

Personal Goals and Perceived Barriers of Farmworker Pesticide Trainers: Implications for Workplace Safety and Health

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ABSTRACT. *Farmworkers are an at-risk occupational group, frequently exposed to pesticides in their working and living environments. Pesticide training for farmworkers is federally mandated, but little is known about the farmworker trainers who provide or supplement the training. Using questionnaires and semi-structured interviews, this qualitative study explored a sample of pesticide trainers (n = 45) in North Carolina. A conceptual framework that recognizes the trainer as a “person-in-context” guided an examination of trainers’ goals and perceived constraints. Findings indicated that five types of organizations provide pesticide training. Individuals from these organizations have shared goals to reduce exposure and ensure health for farmworkers. Trainers identified practical constraints (time, farmworker physical and mental state, physical setting, institutional factors, training, and curricular materials) as restricting goal attainment. This study improves understanding of pesticide trainers and the context of pesticide training, guiding future interventions. Further, it suggests that the congruence of trainers’ goals provides a foundation for future collaborations to better meet farmworkers’ needs.*

Keywords. *Beliefs, Farmworkers, Goals, Pesticides, Trainers, Training.*

Migrant and seasonal farmworkers are an at-risk segment of the agricultural workforce in the U.S. These hand laborers who cultivate and harvest crops face cultural challenges and linguistic barriers in the workplace that predispose them to occupational illness and injury (Arcury et al., 2013; Donham and Thelin, 2006). Farmworkers’ temporary employment, migratory lifestyles, and tenuous documentation status (frequently as guest or undocumented workers) increase their risk of illness and injury and limit their access to health care. These factors also contribute to farmworkers’ feelings of powerlessness within the working environment, including their fear of reporting unsafe working conditions. Low literacy levels and limited formal education among farmworkers exacerbate their at-risk status (Carroll et al., 2005; Tamassia et al., 2007).

Pesticide exposure is a significant occupational hazard for migrant and seasonal farmworkers, who work and often live in close proximity to agricultural chemicals (Mobed et al., 1992). Although deaths and hospitalizations associated with pesticides are on the decline, pesticide exposure remains a public health concern, especially among migrant farmworkers (Arcury et al., 2013), and continued efforts to educate agricultural workers

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about pesticide risks and exposure prevention are recommended (Langley and Mort, 2012). Farmworker trainers provide pesticide safety and health training to migrant and seasonal farmworkers, but little is known about these trainers, their goals, and the environmental context for their training sessions. Many of the factors that increase farmworkers' risks of occupational injury and illness likely contribute to challenging training environments for pesticide trainers and learning environments for farmworkers.

Farmworkers: A Special Risk Population

The majority of migrant and seasonal farmworkers in the U.S. are young and middle-aged Latino/Hispanic males (Carroll et al., 2005). Mexico is the country of origin for 75% of hired farm laborers, with Central American countries accounting for an additional 2%. Literacy skills in both Spanish and English have been found to be limited among Latino/Hispanic adult learners in the U.S. (Tamassia et al., 2007). The majority of foreign-born workers from Mexico and other countries neither speak nor read English, and most workers have completed no more than seven years of formal education (Carroll et al., 2005). Thus, training this group of adults about pesticide risks involves special considerations due to both farmworker literacy limitations and lack of formal education.

Pesticide Training: A Federal Mandate

Federal law mandates that employers in the U.S. provide pesticide training for their farmworker employees. With the goal of reducing pesticide exposure and illness, the Worker Protection Standard (WPS) requires that farmworkers receive pesticide training every five years that "the workers can understand [i.e., in a language they understand, most commonly Spanish]...using nontechnical terms" and that allows workers to ask questions (USEPA, 1992). Sources of pesticide exposure, ways to prevent a pesticide from entering the body, health effects associated with exposure, and appropriate emergency responses are mandatory topics for pesticide training under the WPS.

The latest study commissioned by the U.S. Environmental Protection Agency on the national implementation of the WPS concluded that it was unclear how many workers were receiving the mandated training (Larson, 2000). In the southeastern U.S., Arcury et al. (1999) indicated that approximately one-third of farmworkers in North Carolina had received pesticide training mandated by the WPS. Of the farmworkers who reported receiving WPS training in that study, the vast majority (nearly 85%) indicated that the lesson entailed watching a video in Spanish (approximately one hour in length). Most (75%) reported that a verbal presentation accompanied the video, but fewer than half of the workers reported that they were able to ask questions. Most of these training sessions occurred at the office of a labor recruiter or on a farm where workers were employed.

