Environmental Technology Council
PESTICIDE DRIFT REDUCTION TECHNOLOGY
FIRST STAKEHOLDER TECHNICAL PANEL MEETING

Executive Summary

The Environmental Technology Council (ETC) Pesticide Drift Reduction Technology (DRT) Stakeholder Technical Panel (STP) met January 31, 2006, at the George Washington Carver Center in Beltsville, Maryland. The purpose of the meeting was to bring stakeholders together for input on EPA's Pesticide DRT Project. EPA has been investigating how to reduce pesticide spray drift for several years, and the next step is to receive expert input from the stakeholders to devise a test and quality assurance plan (TQAP) for DRT performance verification.

The goal of pesticide spray drift reduction is to apply active ingredients in the necessary areas without collateral damage to the environment or humans, and the problem must be addressed via a systems approach whereby laboratories collaborate, and many different experts are involved. Pesticide spray drift is an important concern for EPA's Office of Pesticide Programs (OPP). OPP has determined that the best solution to reduce pesticide spray drift is technology regulation.

The first stakeholder review meeting is an opportunity for the stakeholders to provide input into the draft TQAP, which will be written following the meeting. During a second stakeholder meeting, the STP will discuss and finalize the draft TQAP. Then technology vendor participation will be solicited, testing will be conducted, and a draft report of the results will be submitted to EPA. Following approval, EPA will sign and distribute a verification report and statement. The planned protocol outlined in the TQAP will be targeted to technologies that reduce drift in ground and aerial applications to row crops and will encourage new and better DRTs to be introduced into the marketplace.

There are many measures of drift, but the STP chose to focus on relative measurements of deposition as the primary performance measure. The primary performance measure will not exclude other measurements that the panel determines are important to add to the profile, such as droplet size. In addition, the profiles will be broad to address as many performance measures as possible.

DRTs will need to be tested via modeling, wind tunnels, or field studies, or a combination. The STP determined that all three testing approaches can be included in the protocol, with the emphasis placed on wind tunnels; as models develop and improve, they also will be utilized. An *ad hoc* committee will develop a matrix of potential technologies and the best method with which to test them. International harmonization of the DRT program with other countries also is important so that companies do not need to retest to meet multiple standards.

There are many existing standards, including those from the American Society of Agricultural and Biological Engineers, the American Society for Testing and Materials, and the International Standards Organization. The STP will explore these standards and determine which ones are available that fit this program's need. The Environmental Technology Verification (ETV) Program will accept the use of well-established data in creating the protocol. Aerial application does not have as many standards, and the STP will determine if current aerial application standards are acceptable or if more are necessary.

The goal in determining a reference sprayer is to achieve a fair and equitable approach to testing each type of equipment; it is more important that a reference is defined than the specific reference selected. Many factors need to be considered in determining the reference sprayer, which must be tested in both a wind tunnel and the field. An *ad hoc* committee will formulate recommendations as to the minimum number of baseline reference sprayers needed to encompass the desired technologies.

A two-tiered approach was discussed to investigate surfactants and adjuvants as DRTs and then to determine the tank mix formula that will be used to test other DRTs, such as nozzles. Voluntary relationships between the tool manufacturer and the chemical manufacturer should be encouraged to increase available DRTs.

Other issues include keeping labeling on DRTs simple to increase compliance; achieving a balance between efficacy, cost, and drift reduction; and determining the percentage of drift reduction that is considered valuable and significant.

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Meeting Summary
January 31, 2006
Beltsville, MD

The Environmental Technology Council (ETC) Pesticide Drift Reduction Technology (DRT) Stakeholder Technical Panel (STP) met January 31, 2006, at the U.S. Department of Agriculture (USDA) George Washington Carver Center in Beltsville, Maryland.

Introductions
Gregory Sayles, EPA/ORD/NRMRL

Dr. Gregory Sayles, of EPA's Pesticide DRT Action Team, welcomed the participants and explained that the purpose of the meeting was to bring stakeholders together for input on EPA's Pesticide DRT Project. For the past 3 to 4 years, EPA has been investigating how to reduce pesticide spray drift. A research framework flowchart was created and presented at the International Conference on Pesticide Application for Drift Management in October 2004. The next step is to receive expert input from the stakeholders to devise a test plan for DRT performance verification. EPA receives technical input from a variety of methods, one of which is via the Federal Advisory Committee Act (FACA). Dr. Sayles stated that the Pesticide DRT Action Team is not a FACA-directed committee. As such, the panel does not have to come to a consensus recommendation; individual advice and input are desired.

Following his brief introductory remarks, Dr. Sayles asked the meeting participants to introduce themselves.

Welcome
Donald Erbach, USDA Agricultural Research Service

Dr. Donald Erbach welcomed the participants to the USDA facility, which is the headquarters of the USDA Agricultural Research Service (ARS). He stated that the goal of pesticide spray drift reduction is to apply active ingredients in the necessary areas without collateral damage to the environment or humans. This problem must be addressed via a systems approach, because the problem is too large to be solved by a single laboratory. Laboratories must collaborate and communicate, and experts, including plant physiologists, agronomists, horticulturists, engineers, physicists, and chemists, must be involved.

The Crop Production National Program (National Program 305) is the ARS' primary research effort. The mission of the program is to perform research to ensure that crops and their products are safe while preserving environmental quality. Much of this research is conducted in College Station, Texas; Stoneville, Mississippi; and Wooster, Ohio.

Office of Pesticide Programs Perspective
Anne Lindsay, EPA/OPPTS/OPP

Pesticide spray drift is an important concern for EPA's Office of Pesticide Programs (OPP). OPP determined that the best solution to reduce pesticide spray drift was technology (e.g., labels, nozzles, etc.) regulation. Regulations and rulemaking, however, can stifle research and development of new technologies. Questions about the effectiveness of a recent OPP Pesticide Registration Notice regarding labeling statements have led to the process being tabled.

OPP is collaborating with EPA's Office of Water (OW) on pesticide issues as a result of concerns resulting from the intersection of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Clean Water Act (CWA). Certain types of pesticide applications over U.S. waters do not require National Pollutant Discharge Elimination System permits. Currently, OPP does not enforce permits, but a discussion about this topic will occur in the near future. If any meeting participants have input into this topic, they may contact Virginia Garelick of EPA's OW.

Because EPA is able to facilitate the development of pesticide DRTs, it is necessary to increase efforts to develop technologies and increase incentives to encourage best management practices. The goal is to demonstrate, via scientific research, the benefits to utilizing best management practices and then offer regulatory incentives for use of best management practices.

The Pest Management Regulatory Agency of Canada partners closely with EPA on many pesticide activities. The partnership has been beneficial to both the United States and Canada.

