U.S. EPA Research Proposal for Encouraging the Use of Pesticide Spray Drift Reduction Technologies

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Abstract

Growers and pesticide applicators in the U.S. have available a variety of application strategies and technologies to reduce spray drift and deposition from target application sites. However, one of the challenges in deciding whether or not to adopt the use of new technologies is the certainty of their effectiveness or performance in reducing spray drift. To address this challenge, EPA's Office of Research and Development, in collaboration with the Office of Pesticide Programs and various stakeholders, is constructing a research program to determine the feasibility of establishing a drift reduction technology (DRT) process that will (1) verify performance of DRTs, (2) incorporate incentives for using verified DRTs as drift mitigation, and (3) ultimately increase the use of these verified DRTs in the U.S. to reduce spray drift. This paper is a description and status report of the development of this research program.

Introduction

As the outward growth of suburbs encroaches on agricultural areas and farms continue to operate in proximity to ecological refuges, the potential impacts of pesticide spray drift exposure to humans, plants, and wildlife are receiving greater attention. Many applicators in the U.S. continue to effectively manage spray drift by limiting application conditions related to wind speed, droplet size, and release height or using other well validated methods. Over the last several decades pesticide application experts worldwide have identified a variety of additional strategies and technologies to reduce spray drift, such as utilization of drift retardant chemicals and use and placement of improved spray nozzles. The magnitude of drift reduction associated with the employment of some of these drift-reducing technologies (DRTs) is better understood than others. Some existing DRTs, such as air-assist boom sprayers, are commonly used in other countries, such as England and Germany, but have not successfully penetrated the U.S. market. Practical DRTs with proven effectiveness in reducing spray drift can provide applicators with more options for making efficacious pesticide treatments under a wider range of conditions while still meeting environmental goals and requirements.

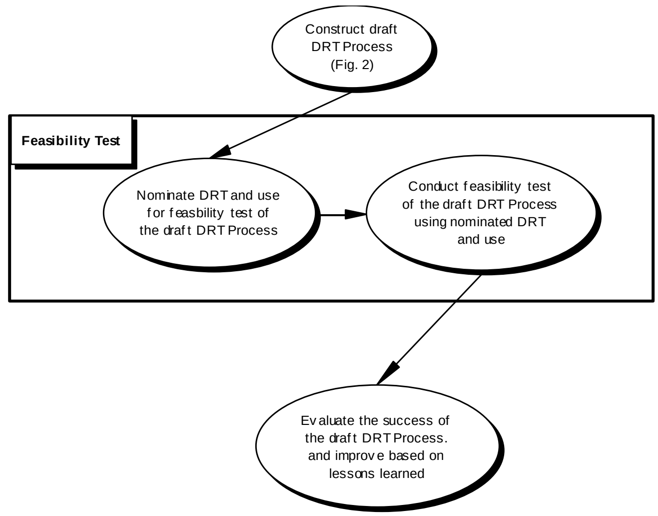
This paper provides a description of and a progress report on the development of a research program to determine the feasibility of increasing the use of drift-reducing technologies (DRTs) in the U.S. The goals of the program are to combine scientifically-sound evaluation of drift-reducing potential of technologies, provide incentives to include DRTs in risk reduction measures on pesticide labels, provide economic analysis of the cost-saving potential of using DRTs, and education of growers and applicators on the availability of effective DRTs and the economic benefits of using them.

EPA has experience in conducting programs that verify the effectiveness of environmental technologies. For example, EPA's Environmental Technology Verification (ETV) program provides credible performance data for commercial-ready environmental technologies to speed their implementation for the benefit of vendors, purchasers, permitters, and the public. Since its inception in 1995, ETV has verified more than 250 environmental technologies and developed more than 75 protocols for testing of technologies including, for example, air pollution control and drinking water treatment. The performance verification element of the DRT Process will be modeled on ETV.

