver pesticides more effectively to the target plant.	13
6	Improve film technology to reduce emissions during fumigations.	13
7	Need sufficient information on emission-reduction strategies.	11
8	Investigate scheduling of prefumigation and post fumigation water applications to optimize emission reductions.	10
9	Use models to check consistency of regulations and screen out unrealistic patterns in regulations.	9
10	Estimate the range of variability in factors affecting VOC reductions.	9
11	Conduct research on economic impacts of VOC reduction strategies, a cost/benefit analysis of VOC reduction from pesticide and improved economic models.	8
12	Develop pesticides with alternative modes of action.	8
13	Investigate the use of polymers to reduce evaporation during the application process.	8
14	Investigate the use of polymers to reduce fine particles produced during application.	7
15	Develop a conceptual framework so regulators can trust the data provided by scientists.	6
16	Develop IPM friendly pesticides.	5
17	Investigate the role of organic matter in reducing emissions.	4
18	Develop alternative to TGA method for no fumigants.	2
19	Breeding pest resistance in crops.	2
20	Improved genetic resistance and tolerance levels to soil borne pests and pathogens in crops dependent upon fumigants.	1
21	Deeper understanding of reactivity-base dynamics re: pesticides.	1
22	New method for measuring emission factor and reactivity instead of TGA.	1

Future Research Priority Questions		Votes
23	Genetic engineering.	1
24	Develop better methods to test for efficacy or specific pathogens and nematodes with fumigants as opposed to focusing on specific crops with minimum pest problems for example, a pythium root rot assay with all fumigants and combinations-focusing on soil type and a pathogen that can transfer across crops.	1
25	Need sufficient information on efficacy effects of emission-reduction strategies.	1
26	What is the impact of VOC reduction strategies on NO _x .	1
27	Mass balance approach benefits analysis.	1
28	Large scale verification of trials for nematodes-resistant rootstocks in things like grasped stone fruit and almonds.	1
29	Better-model-tremendous resources to shifting away from ECS with uncertainly what it will result in.	1
30	Biological control.	1
31	Inventory estimates-is this accurate? Presentations indicated otherwise.	1
32	Genetically modified crops to build in pest resistance.	1
33	Understand reactivity and incorporate into inventory.	1
34	Develop Pesticides With Alternative Formulation.	1
35	TGA should be the stand-alone factor of a voc need to evaluate emissions from actual use, and the reactivity factor. A high TGA material may have zero ozone impact.	1
36	Economics-cost/benefit of VOC reduction from pesticides. If no _x is key, what is the importance of an incremental reduction pesticide VOCs?	1
37	Alternative methods used to develop new cultivars, strains, etc.	1
38	Better economic impact analysis.	1
39	Env. performance indicators for A.G.	1
40	Consider incentives where regulatory authority is lacking.	1
41	Effectively screen and implement emission-reduction strategies= first design the research program.	1
42	Investigate effect of soil temperatures on fumigant emissions.	1
43	Investigate effect of soil depth of incorporation on fumigant emission.	1
44	Study films (vif stretching, temperature effects, and biodegradation).	1

Future Research Priority Questions

Votes

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| 45 | Study effect of soil moisture and soil textures interactions with regard to emission and efficacy. | 1 |
| 46 | Study shank designs to reduce emissions. | 1 |
| 47 | Gross-media inadvertent impacts avoidance/partnership efforts. | 1 |
| 48 | More field application emission level data collection (the uncertainty goes down with more studies). | 1 |
| 49 | Water-sealing and chemical-enhancement (k-hyposulfite) emission reduction or efficacy reduction? | 1 |
| 50 | Soil pest testing methods/better understanding of biology of soil pests. | 1 |
| 51 | Develop alternative pest and pathogen management strategies, such as, some discussed on day 2-
Eg. Rootstock and variety breeding pest free soils, biological and cultural controls, crop rotations, cover crops, biofumigation, soil solarization are examples | 1 |
| 52 | Enhancement of biologically based alternatives | 1 |
| 53 | Develop reactivity information for individual solvent and volatile A.I. | 1 |