Stakeholder Technical Panel Role—Plan for the Day
Drew Trenholm, RTI International

Mr. Drew Trenholm outlined logistical matters for the meeting and explained that a specific technical panel had been created for advice on devising a test plan. Meeting participants who are not members of the STP also are welcome to provide comments about the draft test plan.

The EPA test and quality assurance plan (TQAP) has a specific development process that begins with EPA project scoping. Once the scope of the project has been determined, EPA prepares a background and discovery document for stakeholder deliberations and solicits members for a stakeholder panel. The first stakeholder review meeting (i.e., today's STP meeting) is an opportunity for the stakeholders to provide input into the draft TQAP. Following this meeting, the EPA Pesticide DRT Action Team will draft a DRT TQAP and provide it to the stakeholders before a second stakeholder meeting, which will be held to discuss the draft TQAP. Following the second meeting, the goal of the STP is to finalize the TQAP. Once the TQAP is final, technology vendor participation will be solicited. Testing then will be conducted by an outside testing organization, and a draft report of the results will be submitted to EPA. If the report is approved, EPA will sign a verification report and statement. It is important to note that EPA will not endorse the technology but only state that it has verified the technology. The Agency then distributes the verification report and statement to the applicant and posts the results on the Environmental Technology Verification (ETV) Program Web Site.

Mr. Trenholm gave an overview of the generic draft plan that the participants had received to ensure that the EPA document format would be understood. EPA quality assurance (QA) procedures that must be addressed in the plan provide the constraint for the subheadings of the draft plan. Subheading A (Project Management) reflects an effort to set the data quality objectives for the project, and Section A7 (Quality Objectives and Criteria) is particularly important. Subheading B (Data Generation and Acquisition) is a specific set of methods and quality control requirements for data management and must include an explicit and detailed discussion of how data are used to measure performance. Subheadings C (Assessment/Oversight) and D (Data Validation and Usability Elements) are assessment and QA sections for performance audits.

Dr. Norman Birchfield stated that he has been asked by a number of stakeholders about who will administer the protocol, and he emphasized that the protocol will be set up so that anyone will be able to administer it. Mr. Trenholm agreed that it would be a public protocol that anyone can administer. Dr. Aldos Barefoot asked about the protocol for following EPA regulations (i.e., if a stakeholder performs a study and submits it for review, how would that be handled and would it be similar to the current review of data to support technology registration?). Dr. Birchfield responded that this is a developing process and the details still need to be addressed, but the TQAP should address how the studies will be conducted.

Ms. Sandra Bird stated that the process needs to have some value to increase participation; therefore, the quality of the process should be similar to the OPP process. Dr. Birchfield responded that OPP is one of the stakeholders involved in developing the process and agreed that collecting data that are of sufficient quality to offer incentives on labeling will require data of the same quality as OPP registration submissions. There also are additional incentives available to decrease drift reduction and develop additional DRTs, and having a protocol for evaluating and ranking technologies will be beneficial.

Mr. David Valcore mentioned barriers to implementing DRTs, including the increased expense of the EPA Good Laboratory Practices Standard requirements for registration data submissions. This protocol should provide additional options to encourage the development of quality data for labeling. The TQAP document appears unwieldy but may be necessary if EPA is examining data and ensuring there is no bias. ETV's role in this process should be clarified. This protocol should be economically feasible and of benefit to the pesticide community. Mr. Tom Bals agreed that if individual companies have financial responsibility, then the expense of QA procedures may not be feasible because nozzle manufacturers do not have a large enough market to justify the expense. Mr. Trenholm stated that one of the goals of this process was to develop a protocol that was feasible for all stakeholders, but there may be some compromise involved.

Mr. Trenholm provided an overview of the agenda. Each of the five issues discussed today will be introduced by an expert, who will provide a brief overview of the topic and then lead the discussions. By the end of the day, the panel will summarize what has been accomplished and what remains to be done. Before the next meeting, the panel will develop a full draft TQAP based on the discussion at this meeting. The TQAP will be available for review before the second STP meeting.

Ms. Bird asked if the protocol was targeted to ground and aerial applications to row crops. Dr. Birchfield responded that because the complexities involved with vineyards and orchards are challenging, this protocol would focus on row crops, including both ground and aerial applications. A second project proposal has been submitted to investigate orchard and vineyard DRTs in the future.

Ms. Carolyn Baecker asked if the scope of this project is to encourage the use of DRTs by growers and other nonregulated applicators. Mr. Trenholm responded that the purpose is to encourage new and better DRTs that are introduced into the marketplace. They eventually will be used by growers.

Dr. Dennis Gardisser asked how the name "Pesticide Drift Reduction Technology" was selected, because the goal is to reduce drift potential vs. drift. Dr. Birchfield responded that there was no conscious effort to name the action team; it just evolved.

Mr. Bals asked if many technologies would be investigated or only sprayers. Mr. Birchfield responded that many technologies would be investigated.

Issue 1—Primary Performance Measure
Discussion led by Norman Birchfield, EPA/OPPTS/OPP

Measures of drift are many but include: (1) quantity of pesticides deposited on the field, (2) flux at the downwind edge of the field, (3) deposition at a set distance downwind, (4) deposition integrated over a downwind area, and (5) droplet size spectrum and model extrapolation. EPA risk assessments focus on downwind deposition of drift within the first few hundred meters of the field and in nontarget areas. Plant risk assessment involves deposition onto nontarget plants 100 feet downwind. Drinking water concentrations are measured by the deposition into a nontarget, 300 foot wide water body. Aquatic organism risk assessments focus on deposition into a nontarget 200 foot wide water body. Refined terrestrial animal assessments measure deposition onto food sources of other organisms (i.e., secondary exposure), including nontarget vegetation, seeds, and insects.

If any calculated risk assessment is significant for any pesticide, then the risk manager works with industry to regulate the application (e.g., buffer zones). Concerns of exposure are balanced with industry's financial concerns.

Discussion

Dr. Gardisser stated that ensuring the proper use of DRTs to reduce drift potential after they have been rated must be considered. Mr. Bals stated that education and training, especially at the point of sale, could be a solution. Mr. Benjamin Smallwood commented that mitigation is a system. Although labeling, education, and training are useful approaches, onsite investigation may be necessary to ensure compliance.

Dr. Alvin Womac stated that labeling easily could become cumbersome, and keeping labeling reasonable would involve extensive discussion. Mr. Bals agreed that if labels become too cumbersome, compliance would decrease. Dr. Ted Kuchnicki stated that if the panel chose to include options for various crops, growth stages, and so forth, the label would be too cumbersome. Another approach may be to follow the United Kingdom's Local Environmental Risk Assessments for Pesticides (LERAP) approach, which utilizes a booklet and a Web site where drift reduction based on various technologies can be calculated. Mr. Mark Ledebuhr asked if LERAP had been adopted widely. Mr. Bals replied that such data were not available, but that the idea behind LERAP is that if instructions are communicated clearly, they will be followed. Although the LERAP scheme is complex, it is communicated in a straightforward manner, and he is optimistic that the system is being used.