Methods

EPA's Office of Research and Development, in partnership with the EPA's Office of Pesticide Programs, several pesticide registrants, sprayer manufactures, and academic researchers, and other stakeholders, is developing a process to promote the use of DRTs. The following multi-step approach to developing this DRT Process has been adopted:

i. Identify barriers and challenges to the use of DRTs in the U.S.;
ii. Construct a draft DRT Process that minimizes these barriers and challenges, creating incentives for the use of DRTs in the U.S.;
iii. Nominate a specific class of DRT and an application (pesticide/crop) to test the feasibility of the draft DRT Process.; and,
iv. Conduct a feasibility test of the draft DRT Process. Upon completion of the feasibility test, the draft DRT will be improved based on lessons learned.



The steps above and their interaction are summarized in Figure 1.

Figure 1. A diagram showing the elements of the proposed research and their relationship. The "draft DRT Process" indicated in the first oval above is discussed in greater detail the text and Figure 2 below. The feasibility test of the DRT Process is enclosed by the rectangle.

The development of the draft DRT Process has been founded on the results of two ORD-sponsored meetings of invited stakeholders and experts in 2003 and 2004. In the initial meeting, participants met to discuss barriers or challenges that may inhibit the use of DRTs in the U.S. In the second meeting, participants identified elements for a research program that would address the most significant barriers and challenges.

Implementation of the research program (Figure 1) will be determined by stakeholders subsequent to the writing of this paper. A DRT has been nominated for the feasibility test of the DRT Process (discussed below).

Results

The goal of this effort is to increase the use of DRTs in the U.S. To achieve this goal, steps i – vi above (or Figure 1) must be completed successfully. Work to date has focused on "Constructing the DRT Process" (Figure 1). At the initial meeting, discussion centered on barriers that appear to discourage development of technology, inhibit a reliable process for validation of drift-reducing performance, and how the current pesticide registration process currently may not include incentives for use of DRTs. The end result of the meeting was an appreciation that certain drift-reducing technology is available and that innovation would likely continue if use of DRTs increased, but that the main challenges to DRT use is the lack of a standardized, performance validation process for DRTs, the lack of economic incentives, and lack of acknowledgement of DRTs on pesticide labels.

Participants in the 2004 meeting identified and discussed research tasks that would be required in the program to accomplish the goals and an appropriate choice of a class of DRT for the feasibility test of the DRT Process (Figure 1). Figure 2 represents a summary conclusion of the meeting - a diagram that outlines the proposed DRT process. The diagram applies the DRT Process to a specific DRT, air-assist boom spraying (AABS). Meeting participants nominated AABS as the initial class of DRT to be employed in the feasibility test of the DRT Process for reasons presented below. The research program will yield a generalized DRT Process applicable to any proposed DRT. Figure 2 is written for a specific DRT to keep the initial research activities focused.

AABS was determined to be a good choice for the feasibility test of the DRT Process for several reasons: (1) a relatively large body of performance data is currently available for AABS, (2) several companies produce AABS-type systems in the U.S., which, if AABS is successful in the DRT Process, could provide a healthy, competitive marketplace, and (3) the technology is a commonly used and economically viable DRT in Europe but not in common use in the U.S. Other technologies may be considered for future DRT Process feasibility testing to refine the Process.

The draft DRT Process is composed of many component activities (Figure 2) to be applied to the nominated DRT:

- ***Develop information to support choice of AABS:*** This activity is an initial assessment of whether the nominated technology (AABS in the first case) has sufficient potential to make it through the DRT Process successfully to justify investing in subsequent steps in the Process. Determining potential would likely entail collecting and conducting a critical review of available drift-reduction performance data for the technology. The final DRT process will include a standard operating procedure (SOP) to conduct this step.

- ***Develop definition of AABS for use on labels:*** Creation of incentives for use of DRTs will likely require incentives built into pesticide labels. Indication of a specific class of DRTs on labels necessitates a standardized, technical definition of the DRT (AABS in the first case). This standard that defines the technology, whether currently in existence or in need of development, must be endorsed by an accepted technical organization such as ASAE or ISO. The finalized DRT process will include an SOP for defining the DRT.