Pesticide training provided by a farmworker pesticide trainer is an alternative or a supplement to video-based lessons and may enhance implementation of WPS training requirements. Although federal law places the onus of employee training on the employer, various organizations that provide services to farmworkers throughout the U.S. may engage in pesticide training as part of their delivery of health and education services. Lessons on health and safety topics that are more engaging have been found to increase knowledge gains and decrease negative health outcomes (Burke et al., 2006); therefore, interactive, face-to-face training provided by pesticide trainers is anticipated to reduce worker pesticide exposure and promote pesticide safety practice. However, no known studies explore the organizations and individuals that engage in farmworker pesticide training, apart from broadly examining the delivery of health services to farmworkers (Arcury and Quandt, 2007; Frank et al., 2013).

Conceptual Framework: Motivational Systems Theory

In his motivational systems theory, Ford (1992) proposes a relationship between individuals' goals and contexts and their behavior, describing goals and contexts as "anchors that organize and provide coherence to the activities within a behavior episode" (p. 24). Recognizing that an individual operates as a "person-in-context" (p. 22), Ford asserts that personal goals provide direction to behavior and that the environment serves to facilitate or constrain activities toward that goal. Four categories of environments that may facilitate or hinder goal achievement exist: the natural environment (i.e., natural world), the designed environment (i.e., human-made entities like buildings, tools, and books), the human environment (i.e., people), and the sociocultural environment (i.e., institutions and traditions). According to Ford, individuals may adopt personal goals from the individuals and institutions in their environments, but goals may not be imposed upon a person.

Ford (1992) proposes the concepts of "capability beliefs" and "context beliefs" in characterizing motivation and behavior. Capability beliefs refer to individuals' evaluations of their skills to perform specific tasks effectively. In the case of pesticide training, a capability belief might be that pesticide trainers believe they can provide training in such a way that farmworkers gain knowledge of pesticide risks. These beliefs correspond to Bandura's (1977) concept of self-efficacy. The self-efficacy and teaching beliefs of the 19 pesticide trainers interviewed for this study were previously explored in detail (LePrevost et al., 2013); therefore, this study focuses on Ford's context beliefs. Context beliefs relate to assessments of the responsiveness of an environment in which a specific task will occur. For example, individual pesticide trainers might believe that the agricultural field as a learning environment hinders their ability to train effectively. Within this framework, in order to attain personal goals, individuals must operate within a responsive environment and believe that the environment affords them the opportunity to achieve their goals. In the present study, Ford's "person-in-context" concept guides an examination of pesticide trainers' goals for pesticide training and perceived constraints in meeting those goals, recognizing the importance of the trainers' context beliefs.

Research Questions

Despite their critical role in supplying or complementing federally mandated pesticide training, pesticide trainers are largely absent in the literature. These trainers operate within a loose framework of a variety of farmworker service organizations, each with specific institutional missions. However, how pesticide trainers envision their personal goals and the environmental factors that constrain and/or facilitate meeting those goals is unknown. Therefore, the research questions guiding this study are the following:

1. Who provides pesticide training for farmworkers in North Carolina?
2. What are the goals of pesticide trainers?
3. What are pesticide trainers' beliefs about their training environments, and what practical constraints do pesticide trainers face?

Methods

This study used a qualitative design with collection of data through a survey questionnaire and semi-structured interviews (Merriam, 2009).

Participants

All identified farmworker pesticide trainers in North Carolina ($n = 100$) were asked to participate in the study. Forty-five pesticide trainers in North Carolina completed a sur-

vey instrument, and 19 pesticide trainers from this group, who represented a variety of organizations involved in pesticide training, consented to semi-structured interviews. The criterion for participation in this study was current or previous involvement in the instruction of farmworkers on pesticide risks, including providing pesticide lessons directly to farmworkers, administering farmworker pesticide programming, and enforcing federal mandates for pesticide training for farmworkers. Our university institutional review board granted administrative approval for the study (IRB No. 214-08-5).

Data Sources and Analyses

Questionnaire

We developed an online questionnaire (available in English and Spanish) and disseminated a link to the questionnaire using farmworker service organizations' electronic subscription lists (i.e., listservs) for organizations listed on the statewide farmworker health program website. Additionally, questionnaires were distributed during pesticide trainer workshops and at an annual conference sponsored by the state association for community health center workers involved in migrant farmworker health care. Participants who completed the questionnaire were asked to include their names and phone numbers if they were willing to be contacted for personal interviews.

The questionnaire consisted of 16 demographic items related to trainers' personal characteristics, experiences with farmworker pesticide training, organization affiliations, and experiences with pesticides. Additionally, an open-ended question on the questionnaire prompted respondents to state their personal goals for providing pesticide training to farmworkers.