Ms. Baecker stated that drift management and mitigation implies investigation of droplet size, and if droplet size is too small, it will not reach the crops. Dr. Birchfield responded that droplet size needs to be considered, but other technologies to reduce drift also can be utilized. Mr. Bals commented that European tests indicate that droplet size is not the only factor. He has reservations, however, about efficacy and cost issues.

Dr. Clint Hoffman asked if the focus of the effort would be ground deposition and commented that it was necessary to agree from which point the project is starting. Dr. Birchfield responded that this is a reference question, and the panel needs to decide what is the baseline, or zero, level and to what it will be compared. Mr. Valcore stated that the panel should concentrate on the issues about which OPP is concerned (i.e., ground vs. air). Mr. Trenholm responded that it was possible to have more than one primary performance measure.

Mr. Kuchnicki stated that management of composite components must be considered.

Ms. Terri Barry noted that California's primary consideration is deposition. If OPP desires to concentrate on deposition, then the panel should concentrate on deposition.

Dr. Womac commented that the 200- and 300-foot distances that EPA utilizes for risk assessments are arbitrary. The question is whether relative or absolute values will be measured. He agreed that concentrating on deposition was appropriate and asked about the criteria that would be used to determine if drift actually is being reduced. Mr. Trenholm stated that, unless there was significant disagreement, relative measurement was the most appropriate approach. Mr. Valcore thought that a relative measurement of drift reduction was essential. The issue of differing deposition profiles will need to be addressed. Dr. Birchfield stated that although an absolute approach may be easier to implement, OPP could work with a relative approach. Flux measurement depends on how measurement is taken and on the number and size of droplets. A deposition model can be produced.

Mr. Bals stressed that caution must be used when integrating data because profiles can result in crossover, and this may lead to problems in declaring certain technologies better than others. Additionally, inhalation risks need to be considered.

Dr. Hoffman stated that each current product already has a risk assessment from EPA and asked if these would be utilized as the base case. Dr. Birchfield responded that they could be the base case, but the percent of application rate is not associated with a specific piece of equipment. If a relative comparison is utilized, it will be more productive in identifying specific equipment capabilities and increase standardization. Dr. Ken Giles cautioned that newly developed technologies will have different drift profiles than those seen with standard equipment, and this would have to be taken into account.

Mr. Ledebuhr thought that investigating the air concentration profile could be utilized for the purpose of standardization. Dr. Birchfield replied that drift cannot be quantified by how and where because the fluxes are different. Therefore, more information would be needed with this approach. Mr. Trenholm stated that information requirements could be built into the protocol.

Ms. Barry said that the technology the panel wanted to investigate should not have significant amounts of pesticide in the air. Focusing on deposition is the most efficient method of investigation.

Mr. Trenholm summarized that investigating relative measure and deposition appears to be the primary focus of interest. It is necessary to identify the profile as a part of deposition measure. The secondary interest appears to be the airborne component. A measurement of overapplication in the target area also may be a measurement of interest.

Dr. Barefoot commented that measurements other than deposition (e.g., droplet size) should not be ignored. Mr. Trenholm replied that the primary performance measure does not exclude other measurements that the panel determines are important to add to the profile.

Mr. Bals asked if this performance measure was going to be integrated with other factors (e.g., temperature, topography, etc.). Dr. Birchfield responded that the profiles would be broad to address as many performance measures as possible.

Issue 2—Testing Approach (Field, Wind Tunnel, Modeling)
Discussion led by Andrew Hewitt, University of Queensland

DRTs include sprayers, specific parts of sprayers (e.g., nozzles), modification devices (e.g., reverse venture chambers), adjuvants, and barrier vegetation. It is important to consider how each relates to current models and how each needs to be tested, as well as to attempt to harmonize these technologies across systems and countries. Entire sprayers (e.g., tunnel sprayers, air-assisted, air curtain sprayers) usually need to be tested in field studies, and possible crop interactions need to be considered.

Germany's Biologische Bundesanstalt für Land- und Forstwirtschaft (Federal Biological Research Center for Agriculture and Forestry; BBA) has extensive tables listing the exact setup of a sprayer to qualify for drift reduction approval, but labeling cannot be as complex as BBA's system. Additionally, the American Society of Agricultural and Biological Engineers (ASABE) and the International Standards Organization (ISO) have standards on field drift study procedures. The LERAP approach is cost effective for wind tunnel testing. Field testing should be utilized for systems, as these can perform differently in different conditions. Many different, specific testing conditions do not need to be performed; a worst-case scenario could be utilized. Specific parts of sprayers often can be tested in large, low-speed wind tunnels, particularly nozzle types, and can utilize existing ASABE standards. Nozzles can be classified in different classes under different operating conditions.

DRTs include application techniques, adjuvants, barrier vegetation, and so forth. The STP needs to consider wind tunnel versus field evaluations. Use conditions need to be considered when developing drift classification systems, because interactions pose challenges (e.g., changes in tank mix and crop type or growth stage can change completely the drift performance of a technology). International harmonization of the DRT program with other countries also is important so that companies do not need to retest to meet multiple standards.

Discussion

Dr. Patrick McMullan commented that the protocols should be focused on technology manufacturers and the products they manufacture. Dr. Hewitt responded that the protocols also could be aimed at applicators as in the example of LERAP. If a grower has a DRT, such as a hedge, he can apply for an exception. Mr. Valcore stated that manufacturers should investigate producing synthetic hedgerows as a DRT. Mr. Bals commented that companies in the Netherlands were testing artificial hedgerows.

Mr. Smallwood suggested that adjutants, buffers, and so forth could each be labeled with risks, and the various components could be used as a system where all of the risks for each component are put into the equation to reduce drift. Dr. Hewitt asked the panel to consider if they wanted to include barriers (e.g., hedgerows) in addition to nozzles in developing the protocol. Mr. Bals stated that developing one label with all of the information was not the solution. All of the risks need to be known. Dr. Barefoot commented that the focus of this program should be on manmade technologies that also are applicable to natural barriers.

Mr. Valcore stated that the primary focus for testing is on wind tunnels, field testing, and modeling. All three will be needed, but the majority of tests should be via wind tunnel, because wind tunnels are simple, inexpensive, and accurate. Dr. Barefoot agreed and reiterated that some tests will have to be performed in the field. Mr. Howard Stridde stated that the biggest challenge would be to find a standard set of conditions, because there is not simply one answer, one technology, or one set of conditions. The protocol must be inclusive. Dr. Hewitt commented that ASABE and ISO have existing standards for testing methods. The panel should explore these standards because those that have tested internationally have used these.