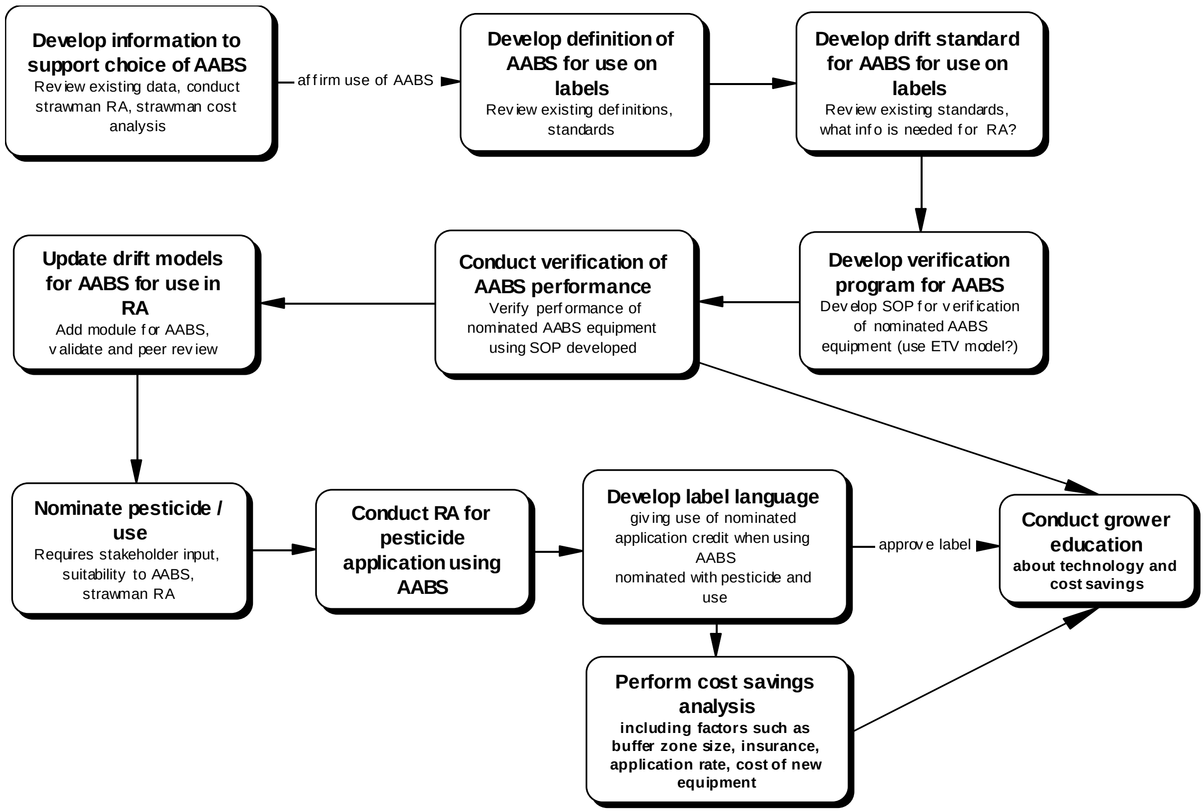


Figure 2. A diagram showing the elements of the draft Drift-Reduction Technology (DRT) Process applied to the DRT proposed for the feasibility test, air-assist boom spraying (AABS). "RA" is an abbreviation for "risk assessment."

- ***Develop drift standard for AABS for use on labels:*** A proposed DRT deserves incentives for use only if it has been adequately demonstrated that to significantly reduce drift according to a drift-reduction standard. The final DRT process will include an SOP for establishing a standard for the DRT Process, either adopting an existing standard or developing a new standard. Giving pesticide applicators the option on a label to use DRT with less stringent application restrictions versus standard application equipment with more restrictions should benefit applicators and environmental protection.