Demographic items were analyzed using descriptive statistics, and the open-ended goal item was coded thematically. The first author referred to the mission statements and goals posted on institutional websites to develop a list of *a priori* codes. Initial codes included "promote environmental quality" and "foster a safe and healthy state." Trainers' responses to the personal goal questions were entered into ATLAS.ti version 6.2 (ATLAS.ti, 2011) and coded by the first author. Emerging codes from the data were identified, in addition to initial codes. For example, emerging codes included "motivate farmworkers to adopt safe behaviors" and "reduce pesticide illness."

Semi-Structured Interviews

All questionnaire respondents who indicated on the questionnaire a willingness to participate in interviews ($n = 19$, 42%) were contacted. Pesticide trainers from the Migrant Education Program and from Migrant Head Start declined to participate in interviews, citing that they were just beginning to offer pesticide training services.

The first author interviewed 19 participants. Each semi-structured interview was between 30 and 90 minutes in duration. Interviews took place face-to-face when possible and via phone when travel distances were prohibitive. The interview protocol contained seven items related to teaching beliefs and practices (Luft and Roehrig, 2007) (e.g., *How do you describe your role as a pesticide educator? How do you maximize farmworker learning during pesticide lessons? For pesticide lessons, how do you decide what to teach and what not to teach?*), two items related to defining pesticide training (e.g., *How do you define teaching in the context of farmworker pesticide education? How do you define learning in the context of farmworker pesticide education?*), and one item related to participants' goals in providing pesticide training (*What is your ultimate goal in providing pesticide training to farmworkers?*).

An audio recording was made of each interview, and interviews were transcribed verbatim by an independent contractor. Approximately 275 single-spaced pages of transcriptions were yielded from the interviews. Using ATLAS.ti (2011), the first author analyzed and thematically coded the interviews for goals and contextual factors that shaped beliefs, practices, and goal attainment. Goals stated during the interviews were coded thematically, as previously described. Twenty-eight contextual factors first identified by Lumpe et al. (2000) in studying the context beliefs of classroom teachers (e.g., professional development, equipment, supplies, class size, class length, funding, teacher support, administrative support, and curriculum materials) were used as *a priori* codes for analyzing the contextual factors. Examples of emerging codes from this topic of inquiry were “time” and “weather.”

Results

Pesticide Trainer Organizations

Five types of organizations were found to participate in pesticide training for farmworkers: Cooperative Extension and other university personnel, farmworker advocacy groups, health care organizations, the Migrant Education Program and Migrant Head Start, and state agencies (table 1). The majority ($n = 23$, 51%) of the 45 questionnaire respondents were associated with health care organizations. Migrant and community health centers were the most common place of employment for trainers affiliated with health care organizations ($n = 15$, 65%). The organizations that provide education for children of farmworkers or farmworkers who are minors (i.e., Migrant Head Start and Migrant Education Program) had the fewest representatives ($n = 3$, 7%).

Demographics of Pesticide Trainers

Clear demographic differences existed in comparing the employees of the organizations that provide pesticide training. Of the total number of pesticide trainers in the study ($n = 45$), those who self-identified as Latino/Hispanic ethnicity were most prevalent in health care organizations (74% of health care workers) and farmworker advocacy groups (57% of advocates). European American trainers predominated among Cooperative Extension and other university personnel (80%), Migrant Education Program and Migrant Head Start staff (100%), and state agency employees (71%). Health care workers and advocates generally had lower levels of education when compared to other trainers; train-

Table 1. Organizations providing pesticide training and characteristics of pesticide trainers.^[a]

Trainer Characteristics	Cooperative Extension/ University		Health Care	Migrant Education/ Head Start		State Agency	Overall Totals
	Advocacy						
Total number	5 (11%)	7 (16%)	23 (51%)	3 (7%)	7 (16%)	45	
Male	2	3	10	-	4	19 (42%)	
Female	3	4	13	3	3	26 (58%)	
White/European American	4	1	6	3	5	19 (42%)	
Latino/Hispanic	-	4	17	-	2	23 (51%)	
Multiple ethnicities	1	2	-	-	-	3 (7%)	
Graduate/professional degree	5	1	3	1	3	13 (29%)	
Bachelor's degree	-	4	7	2	4	17 (38%)	
Some college/associates	-	-	9	-	-	9 (20%)	
High school diploma	-	2	4	-	-	6 (13%)	
Worker experience	4	3	4	-	2	13 (29%)	
Handler experience	4	-	2	-	1	7 (16%)	

^[a] To help protect the anonymity of the participants, characteristics were disaggregated from individuals.

ers had high school diplomas (20%) and some college experience or an associate's degree (30%). The Cooperative Extension and other university personnel had the highest percentage of trainers (80%) who had field experience as workers or handlers, meaning these trainers had worked in agricultural fields sprayed with pesticides or had mixed, loaded, or applied pesticides. Overall, pesticide trainers across all institutions were more likely to be female (58%), report Latino/Hispanic ethnicity (51%), hold a bachelor's degree (38%), and have no worker (71%) or handler (84%) experience.