Dr. Stephen Pearson stated that tunnels have been used effectively, and modeling has benefits as well. Keeping all three in the protocol, as Europe does effectively, can provide a useful tool for the end user. Mr. Bals agreed and commented that more work needs to be done on ground sprayer modeling. Dr. Barefoot stated that models could be viewed as standards or as simulating drift. Mr. Carmine Sesa asked what models entailed. Dr. Hewitt responded that the AgDRIFT® model covers conventional applications where droplet size is the significant effect, and AGDISP is a new ground model. Dr. Pearson commented that if all three testing approaches are included in the protocol, as models develop and improve, they could be utilized. Dr. Birchfield explained that there is a ground model included in AGDISP, but there are problems modeling near the nozzle head. When measurements are taken away from the nozzle head in the wind tunnel, AGDISP is able to process the data accurately. Dr. Hewitt commented that the next AGDISP meeting is in March. It is possible that the AGDISP workgroup could develop modeling options based on the STP's input. Ms. Bird stated that there is the potential for linking with the wind tunnel; in spite of the canopy limit, it could work for relative assessment. Dr. McMullan asked if the models take into consideration droplets created by the machine. Dr. Hewitt responded that wake effect is considered for air assessments, but the AGDISP ground model has a basic, limited conversion option. Dr. McMullan added that international standards have been accepted for wind tunnel testing. Mr. Bals stated that they were in draft format. Mr. Sesa commented that high shear has the potential to significantly change the properties of a chemical solution.

Dr. Hewitt stated that the American Society for Testing and Materials (ASTM) has protocols that should be investigated to determine if they meet the needs of the STP instead of "reinventing the wheel." Mr. Bals agreed that the STP should try to improve on what has been done already instead of developing new protocols. Mr. Trenholm asked if it was plausible to list the technologies the STP would like tested and the best approach to testing each and put it into a matrix. The group consensus was that this was possible.

Issue 3—Use of Existing Standards
Discussion led by Andrew Hewitt, University of Queensland

Spray drift test guidelines include EPA's Office of Prevention, Pesticides, and Toxic Substances (OPPTS) 840.1000 (Background for Pesticide Aerial Drift Evaluation); OPPTS 840.1100 (Spray Droplet Size Spectrum); and OPPTS 840.1200 (Spray Drift Field Deposition). EPA also relies on ASABE and ASTM standards.

Drift standards include ASABE Standard S561 (Procedure for Measuring Drift Deposits from Ground, Orchard and Aerial Sprayers); ISO Standard 22866 (Equipment for Crop Protection: Methods for the Field Measurement of Spray Drift); ISO Draft Standard 22856 (Equipment for Crop Protection–Laboratory Drift Methods Measurements); ISO Draft Standard 22369 (Crop Protection Equipment: Drift Classification of Spraying Equipment–Part 1: Classification); and international DRT wind tunnel and field testing protocols (e.g., LERAP, BBA, and the Netherlands' Instituut voor Milieu en Agritechniek, known as IMAG).

Droplet size standards are encompassed in several ASTM (e.g., Standards 799, 1088, 1296, 641, 1260, and 1458), ASABE (e.g., Standards S327.2, S386.2, and S572), and ISO (e.g., Standard 25358) standards. Physical property standards can be found in ASTM standards, including the Draft Standard Test Method for Characterization Performance of Drift Control Adjuvants; the Rheological Standard Test Method for the Relative Extensional Viscosity of Agricultural Spray Tank Mixes; E1142 (Standard Terminology Relating to Thermophysical Properties); and E1194 (Standard Test Method for Vapor Pressure). Other standards include ASTM E177 (Practice for Use of the Terms Precision and Bias in ASTM Test Methods); ASTM E691 (Standard Practice for Conducting an Interlaboratory Study To Determine the Precision of a Test Method); and ASTM E456 (Definition of Terms Relating to Statistical Methods). Additionally, the Spray Drift Task Force (SDTF) has developed standard operating procedures for field, droplet size, and physical properties studies, but these may not be viable as a result of expense.

Many of the standards listed above are being finalized in 2006, with the next drafts being reviewed in April or May. This is ideal timing for input from this DRT project to ensure that the new standards meet the project requirements, if possible.

Discussion

Dr. Birchfield asked if the standards are commonly used and about any cost issues involved. Mr. Bals stated that some are too expensive, and their stringent conditions make compliance difficult. Currently, Europe is investigating a more relative measure for measuring spray equipment as a whole.

Dr. Hewitt stated that the panel must address the issue of replications, determining the amount of replications needed to produce significant data that are statistically valid. He added that Dr. Jan Van de Zande of the Netherlands uses 10 repetitions on each of 3 days. Dr. Giles asked how Dr. de Zande chose that number. Dr. Hewitt responded that he reported a 95 percent confidence level at 10 replications. Ms. Barry asked what Dr. de Zande classified as a replication. Mr. Valcore replied Dr. de Zande defined replications as 10 repetitions using different crop canopies on 3 different days. Drift reduction of 30 percent is the minimum Europe will consider, and Mr. Valcore thought that 25 percent drift reduction should be the minimum. Dr. Birchfield responded that 25 percent is just noise from a risk assessment standpoint, and at least 50 percent reduction is a more reasonable goal. Using 50 percent and 95 percent drift reduction as standards may be appropriate. He asked the panel to consider if a reduction of a factor of two is acceptable.

Dr. Pearson commented that a separation of percentages is important, but it also is important to determine where the baseline is set. Mr. Bals added that a significant amount of already-developed technology can reduce drift by 50 to 75 percent; Germany demands 99 percent drift reduction. Dr. Hoffman added that Germany is performing relative comparisons of technology, trying to replicate environmental conditions

as close as possible. The standard methods that Germany is utilizing are derived from ASABE standards but with decreased samples downwind.

Dr. Gardisser thinks that field trials are time consuming and expensive. To perform field testing, his association makes multiple passes because wind gusts can affect significantly the standard deviation. Utilizing multiple passes allows the calculation of average wind speed. Dr. Dave Schulteis asked if a 30 percent decrease in drift reduction is defined by the target. Mr. Valcore stated that 30 to 50 percent reduction is the base minimum that can be considered meaningful. If it can be statistically proven that a 30 percent drift reduction has a significant impact in reducing drift on large fields, it may be appropriate to keep the 30 percent as a base number.

Dr. Womac asked if the ETV Program will accept the use of well-established (e.g., BBA tested) data. Mr. Trenholm responded that the panel is investigating standards to determine which ones are available that fit this program's need. The ETV Program will need to give explicit instructions regarding what data are acceptable. Dr. Birchfield commented that the first step of the ETV process asks about the approach this panel would like to take. The second step asks how existing data can be utilized in the chosen approach.