- ***Develop a verification program for AABS:*** A process is needed to conduct tests or evaluate existing data to verify the drift-reducing capability of a nominated DRT. Stakeholder input and two existing, successful programs will be used to design the verification program: EPA's ETV program and the UK's Local Environmental Risk Assessments for Pesticides (LERAP) performance ratings program. The final DRT process will include an SOP on how to conduct DRT performance verifications.

- ***Update drift model for use in AABS risk assessment:*** OPP uses mathematical models (e.g., AgDRIFT and AgDISP) and scientific studies to assist in estimating potential risks associated with pesticide application. These models currently simulate standard pesticide application equipment and do not account for the influence of a DRT. Thus, drift models must be updated to include the effects of the DRT on spray drift risk. With presumably lowered risks resulting from use of DRTs, greater flexibility may be indicated on labels of products otherwise needing more spray drift-reducing measures. Allowing a greater range of spraying conditions can be an incentive for growers and applicators. For example, allowing smaller buffer zones or spraying in higher wind speeds would provide applicators greater flexibility in making their pesticide applications while achieving equal or more risk reduction than using traditional technology with more restrictions.

- ***Nominate pesticide/use:*** To encourage their use, specific DRTs should be acknowledged on pesticide labels once EPA and others acknowledge the effectiveness of the specific DRT. Ideally, the DRT to be considered and the proposed pesticide/use would be nominated from a collaborative process that includes DRT manufacturers, pesticide registrants, growers, or other stakeholders.

- ***OPP conducts risk assessment of DRT/pesticide combination and negotiates label with registrant and stakeholders:*** OPP conducts a risk assessment (RA) in association with pesticide registration or reregistration. With verified drift-reduction performance data and a model that includes the influence of the DRT, OPP can conduct the RA for the pesticide with and without the use of the DRT. The RA will determine if the use of the DRT can substantially reduce any spray drift risks associated with the specific product. With lowered risks afforded by the DRT, applicators may be allowed greater freedom in applying the pesticide than without the DRT. These freedoms may, for example, include smaller buffer zones, or spraying in a wider range of meteorological conditions (e.g., at higher wind speeds) allowing for more spray hours per day or days per year. The label could, <u>for example</u>, give the grower/applicator the following choices (Table 1):

Table 1. An example of possible label language that would provide a lower buffer zone requirement if using the DRT.

Application Equipment	Release Height	Droplet Size	Buffer Size (ft)
Standard application equipment	High boom	Fine	80
		Coarse	40
	Low boom	Fine	40
		Coarse	20
DRT	--	--	20

- ***Perform cost-savings analysis:*** The DRT Process includes conducting a holistic, generic cost analysis of the difference between spraying with and without the DRT. The analysis will attempt to account for savings that may accrue by use of the DRT including, for example, more plantable land due to smaller buffer zones, more days to spray per year due to less strict meteorological requirements for spraying, lower liability insurance rates due to less liability associated with drift. The cost analysis will be a component in the communication to growers and applicators about the DRT.

- ***Inform growers/applicators:*** Once incorporated into a pesticide label, and cost-savings information is generated, there must be a concerted effort to educate a wider group of potential users of this information. DRTs will not be employed if growers and applicators are not aware of the incentives and possible cost-savings. The finalized DRT process will include an SOP on how to conduct the educational portion of the program.

Conclusions

This paper summarizes the current state and future plans of a research program aimed at increasing the use of spray drift-reducing technologies in the U.S. The research program will require development of scientific standards to verify efficiencies of DRTs, and if successful, application of efficiencies to regulatory decision-making for the use of pesticides. Successful implementation of the research program requires the cooperation of many stakeholders including growers/applicators, pesticide registrants, DRT developers, drift researchers, and EPA's ORD and OPP. Success also requires a commitment of substantial financial and in-kind contributions. A successful research program will yield institutionalized incentives to use DRTs giving growers/applicators more choices in applying while reducing potential ecological and human health impacts of off-target pesticide deposition.