In addition to representing a large percentage of the pesticide trainers who participated in this study (more than 50%), pesticide trainers associated with health care organizations provided significantly ($p = 0.032$) more pesticide lessons in a year than trainers in other organizations. Pesticide trainers associated with Cooperative Extension or a university, Migrant Education Program or Migrant Head Start, and state agencies provided individually no more than 10 pesticide lessons each year. In contrast, 11 pesticide trainers from health care organizations reported delivering 100 or more lessons each growing season. Therefore, the vast majority of pesticide lessons were provided by health care workers.

Pesticide Trainers' Goals

Pesticide trainers shared similar personal goals for providing pesticide training. Of the 37 pesticide trainers who provided a personal goal statement, 30 (81%) described the personal goal of promoting the safety and health of farmworkers, their families, and the agricultural community (see table 2 for exemplary quotations). As Ruth, a Cooperative Extension/university employee, explained, "I just want people to be safe and healthy." Pesticide trainers sought safe working and living environments for farmworkers and their families, and trainers endeavored to safeguard and improve farmworker health.

Mitigating pesticide exposure was mentioned by 11 (30%) of the 37 pesticide trainers who provided goal statements. Reduction of pesticide exposure was discussed in conjunction with safety and health by 7 (19%) of the trainers: "[My goal is] to make sure that there are less and less exposures to pesticides for farmworkers, which means that they're going to be healthier" (Scott, health care worker). More than 90% of pesticide trainers in the study group (i.e., 34 out of 37) had personal goals that encompassed promoting safety and health or reducing exposure.

Trainers described two general approaches to reducing exposure and promoting health and safety: increasing farmworkers' awareness of pesticide hazards ($n = 11$) and increasing farmworkers' adoption of safe behaviors ($n = 13$). This goal statement from health care worker Lorenzo reflects the perspective that farmworkers should know their occupational risks, the dangers of pesticides, and the chemicals to which they are exposed: "[My goal is] to prepare the farmworkers with information about pesticides, their use, and handling and control in order to protect their physical integrity." Focusing on the adoption of protective behaviors, Ruth's (Cooperative Extension/university employee) discussion of her personal goals reflects the viewpoint that farmworkers' understanding of safe behaviors and actions to take in case of exposure will keep them safe and healthy:

"I want people to understand that even though pesticides can have long-term and short-term health effects, that pesticides can be used safely, and it's the behaviors and the practices that we choose or choose not to do that have an effect on what our risk is, and so if we can educate people to understand the things that they need to do, what they need to do to change their behavior to be able to safely be in an environment that uses pesticides, then we're able to decrease their risk and help them be safer and healthier."

Another trainer described her goal as being to “motivate” farmworkers in the adoption of these behaviors that limit farmworker exposure to pesticides.

Some trainers’ personal goals represented goals unique to particular institutions, such as focusing on farmworkers’ rights ($n = 5$) or protecting the environment ($n = 3$). However, these specific goals were not universally reflected in the statements of all trainers associated with these institutions. Additionally, some pesticide trainers expressed goals that aligned with goals unique to institutions other than their own. With an institutional goal of empowerment and protection of farmworker rights, Alicia, an advocate, describes her personal goals:

“We want to make sure that workers know what their rights are, workers know how to recognize when something is not being done the right way, and they know what they should do when that happens. From the education standpoint, I think that our main goal is just to make sure that people know when something is wrong and are prepared and equipped to act.”

Table 2. Pesticide trainer personal goal codes, occurrence, and exemplary statements.^[a]

Code	Exemplary Goal Statements
Safety and health promotion ($n = 30$)	<ul style="list-style-type: none"> • “[My goal is] to educate them so they can protect themselves and work and live healthy lives.” (HC) • “I want them to learn to protect themselves, because the grower never will, so they can go back to Mexico healthy and happy to see their families.” (A) • “[My goal is to] keep them safe, to make sure that they can do their job and do it safely, to make sure they know how to identify symptoms in coworkers if they happen to have a problem, and to know how to respond to the problem.” (SA) • “The most important thing is for the workers to be safe and to know the dangers of pesticides. I can help them, and they can help others.” (HC) • “[My goal is] that I can keep people that are involved with pesticides healthy, safe, and that they understand the processes involved in keeping themselves safe.” (CE/U)
Exposure prevention ($n = 11$)	<ul style="list-style-type: none"> • “The goal is [for farmworkers] to learn the present behavior that helps them to be less affected by the risk of exposure to these chemicals.” (SA) • “[My goal is] to limit pesticide exposure, both take-home and in the workplace.” (A) • “My goal is to make sure that the farmworkers know how to protect themselves against exposure so that they don’t get sick or cause a member of their family to get sick.” (HC) • “Through providing training to farmworkers in scouting and IPM [Integrated Pest Management], I hope to help the industry reduce the use of insecticides and thereby reduce worker exposure to pesticides.” (CE/U)
Farmworker rights and protections ($n = 5$)	<ul style="list-style-type: none"> • “Our goal is to inform farmworkers about the obligations of their employers to provide a safe working environment (including pesticide education and protective gear), their rights as agricultural workers, and the measures they can take to protect themselves in the all too common event that their employer does not comply with the law and their work environments are unsafe.” (HC) • “To communicate, in an effective way, the existence of the regulations that promote a safe use of pesticides.” (SA) • “We want to make sure that workers know what their rights are, workers know how to recognize when something is not being done the right way, and they know what they should do when that happens.” (A)
Protection of environment ($n = 3$)	<ul style="list-style-type: none"> • “[My goal is] to reduce exposure of pesticides to individuals and to the environment.” (HC) • “[My goal is to] improve the impact of agriculture on the environment.” (CE/U)