Mr. Jay Ellenberger stated that OPP cooperates with foreign governments, including the United Kingdom, Canada, New Zealand, Australia, and Japan, to establish ways to harmonize studies and determine a common approach. Successful harmonization is generally agreement on 85 to 90 percent of pesticide standards; 100 percent is not possible. This panel should focus on what is the best approach for the United States and then investigate what is available and how to harmonize with other countries. This approach has been successful in terms of cost and resource savings for the United States, foreign countries, and the chemical industry.

Dr. Hewitt commented that aerial application does not have as many standards, and the panel needs to determine if current aerial application standards are acceptable or if more are necessary. Dr. Kuchnicki commented that as the wind changes, some testing methods become very cumbersome. Dr. Hoffman added that such testing can be done, but there must be an adequate number of replications.

Mr. Ledebuhr stated that the solution might be to build a facility that encompasses all of the variables. He asked if this goal was a viable outcome of this project. Data variation occurs because of ambient problems. Dr. Hewitt responded that it was possible to investigate the use of the two ambient wind tunnels in existence, but the equipment industry would never bear the expense for building a new facility.

Dr. Gardisser commented that airplanes introduce many variables depending at what height they fly, and this cannot be fully replicated in wind tunnels. Mr. Valcore stated that the Battelle wind tunnel in Columbus, Ohio, is more than 100 feet long, and that the Dugway wind tunnel in Dugway, Utah, is larger and superior to Batelle's. He asked if any panel member was aware if the Dugway wind tunnel was available for outside testing. Ms. Baecker commented that a wind tunnel provides droplet spectra data but does not measure drift. Each individual airplane has a unique "fingerprint." Identical models of airplanes in identical testing conditions will give different droplet spectra and deposition. Field testing shows a larger droplet spectra than that found in wind tunnels. Additionally, temperature and humidity significantly change the droplet spectra even when all other variables are identical.

Dr. Birchfield asked if models were available for aerial testing. Ms. Baecker responded that there were peer-reviewed models and protocols. Mr. Valcore added that there were no ASTM standards, but the protocols were well established.

Dr. Hewitt stated that the two choices were to be conservative and use the worst-case scenario when determining reduction or perform so many trials that the protocol is prohibitively expensive. Ms. Baecker commented that utilizing the worst-case scenario might decrease efficacy, which would in turn increase pesticide use, thereby increasing drift.

Mr. Bals asked if it was possible to utilize data already compiled by the SDTF. Dr. Hewitt responded that the data could be utilized, but the panel also should focus on what the SDTF has not investigated (e.g., wing-tip devices, electrostatic sprayers). Dr. Birchfield stated that there are many current technologies that have not been tested, and if there is no interest in testing them, they should not be added to the protocol.

Dr. Hoffman asked if EPA would allow the use of data formatted similar to the SDTF data for this project. Dr. Birchfield stated that the SDTF protocol was approved by EPA, so this was possible. The testing was robust and expensive. In terms of developing a cost-effective method of testing, the SDTF protocol may need to be reduced but is a good place to start.

Dr. Gardisser stated that airplane manufacturers have responded to standards and protocols by producing only lower booms when it was shown that a lower boom increases efficacious pesticide application. Dr. Hewitt said that it is in the aerial community's interest to be involved in this program.

Dr. Womac commented that it was necessary to develop a smart approach to determine the state-of-the-industry. For wind tunnels, the ISO standard is state-of-the-industry. ASABE and ISO standards are utilized for field testing. The ISO has adopted the BBA atomization standards. ASABE has the only standard with an aerial component. Dr. Hewitt indicated that ASABE S572 is being developed into an international standard.

Dr. Birchfield instructed participants to send their recommendations on the most practical and useful standards to him via e-mail within the next week.

Mr. Valcore noted that having two different standards for aerial and ground was not desirable. Dr. Gardisser agreed and said that the aerial standard should be simple so that it was possible to collect data. Mr. Valcore added that a larger ASABE committee has developed a relative standard, and this panel's efforts may be overlapping with that effort.

Dr. Gardisser commented that the National Agricultural Aviation Association operates a training program to train applicators to reduce drift, which then results in certification. This could be another option. Ms. Bird asked if there were any data that indicated certification decreased drift. Dr. Gardisser was unsure but stated that insurance companies did recognize and give incentives for certification.

Dr. Hewitt stated that the key to aerial standards might be to assign credit to nozzles that create a more desirable droplet size. Currently, ground standards have only two droplet sizes. Ms. Bird stated that there were two sizes because it was difficult to determine any significant difference between additional groups. Dr. Kuchnicki stated that the datasets used for the ground droplet size measurements were determined via older, conventional techniques. With current techniques, it may be possible to separate droplet size groups even further. A new DRT for ground may be to reduce droplet size. Categorizing by droplet size, however, is a fundamental mistake; it should be categorized by drift. Ms. Baecker stated that the droplet spectrum still is significant. Mr. Valcore added that European tests correlated droplet size with wind speed. Dr. McMullan commented that buffer zones designed for fine, medium, and coarse droplets may cause problems in maintaining a balance between drift reduction and efficacy. Dr. Birchfield responded that droplet size is categorized for efficacy and can be crude for drift purposes; the ASABE droplet spectrum, however, is useful.

Issue 4—Reference or Baseline Technology
Discussion led by Ken Giles, University of California at Davis

The general objectives of technology evaluation are to: (1) facilitate and expedite development, approval, and adoption of new technology and application strategies; (2) document the performance of candidate technologies for reduction in spray drift from the application area; (3) provide data consistent with needs

for modification of label language and provide a common reference for tested equipment; and (4) leverage existing data, models, and evaluation techniques to expedite approval and adoption of DRTs.

Practical questions for reference sprayers include:

- Is one single sprayer used for all tests or for a specific use context (e.g., grains vs. vegetables vs. fruit)?
- Is a reference sprayer determined for each specific crop interaction (e.g., stage of growth, canopy, target area)?
- Is a reference sprayer determined for a single operating condition or practical range of operations (e.g., ground speed ranges, rate controller effects)?
- Can the manufacturer specify the reference sprayer?
- How can reference sprayers and data generated outside of the United States be used to expedite the process?

Challenges to defining a reference sprayer include: (1) determining if the reference sprayer is based on a current "low drift" system or a worst case; (2) accounting for geographic differences in spray practices (e.g., volume differences in aerial application); (3) establishing if a grower group, manufacturer, or other stakeholder can supply the reference sprayer; (4) ascertaining how the application rate of the active ingredient is a factor in a manufacturer's specification of a drift reducing technology; and (5) managing "difficult to model" technologies.

Discussion

Mr. Trenholm explained that the goal was to achieve a fair and equitable approach to testing each type of equipment. It is more important to define the reference than to assign it. Dr. Gardisser stated that geographical differences must be accommodated. For example, wind speeds that are unacceptable in certain geographic locations are the only option in others. Dr. Birchfield asked the panel to consider if there will be one reference for comparison purposes or a wide spectrum of sprayers for different purposes.