^[a] SA = state agency, CE/U = Cooperative Extension/university, HC = health care, A = advocacy, and n = number of goal statements coded in each category.

Farmworkers' knowledge of their rights and empowerment were not only sought by the advocate Alicia but also by three health care workers and one state agency employee. The other four advocates, whose institutional mission statements reflect rights and empowerment, did not discuss farmworker rights in their personal goal statements.

Two of the five Cooperative Extension/university staff, Dana and Joe, included improving "the impact of agriculture on the environment" (Joe) in their personal goal statements. Cooperative Extension indicates an organizational commitment to "environmental quality" in its goals and objectives. One health care worker, Fabiola, also sought to "reduce exposure of pesticides to individuals and to the environment." Although environmental protection is a specific goal of Cooperative Extension, as well as the state agencies, the goal was neither universally evident in Cooperative Extension employees' personal goal statements nor restricted to trainers from this specific institution. In the case of both environmental protection and farmworker empowerment, institutional goals were not always evident in personal goals and were not exclusive to individuals with the particular affiliation.

Pesticide Trainers' Context Beliefs

Time

Mentioned by nearly one-third ($n = 6$) of the 19 pesticide trainers who participated in interviews, time was one of the most widespread contextual factors that pesticide trainers described as constraining their work. As Salvador, a state agency employee, explained: "It's one of the barriers: the time and the hours." Salvador elaborated on the factors that contribute to the prevalent context belief that time is a hindrance: "It's kind of a complicated job because in [our state] the geographical area is pretty big. We're talking about 20,000 farms, greenhouses, and nurseries. But the time is spent so much in [getting to] the geographical locale that you are going to reach only some of those ones." The way the constraint of time was experienced by the trainers varied according to the type of institution with which the trainers were affiliated.

Two health care workers described the federal WPS training requirements for workers as limiting the extent to which their pesticide lessons can be learner-centered and learner-directed within the allotted time frame:

"I think what happens is that there's so much that needs to be shared about pesticides, and we know our EPA has 11 points that we have to get through. Well, it may be that you can't get through 11 points on a real good dialogue session where people are discovering point number one, right? So there is this limited time to have this prescribed lesson plan put in there."

(Fabiola, health care worker)

Sharron, also a health care worker, similarly reported using the training criteria, rather than farmworker input, to guide the flow of topics discussed in more formal pesticide lessons. For these health care workers, meeting all of the WPS criteria in a limited amount of time necessitated their taking a more didactic approach.

State agency (Adam) and Cooperative Extension (Janet) pesticide trainers revealed that their decisions about when to move from one topic to the next depended on time. Participating in more formal lessons, Janet described how the scheduled time frame influences her training decisions:

"I have a certain time frame that I'm supposed to stay within because there are other speakers or just how a thing is scheduled, so it depends on

how much information there is and I think what the things are that need to be covered.” (Janet, Cooperative Extension/university employee)

Adam suggested that he might have to move on to another farmworker or lesson if the farmworker he is teaching is unable to learn within the specified time frame.

Alicia, an advocate, described the considerable amount of time that it takes for “relationship development” with farmworkers to gain their respect and trust as taking “more than one season.” She states that it takes “going and sitting and talking with them on outreach and listening to their problems, all kinds of problems” to build relationships with farmworkers. This time commitment for relationship development limits the number of farmworkers that Alicia can reach.