Mr. Ledebuhr asked if there would be a reference sprayer for different canopy heights. Dr. Birchfield responded that if the canopy could be described (e.g., corn at the four-leaf stage), then the reference sprayer could be utilized. Mr. Ledebuhr commented that logistically it made sense to have a reference canopy. Dr. Womac added that technologies that have a canopy interaction have been evaluated, and canopy effect is very low in the overall scheme. There is precedence for a floating reference system in ISO standards, but this system is more difficult to standardize and rate fairly. The protocol needs to be kept simple but with the flexibility to accommodate canopy height when it plays a significant role.

Mr. Bals thought that multiple reference sprayers would be needed, as well as a method of relating them across a matrix. Dr. Gardisser responded that if multiple sprayers are allowed, the market strategy might be to use the least expensive (and possibly inferior) standard to reduce DRT on paper. Mr. Trenholm stated that there would be one reference per type of technology, so that there would not be a choice.

Dr. McMullan asked if there would be a drift reduction statement for each portion of the label. Dr. Birchfield responded that testing would be done by category to cover a range of canopy heights (i.e., not by each individual growth stage). Dr. Hoffman asked if the speed in which labeling changes are processed would decrease. Dr. Birchfield responded that once the review has been completed, the changes are available on the EPA Web Site within hours to a few days. Mr. Trenholm clarified that the review process itself can take a few months.

Ms. Baecker asked about the source of the resources needed to quickly test the standards. Dr. Birchfield responded that resources could by provided by whichever organization could implement the protocol; EPA does not have to be the testing agency. Ms. Baecker commented that if current resources were not used judiciously, the amount of necessary resources would be overwhelming. Dr. Birchfield replied that this is why it is important for all of the stakeholders to work together and pool resources to develop this protocol.

Dr. Barefoot stated that tests could be categorized so that they could be completed in a realistic timeframe (e.g., all technologies in a certain category get the same DRT percentage rating).

Mr. Ellenberger stated that it is unknown how many tests will result from this protocol; it will depend on how well the protocol is received. Currently, the EPA Pesticide Program reviews more than 1,000 studies every month. Ms. Barry indicated that the State of California, which has tested groups of technologies, worked cooperatively with stakeholders. From this experience, once the protocols are in place, the stakeholders will find a method to efficiently perform the studies. Mr. Ledebuhr mentioned that east of the Mississippi River, growers' groups generally are fragmented. It might be beneficial to execute a regional drive. Chemical companies could use this to their advantage to sell more products to small growers.

Dr. Birchfield stated that with the LERAP system, there is one reference sprayer. Mr. Bals responded that because the United Kingdom is a small country with a small amount of crops, it is easier to use one sprayer, but there are still problems. Dr. Birchfield asked if Germany had multiple references. Mr. Bals responded that Germany uses one boom sprayer as a reference for ground application. Whichever reference sprayer is chosen must be tested in both the wind tunnel and in the field.

Mr. Sesa asked if there would be a protection of data produced by companies. Mr. Bals responded that in the German system raw data are protected, but analyzed data are released.

Issue 5—Tank Mix Surrogates
Discussion led by Alvin Womac, University of Tennessee

A surrogate tank mix should provide: (1) representative liquid properties, atomization, and spray settling behavior; (2) an accurate, repeatable, nonbiased, quantifiable tracer; and (3) low interference between items (1) and (2). The pesticide manufacturers' product formulations generally have dispersants to handle active ingredients of viscous oil, solids, and so forth. Some plain formulations do not contain product-enhancing adjuvant(s), whereas others are premixed with adjuvant(s) to increase biological efficacy. Applicators add adjuvant(s) to the plain formulations for biological efficacy and may add adjuvants for application efficiency (e.g., drift reduction, evaporation). When using premixed products, applicators may use the formula as supplied, may add more adjuvant(s) for biological efficacy, or may add adjuvants for application efficiency. The basic tank mix has adjuvant(s) present for biological efficacy. Adjuvants for biological efficacy and application efficiency affect drift primarily through droplet size at atomization and secondarily through droplet behavior after atomization.

Examples of surrogate use:

- 0.1 percent Agral 90 (Arnold, A. The dropsize of the spray from agricultural fan spray atomizers as determined by a malvern and the particle measuring system. *Atomization and Spray Technology* 1987;3:155-167).

- 2.5 percent Tenneco 500/100 solvent and 0.5 percent Triton X-100 adjuvant plus tracer (Mitchel RD, Bouse LF, Bode LE. Sampling techniques to determine droplet size spectrum for fan nozzles. In: Hirleman ED, Bachalo WD, Felton PG, eds. Liquid Particle Size Measurement Techniques [ASTM Standard 1083]. Philadelphia, PA: ASTM, 1990, pp. 238-245).

- 0.1 percent (v/v) Triton X-100 plus tracer dye (Hoffman WC. Presented at the 93rd International Meeting of the ASABE, Milwaukee, WI, July 9-12, 2000, Paper No. 001050).
- Blanks and various tracers in the atomization matrix (SDTF).
- 0.1-0.25 percent induce wetter plus tracer and approximately 1 percent Agridex crop oil plus tracer in field studies (SDTF).
- Surfactant plus tracer (LERAP).
- Surfactant-water mix 40 dynes at 10-20 ms such as 9 percent wt/wt isopropanol or 0.1 percent (v/v) Surfynol® TG-E surfactant and no tracer for nozzles claimed to reduce drift (Spray Nozzle Classification by Droplet Spectra [ASABE Standard S572]. St. Joseph, MI: ASABE, August 1999).

Generally, less than 0.25 percent of the mix should be surfactant and inert tracer dye.

Issues that need to be considered when investigating representative liquid properties, atomization, and spray settling behavior of surrogates include: (1) if the same must be used in both the reference and the DRT being evaluated (separate or a central mix); (2) the minimum tank mix volume for accuracy; (3) the uniformity of the tank mix during test (e.g., tank shapes with agitation dead spots, tank samples vs. nozzle samples, and corrections and full disclosure); (4) typical versus worst-case selections (e.g., uniform or biased effect on portions of cumulative droplet spectra; fairness in affecting all DRTs and results the same amount; and outliers in nozzle, tank mix, or atomization); (5) interactions when evaluating adjuvant-type DRTs; (6) disposal; (7) quality control of adjuvant to ensure uniformity; and (8) assurance of the lack of perceived favoritism toward brand, class, chemistry, and so forth.

Issues that need to be considered when investigating an accurate, repeatable, nonbiased, quantifiable tracer include: (1) tracer stability; (2) detection levels, environment false positives, and mass balance; (3) codified standards; (4) cost to quantify; (5) disposal; (6) quality control of tracer to ensure uniformity. Also, it is necessary to ensure that there is no interference between the adjuvant(s) and tracer for all possible use scenarios.

Discussion

Mr. Sesa commented that formulations and tank mix combinations could be used to draft protocols based on drift reduction, and to simplify this, the adjuvants could be narrowed down as the DRT. Dr. Womac asked if surfactant and adjuvants alone define a representative tank mix. Mr. Sesa responded that a few representative categories could be developed.

Mr. Stridde stated that tank mixes may have different emulsifiers and dispersants that change the surface tension, and this is the problem with defining a "basic pesticide tank mix." In general, tank mixes do have a surfactant and an adjuvant, but these vary from company to company, and the complexity and variation is very high. At some point, there must be a controlled spraying of the active ingredients. Mr. Sesa asked if that meant testing every combination. Mr. Stridde responded that the combinations tested would be driven by risk, as there are too many to test every combination. Dr. Hewitt agreed that it is impossible to test the full range of products. One solution might be to have a manufacturer include a statement on the label regarding the confidence that the product will perform as the nozzle indicates.

Dr. McMullan stated that there are more similarities between surfactants than between categories of products (e.g., nonsurfactant systems). One category could be for oil-based products and the other for liquid-based products. Mr. Valcore stated that a tiered approach was needed to mimic a formula (e.g., water and surfactants) to test equipment. The drift retardant, which must act over a full range of surfactant products, then could be qualified. Three to six blanks (e.g., an emulsifiable concentrate blank,

an oil blank, etc.) could be used to operate across a full range of surfactant products. Dr. McMullan commented that certain nozzles could be tested with multiple types. Dr. Schulteis mentioned that the mode of action dictates what is added to the tank for biological effect, which in turn affects the concentration of the surfactant. Dr. Womac commented that it might be possible to make the matrix accommodate extreme applications. The most important systems can be prioritized, but more will need to be done in the future.

Ms. Bird noted that there were two issues present. First, investigating the surfactant as a DRT itself. Second, determining the tank mix formula that will be used to test other DRTs, such as nozzles. It is possible to test relatively with one suite. She asked if it was possible for a baseline tank mix to give a good idea of the relative reduction of other DRTs. Dr. Hewitt responded that it was possible, but it depends on many factors. Mr. Valcore also thought it was possible.

Dr. Barefoot stated that enough is known about which nozzles fall into certain categories when testing adjuvants. Mr. Sesa commented that some companies are performing this research, so there is some knowledge. If there is a clear-cut goal, companies will have incentives to continue this testing.

Dr. Christine Hartless asked for clarification if the panel was proposing a two-tiered approach (i.e., a system to address nozzles as a DRT and then address adjuvants as DRTs). Dr. Womac confirmed the proposition.

Dr. McMullan stated that most drift retardants typically are used with conventional (i.e., non-drift-reducing nozzles). Applying multiple DRTs to one application might interfere with efficacy. It is possible that many evaluations will not need to be done because adjuvants generally are used with conventional nozzles versus drift-reducing nozzles.

Mr. Sesa asked how EPA viewed the regulatory process. Dr. Birchfield responded that as long as a protocol is in place to test the drift reduction potential, it should fit into the labeling process.

Mr. Ellenberger stated that the protocol is a risk reduction tool. To take advantage of an efficacious tool, there should be a voluntary relationship between the tool manufacturer and the chemical manufacturer. EPA is not the driver for mandatory regulations. Industry and EPA partner to reduce risk; industry takes steps to decrease risk, and EPA approves the technology after performing a risk assessment. Ms. Baecker asked if the suggestion was that nozzle companies would have to partner with chemical companies. Mr. Ellenberger responded that it was not mandatory, but partnerships will facilitate label changes. Mr. Valcore commented that marketing concerns might preclude such a partnership. Current labels are outdated and need to be revised. EPA must be involved with this update.

Dr. Barefoot thought that the goal was for companies to receive a statement from EPA approving the product as a DRT to put on the label. Companies will want to work together to receive that approval. Mr. Ellenberger stated that EPA is open to how the results of the studies get conveyed to the end user (e.g., statement for labels, via the Internet, etc.).

Dr. Schulteis stated that the infrastructure in the chemical industry is not conducive to changing labels. Dr. Kuchnicki cautioned about what is placed on the label so that it does not become overwhelming. Recommended nozzles and other DRTs can be placed on a Web site, whereas chemical changes would cause a label change.

Mr. Ellenberger stated that EPA would not require adjuvants to be placed on labels but will accept a label with a claim of reduced drift with use of a particular adjuvant if that claim can be substantiated. Mr. Valcore stated that a discussion is needed to determine the best method to increase technology transfer and ease the changing of labels. Mr. Ledebuhr stated that the Interregional Research Project #4 (IR-4) has a supplemental labeling program. Mr. Ellenberger responded that Dr. Robert Holm is the head of the IR-4 program, which is based at Rutgers University. Dr. Holm might be a good contact.

Summary/Wrap-Up/Next Meeting
Drew Trenholm, RTI

Two *ad hoc* committees were formed, and each will report their recommendations to the DRT Action Team by February 28, 2006. The first *ad hoc* committee, consisting of Mark Ledebuhr, Sandra Bird, and Tom Bals, will formulate a matrix on how to categorize testing types and approaches. The second *ad hoc* committee, consisting of Terri Barry, Carolyn Baecker, and Dennis Gardisser, will formulate recommendations regarding the minimum number of baseline reference sprayers needed to encompass the desired technologies. The *ad hoc* committees should communicate with Drew Trenholm, Norman Birchfield, and Andrew Hewitt.

Mr. Trenholm asked each panel member to identify any major issues that were not discussed at today's meeting.

Dr. Womac stated that the overall cost to manufacturers should be considered, as the companies affected are small. The protocol must be simple, which may preclude testing all possible combinations. He suggested that a survey to gage potential customer interest in contributing could be useful in guiding the overall protocol and allow better-informed decisions regarding expectations of the project.

Mr. Valcore commented that it was necessary to determine the existing infrastructure and link this project to the overall program where it will be most effective. The impacts on the user and the benefits to the grower need to be investigated, as well as how this protocol will be delivered to the users.

Ms. Barry stated that an effective protocol does not necessarily have to be placed on labels; agricultural commissioners, or similar officials, also can be informed of protocol and issue these conditions in addition to label requirements. DRTs then could ease the impact of those conditions by allowing a relaxation of the local use conditions, creating unanticipated nonlabeled benefits as a result of potential state regulations leading to more motivation to participate in developing DRTs using the protocol.

Dr. Barefoot thought that it was necessary to determine the target drift reduction factor and performance objectives. Additional incentives (e.g., certification, insurance) also should be explored. Dr. Hoffman stated that he was unsure if the exact goal of the project was to decrease buffer zones or decrease drift. Decreased dose also was not discussed. Mr. Bals stressed the importance of making the use of best management practices attractive to both regulators and industry, as well as effective delivery of the protocol to users.