Farmworker Physical and Mental State

Six pesticide trainers (32%) who were interviewed described their perceptions of the physical and mental state of the farmworkers, including both physiological needs and safety needs (Maslow, 1943), as influencing training decisions. For example, trainers’ perceptions of the fatigue of their learners were a frequent consideration for pesticide trainers ($n = 5$):

“I think that they can be tired, especially after coming from the fields. What we would do is go out to their homes after they had worked all day, so sometimes I kind of wondered, what is the best way to approach it?” (Sharon, health care worker)

These trainers also described the distracted conditions they encountered in farmworkers’ homes or camps after the workers had spent the day in the fields: “They’re eating or they are just rushing, you know, counting little tags to see how much money they’re gonna make per bucket of sweet potatoes” (Marissa, advocate). In addition to being “tired” and “hungry” (Adriana, health care worker), the farmworkers “got a thousand other things on their minds” (Ruth, Cooperative Extension/university employee) with which trainers must compete in order to engage farmworkers and enhance farmworker knowledge of pesticide concepts.

The advocate Alicia was the only trainer to address safety needs (Maslow, 1943) that farmworkers have as shifting the focus of her discussions with farmworkers away from pesticides:

“It’s hard to focus just on one theme or one issue in conversations with workers just because there are so many, and for workers, they’re all extremely connected, like a person’s exposure is increased the longer they are walking around with residues on their skin and clothes. Well, that has a lot to do with the quality of their [employer-provided] housing. All of these things come into play in our conversations.” (Alicia, advocate)

Alicia stated that immigration is the “biggest priority” for farmworkers during her training sessions, as the workers are concerned with their documentation status (frequently as undocumented or guest workers). These global policy concerns distract farmworkers’ attention during the training sessions and shape the course of discussions.

Institutional Factors

The institutional missions of the state agencies to carry out regulatory mandates were perceived by three (16%) trainers as restricting the activities of the pesticide trainers. Rebecca, a state agency trainer, described her role as consisting of “enforcement primarily and education secondarily.” A second state agency trainer, Bridget, revealed that most

of her pesticide lessons take place within the context of compliance “only because we [at the state agency] don’t actually get the opportunity to get on the farms any other way.” Alicia, an advocate, described her frustration that the role of the state agencies does not allow their trainers to engage in advocacy and farmworker empowerment:

“I feel like a lot of the people who are doing the training are coming from agencies where they’re not really allowed to agitate. They’re not really allowed to encourage workers to act on their own behalf, and I feel like when so many of the people who are the conveyors of information have their hands tied that way, it’s really a struggle to make any meaningful change.”

The roles of state agency trainers were perceived to be limited by their institutions’ scopes and missions.

Physical Setting

Three pesticide trainers (16%) revealed the ways in which the physical setting of the pesticide lessons influences their teaching practices. Health care worker Fabiola relayed how the setting determines the materials that she utilizes: “The reality is that you might be in the middle of a field and you’re gonna have to pick up a twig and make it into something [to demonstrate pesticide concepts] and start doing pesticide training right there.” She goes on to state that pesticide trainers “cannot depend on the PowerPoint, the copier, the handout, the really slick-looking kind of educational material or prop.” With many training sessions occurring outside, Salvador and Sharron explained the influence of the weather on the delivery and effectiveness of pesticide training. Salvador (state agency employee) delineated “heat or conditions of cold in the mountains” as considerations, when one is “teaching outside under the trees.” Sharron (health care worker) revealed how her teaching decisions had to be flexible in this environment: “You didn’t know what the weather would be like. You didn’t know what the conditions around you were gonna be like, so it was just about being adaptable.” The training locations in the field or in a migrant camp were important contextual factors identified by these three trainers.

Training and Curricular Materials

Two pesticide trainers indicated that training and curriculum materials developed for them by others would improve their teaching of farmworkers (professional development and curriculum materials were *a priori* codes, based on Lumpe et al., 2000.) State agency trainer Lisa stated that “better tools” should be made available because she has not had access to “adequate training materials.” Chris, who works with Cooperative Extension/university, described a need for training: “As an organization, we need more training to be able to communicate with [farmworkers] in a way to keep them safe and [create] a more comfortable setting for Latinos.” These two pesticide trainers believed that a lack of resources in the form of curricular materials and professional development were currently constraining their training.

Connections with Other Trainers

In addition to Alicia’s frustration about some trainers having their “hands tied” due to institutional constraints (described previously), other trainers revealed tensions between organizations involved in farmworker pesticide training; some frustrations were expressed “off the record.” Joe expressed consternation with pesticide trainers who do not have practical field experience yet who “claim that they are effective trainers.” Findings

from this study suggest that Cooperative Extension/university employees, like Joe, are more likely than trainers from other organizations to have experience with pesticides in the field. Salvador, from a state agency, suggested that building “rapport and friendship and collaboration” with the other entities involved in farmworker pesticide training was challenging.

In interviews and informal conversations, several pesticide trainers expressed dissatisfaction with the current state of pesticide training. Joe put forth a question that suggests his concern that current education efforts are insufficient: “I think one good question would be ‘Are we being effective collectively in pesticide training?’ Put together all the pesticide training. Are we really making a difference?”