Ms. Baecker stated that the Association of American Pesticide Control Officials should be involved in developing this protocol. Small growers have less incentive to comply, and if regulations become too difficult or expensive for applicators, then the growers will perform the applications themselves, thus increasing the problem of noncompliance. Ms. Bird commented that it should be determined how the program/protocol can be integrated into the system.

Dr. Kuchnicki mentioned that it was necessary to be cautious when using modeling, as each individual component may not be simply additive when assembled. Will components be tested individually and then added together or tested in combination?

Dr. Pearson stated that it was necessary to consider the differences in ground and aerial applications. Harmonization and utilizing existing data also are important.

Mr. Trenholm thanked the panel members for their participation and excellent comments. The next meeting will take place at the end of March or in April and will be held on the West Coast or in Canada. Another possibility is to hold the meeting in College Station, Texas, on March 31, 2006, in conjunction with a meeting that will be attended by many of the stakeholders. Panel members will be notified of the time and location soon.

Mr. Ellenberger commented that the meeting was productive and the questions on the table will help formulate the next steps. He thanked the participants for their ideas and suggestions. The panel must keep in mind the following: (1) consideration of international harmonization opportunities; (2) simplification of the process (i.e., the 80/20 rule whereby 80% of technologies are included, and the remaining 20% are investigated later or not at all if it is determined that there is no benefit in doing so); and (3) consideration of partnering with existing testing organizations (e.g., IR-4) to decrease costs. He was impressed with the willingness of the panel to engage in this process and appreciated the positive energy and feedback. He thanked RTI for their help in facilitating the meeting.

Mr. Trenholm adjourned the meeting at 4:35 p.m.

Meeting Participants

Stakeholder Technical Panel:

Carolyn Baecker
The CP® Products Company, Inc.

Tom Bals
Micron Sprayers Limited

Aldos Barefoot
Dupont Crop Protection
Crop Life America

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Stephen Pearson
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Alvin Womac
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Mark Mohr
Hypro Corporation

Andrew Moore
National Agricultural Aviation Association

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Cooperative State Research, Education, and
Extension Service

David Schulteis
Wilbur-Ellis Company

Carmine Sesa
Rhodia

Benjamin Smallwood
U.S. Department of Agriculture
Natural Resources Conservation Service

Howard Stridde
Huntsman Petrochemical Corporation

Jim Thrift
Agricultural Retailers Association

J.D. Whall
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ETC Contractor Support:

Kristen LeBaron
The Scientific Consulting Group, Inc.

Pamela Wallace
The Scientific Consulting Group, Inc.

APPENDIX 1:

Meeting Agenda

U.S. Environmental Protection Agency
Environmental Technology Council
PESTICIDE DRIFT REDUCTION TECHNOLOGY
FIRST STAKEHOLDER TECHNICAL PANEL MEETING
January 31, 2006
USDA Agricultural Research Service
George Washington Carver Center, Room 4-2223
Beltsville, MD
AGENDA

8:30 a.m.–8:40 a.m.	**Introductions** Michael Kosusko, Project Manager, EPA
8:40 a.m.–8:50 a.m.	**Welcome** Donald Erbach, USDA Agricultural Research Service
8:50 a.m.–9:10 a.m.	**Office of Pesticide Programs Perspective** Anne Lindsay, EPA
9:10 a.m.–9:30 a.m.	**Stakeholder Technical Panel Role—Plan for the Day** Drew Trenholm, RTI
9:30 a.m.–10:15 a.m.	**Issue 1—Primary Performance Measure** Brief Introduction by Norman Birchfield, EPA Discussion
10:15 a.m.–10:30 a.m.	**BREAK**
10:30 a.m.-11:30 a.m.	**Issue 2—Testing Approach (Field, Wind Tunnel, Modeling)** Brief Introduction by Andrew Hewitt, University of Queensland Discussion
11:30 a.m.–11:45 a.m.	**Issue 3—Use of Existing Standards** Brief Introduction by Andrew Hewitt, University of Queensland Discussion
11:45 a.m.–12:45 p.m.	**LUNCH**
12:45 p.m.–1:45 p.m.	**Issue 3 (continued)**
1:45 p.m.–2:30 p.m.	**Issue 4—Reference or Baseline Technology** Brief Introduction by Ken Giles, University of California at Davis Discussion
2:30 p.m.–2:45 p.m.	**BREAK**
2:45 p.m.–3:30 p.m.	**Issue 5—Tank Mix Surrogates** Brief Introduction by Alvin Womac, University of Tennessee Discussion
3:30 p.m.–4:30 p.m.	**Summary/Wrap-Up/Next Meeting** Drew Trenholm, RTI
4:30 pm	**ADJOURN**

Description of Agenda Items for Discussion:

Primary Performance Measure
Two principals of Environmental Technology Verification testing particularly are pertinent to deciding the appropriate primary performance measure. First, the verification test should generate data that quantifies a technology's environmental performance in a consistent form such that all tested technologies can be judged in an equitable manner. Second, the performance measure should provide data in a form that matches the primary use of the data (e.g., risk assessment). Data other than the primary measure can be generated by a verification test if deemed useful; however, a consistent primary measure should apply to all tests. If necessary, the performance measure can be varied for different technology types, though that approach should be minimized.

Testing Approach (Field, Wind Tunnel, Modeling)
Several approaches can be used to generate data on technology performance. Each approach has pros and cons and each may be best suited to a particular type of technology or type of data. Verification testing is ideally based on the approach or combination of approaches that provide the best measure of a technology's performance, tempered with consideration of the costs, practical testing constraints, and limitations of measurement methods. The approach selected for verification plans often involve compromises.

Use of Existing Standards
A verification test plan should be based on the collective judgment of stakeholders as the best approach and methods to provide the desired performance measure. This usually results in a test that differs, at least in some respects, from any existing method or standard. When an existing standard, or portions of an existing standard, are suitable, however, it should be incorporated into the verification plan. Use of existing standards or methods minimizes the effort to develop the plan, results in test procedures more familiar to those conducting the technology tests, and provides more familiar test results.

Reference or Baseline Technology
As mentioned above, a verification test should generate data that quantifies a technology's environmental performance in a consistent form such that all tested technologies can be judged in an equitable manner. A key aspect of achieving this objective is to have a common reference or baseline against which a technology's performance can be measured. A baseline should be selected that provides a meaningful performance answer to stakeholders; however, the most important consideration is to select a baseline that can provide a common reference point across all technologies or, at least, all technologies of a given type.

Tank Mix Surrogates
Similar to the issue above, a tank mix surrogate(s) for the applied pesticides should be chosen to provide a consistent performance measure for all technologies. In addition, the surrogates should represent, as best as possible, all pesticides and all inert carriers of interest. It may be necessary to select more than one surrogate to represent all cases of interest.