Discussion

This qualitative study explored the organizations and individuals who provide pesticide training to farmworkers in North Carolina, focusing on trainers’ goals and their beliefs about the environment in which they pursue those goals. This research allows for the creation of a profile of target organizations and individuals for future interventions and professional development for trainers.

Providers of Pesticide Training

Many pesticide trainers in the state (more than 50% of the study group) were affiliated with health care organizations, and these trainers delivered large numbers of lessons each year. The majority of trainers from health care organizations (nearly 75%) self-identified as Latino/Hispanic ethnicity, and most had completed no more than an associate’s degree or some college. As outreach workers at migrant and community health centers, the primary responsibility of these health care workers is accessing farmworkers where they live and work to inform them of available services and provide health education (NCFHP, 2012). In order to do this type of work, individuals need Spanish language abilities. Therefore, we were not surprised by these findings related to the prevalence of health care worker training and the predominant Latino/Hispanic ethnicity of this group. We found that few health care workers (22%) had real-world experience with pesticides and farm work, which might raise the question of how this lack of experience might limit these trainers’ abilities to deliver relevant and practical pesticide lessons. However, LeP-evost et al. (2013) found that pesticide trainers, including health care workers, who did not have direct experience working with pesticides in the field had more cautious views of pesticide risk and were more concerned with adverse health effects related to pesticide exposure. Therefore, the lack of experience with pesticides may in fact make these trainers more effective in communicating health risks to farmworkers.

Goals of Pesticide Trainers

The pesticide trainers in this study exhibited personal goal congruence; more than 90% expressed the common goals that through pesticide training they should reduce pesticide exposure and promote the safety and health of farmworkers, their families, and the agricultural community at large. A Cooperative Extension/university employee, state agency staff person, or advocate was just as likely as a health care worker to express a personal goal of improving safety and health. Trainers’ personal goal statements indicated that reduction of pesticide exposure was the means by which to promote safety and health, focusing on increasing farmworkers’ knowledge of pesticide risks and their adop-

tion of safe behaviors. Unique institutional goals related to protecting the environment (14%) and empowering farmworkers to exercise their rights (8%) were neither universally adopted by individual trainers within the corresponding organizations nor exclusive to individuals within the organizations.

Despite trainers' describing their roles differently according to their institutional affiliations (e.g., state agency personnel as "regulators" before "trainers"), these individuals expressed goals with similar content. Indeed, findings from this study reveal that few substantive differences exist in pesticide trainers' personal goals and that these goals transcend defined institutional goals and prescribed roles. For example, a health care worker expressed the goal of informing farmworkers about their rights as agricultural workers and the legal responsibilities of their employers. Ford's (1992) position is that personal goals may be shaped by the individuals and institutions in a person's environment and that goals may not be imposed on individuals. Although we do not have data that specifically suggest that institutions do not shape a person's goals, we found that similar personal goals existed despite the function of a trainer's organization. Pesticide trainers' personal goals in this study differed at times from the goals of their affiliated institutions, suggesting that institutional affiliation did not determine their goals.

Context Beliefs and Practical Constraints

Pesticide trainers sought out opportunities to engage with farmworkers in their camps at the end of the work day, at farm owner/operator-sponsored training days, and in the van while providing transportation to local clinics for medical or dental appointments. In trying to reach farmworkers, the trainers found that time was a constraint. Trainers described their experiences with time in different ways, largely according to the institutions through which they provide pesticide training. Beliefs about time intersected with the multiple environments described by Ford (1992). Large geographic distances to reach farmworkers corresponded to the natural environment, building trusting relationships related to the human environment, and federal regulations and organizations' training criteria reflected the sociocultural environment.

The health workers described the federal WPS training criteria as hindering their ability to use learner-focused approaches to providing pesticide lessons within the limited amount of time that they have with farmworkers in training sessions (typically one or two sessions each growing season). State agency and Cooperative Extension personnel similarly expressed time as dictating their teaching decisions during formal training sessions, preventing them from relying on farmworker feedback. When delivered within the time constraints perceived by these trainers, WPS lessons led to trainer-centered delivery of training. More engaging health and safety lessons have been found to increase knowledge gains and decrease negative health outcomes (Burke et al., 2006), so this perceived policy constraint likely lessened the effectiveness of the training by promoting less interactive training sessions.

Another influence on the perceived constraint of time was the extensive geographical area and the large number of farmworkers across the state (estimated at 86,000 by the state farmworker health program at the time of the study). When combined with the extensive amount of time that trainers such as Alicia perceived to be necessary to build relationships of mutual respect and trust, it is clear that pesticide trainers felt limited in the reach and impact of their training sessions. For pesticide trainers, time proved to be a barrier, shaping their behaviors in striving to meet both their information-delivery goals and their personal goals of farmworker safety and health.

While other studies have detailed poor living conditions and physical and psychological demands on farmworkers (Arcury et al., 2013), the findings from this study are the first to link pesticide trainers' beliefs to these contextual factors. The majority of the pesticide training sessions captured by this study occurred at the end of the work day in the farmworker camps by health outreach workers and, to a lesser extent, advocates. Pesticide trainers perceived that environmental factors, which resulted in farmworker learners who were tired, hungry, and distracted, limited their ability to attain their pesticide education goals (Maslow, 1943). Trainers' beliefs about the physical and mental state of farmworkers suggest that much of this after-work pesticide training has limited effectiveness.

Ford's (1992) environments that impact pesticide trainers' goal achievement include the natural environment (i.e., physical setting of training sessions in migrant housing or outdoor areas), the human environment (i.e., physical and mental state of farmworkers), the designed environment (i.e., curricular materials), and the sociocultural environment (i.e., impact of immigration policy on undocumented and guest workers). In providing pesticide training, trainers find themselves in highly complex environments, requiring them to rely on their beliefs to guide their practices (Nespor, 1987). When designing interventions, professional development, and curricular materials, individuals who work with pesticide trainers must consider the dynamic situations in which pesticide trainers function and the interplay of Ford's (1992) categories of environments (natural, human, designed, and sociocultural).

In analyzing trainers' context beliefs, Kegan and Lahey's (2001) construct of "competing commitments" is useful for understanding the conflicts that trainers face in providing pesticide training in complex environments. Perceiving that time is limited, trainers' commitments to covering the established training criteria compete with their desire to allow farmworkers to guide the lesson. Trainers believe that covering the 11 WPS points is important, but they also realize that farmworkers must construct their own meaning for learning and adoption of safe behaviors; there is not enough time to do both. Trainers have competing commitments in relation to meeting farmworkers' interests and safety needs (e.g., to include discussions on immigration, housing, etc.) on the one hand, and achieving their specific objective of enhancing knowledge of pesticides on the other. Ultimately, in practice, pesticide trainers must adopt one commitment to the detriment of fully addressing others.

This study revealed the disconnect between pesticide trainers at different institutions. Interestingly, this disconnect seemed to be driven by a lack of understanding of the shared dissatisfaction with contextual aspects of pesticide training and shared common goals of trainers at different institutions.

Although a qualitative design proved to be useful in this exploratory study in illuminating pesticide trainer goals and perceived barriers, this design limits the extent to which the findings are generalizable to other populations. Further, bias may have been introduced into the study through sample selection and the use of self-report data. In order to aid the reader in interpreting findings and determining how applicable the findings are to other states and training contexts, demographic information about participating pesticide trainers has been provided.

Conclusions and Recommendations

Pesticide trainers share goals and beliefs, including the perception that current pesticide training is limited by environmental conditions that diminish its effectiveness. These

findings suggest the untapped potential of realizing commonalities among pesticide trainers who work in different organizations and finding ways to work together to enhance pesticide education. Therefore, our primary recommendation is to organize an interagency meeting to establish new relationships and improve existing relationships among educators, to share goals, and to make suggestions to improve pesticide training. The type of social support that can be achieved through such interagency connections has been shown to reduce workplace strain and mitigate the perception of stressors (Viswesvaran et al., 1999). Through communication and collaboration, trainers representing various organizations could collectively address the factors that they perceive as restricting their goal attainment. To enhance farmworker safety and health by overcoming contextual constraints, interagency discussions should focus on strategies to do the following:

- Build relationships with farm owners/operators to facilitate on-site occupational training and a farm culture that promotes safety and health in more comprehensive ways. Workers' learning would be improved if training sessions were provided in more comfortable settings and when farmworkers were not hungry and tired. Collaborating with farm owners/operators to provide training when workers are "on the clock" will reduce worker distractions.
- Increase the number of pesticide trainers to reach the large and dispersed farmworker population. More trainers will reduce the burden of training on health care workers and will allow pesticide educators to spend more time with workers, enhancing interpersonal relationships.
- Increase the frequency of farmworker pesticide training sessions for each work or living site. More frequent sessions would require less information to be addressed in each session, making the training more interactive and less didactic.
- Improve pesticide trainer access to curricular materials and professional development.
- Focus greater attention on the significant issues for migrant farmworkers related to immigration policy.

Ruth, a Cooperative Extension/university educator, commented, "There are a lot of opportunities with growers and farmworker trainers to be partners, and we just have to do more to build those bridges, to make sure it happens, and to make sure that we really are doing best practice in pesticide training in North Carolina." By working in concert, pesticide trainers from the range of farmworker-serving organizations have the capacity to improve the safety and health of farmworkers.

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