

Planning for Gender Equality: Ensuring Pesticide Educational Programming Protects Women

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Although global pesticide use reportedly plateaued in 2012 (FAO, 2022), a 2023 report by Shattuck et al. suggests that pesticide use is in fact on the rise, with the most dramatic growth (153%) occurring in least developed countries (LDCs). This increase, coupled with inadequate pesticide education (Halbleib & Dinsdale, 2023), insufficient container labeling (Rother, 2018), and low use of personal protective equipment (PPE) (Nguyen & Tsai, 2024) results in entire farming families in LDCs being regularly exposed to pesticides (Donald et al., 2016; Jepson et al., 2014; Ngowi et al., 2020; Scott & Pocock, 2021; Utyasheva et al., 2024).

While minimizing pesticide exposure is essential for everyone, women are particularly vulnerable to adverse health outcomes from pesticide exposures due to their smaller physical stature and higher proportions of body fat, which can lead to greater bioaccumulation of pollutants (Carvalho et al., 2011; Jain et al., 2023; Ledda et al., 2021). Protecting women from exposure is also crucial to reducing risks to developing fetuses during pregnancy (Chilipweli et al., 2021; Jaacks et al., 2019). Despite these heightened vulnerabilities, it is not uncommon for women in LDCs to have reduced access to extension advisory services and lower pesticide safety knowledge compared to men in their communities (Chetna et al., 2012; Wang, 2019). Our experience in a pesticide risk reduction program in Senegal (Halbleib & Dinsdale, 2023) provided an opportunity to explore how identifying the barriers to women's participation, exploring their needs, and understanding their knowledge gaps can improve outcomes for women.

Background

In 2014, a group of six United Nations (UN) Food and Agriculture Organization (FAO) Integrated Production and Pest Management (IPPM) coordinators working in Senegal, Mali, Mauritania, and Burkina Faso requested support in designing programming to combat widespread pesticide exposure among smallholder farmers in West Africa (Jepson et al., 2014). In response to this request, the lead author of this manuscript (an extension program design specialist), a pesticide risk assessment expert, and UN FAO national-level program leader collaborated to develop and deliver a pesticide risk reduction education program for smallholder farmers in Senegal (Halbleib & Dinsdale, 2023).

Despite the program's overall success in reducing the use of highly hazardous pesticides, the research team faced low participation rates among

women, particularly in the early stages of the program. A focus group (n=6) held with women in the community provided insights into the potential consequences of this lack of engagement. For example, participants shared that women in the community were often responsible for directly handling and applying pesticides. Those with men in their families who had served as facilitators at both trainings had not yet shared important program content with them, including critical safety practices such as knowing the duration of and observing the restricted-entry interval (REI). Additional findings included that women and children were engaging in activities unrelated to mixing and spraying pesticides (the general focus of the broader program) that could result in dangerous exposures. These activities included bringing children up to five years old into the field while weeding or harvesting, teenagers working in the fields, and using and storing pesticides in the home.

These outcomes indicated to the research team that consulting with women directly is critical when considering potential exposure pathways for women and children and being able to develop gender-informed programs to address them. The focus group also highlighted that gender roles and family dynamics in the community appear to have affected how new pesticide knowledge was (or was not) discussed and shared, and that women's direct participation in the program was necessary for enabling them to make choices that could protect themselves and their children from exposures.

Purpose & Objectives

The purpose of this research note is to determine common gender-based obstacles that hinder women's participation in pesticide safety programs and prevent them from achieving outcomes equal to those of men. It also presents evidence-based strategies to address gender disparities within these programs. The objectives were to:

1. Describe common barriers women face in accessing and benefitting from pesticide safety programming;
2. Provide recommendations on how to implement an intentional, structured process using evidence-based strategies to increase women's engagement and benefits from pesticide safety programs.

Methods

A literature review was conducted to determine common barriers faced by women to participating in and benefitting from agricultural extension programs and strategies to overcome them. With the exception of studies on health outcomes from pesticide exposures which span geographic regions, searches were limited to LDCs due to the disproportionate lack of access for women in these regions to agricultural

services, as well as the fact that the original study from which this effort originated was conducted in an LDC (i.e., Senegal).

To achieve the objectives outlined in this research note, an initial, general review of the literature was conducted using Google Scholar and Oregon State University iSearch, which searches the international WorldCat database. Keywords included: women farmers, farmer identity, cultural norms, division of labor, LDCs, barriers, access, participation, extension and advisory services, gender-sensitive, empowerment, pesticide safety, pesticide exposure pathways, and pesticide health impacts. The Google search engine was also used to locate grey literature such as agency reports (FAO, CGIAR). Searches were limited to literature and resources published in the past 10 years, except for seminal articles (i.e. Ilahi, 2000; Garcia, 2003). Lastly, handbooks on gender, agriculture and agricultural research and extension were included.

Results

The results of the literature review together with the Senegal case study are presented here to assist educators in identifying common barriers that women may face in accessing and benefitting from their pesticide safety programs. Guidance is then provided on strategies for working directly with women to overcome these challenges.

Barriers to Women's Access to Pesticide Safety Programs

Since agricultural workers are the occupational group most likely to be exposed to pesticides (Alavanja, 2009), pesticide safety educators often target farmers to participate in their programs. Although this may seem like a common-sense approach, using the term "farmer" in recruiting program participants may inadvertently exclude women from pesticide safety initiatives. This is because, in many LDCs, structural barriers such as lack of access to land and perceptions that farming is "men's work" result in many women not identifying as farmers and potentially self-excluding from farmer-focused programs (Burton et al., 2021; Galié, 2013; Meinzen-Dick et al., 2019; Whitley & Braiser, 2020).

Certain logistical factors within programs have also been found to prevent women from participating in and benefitting from pesticide safety initiatives. For example, because women in agricultural contexts in many LDCs are responsible for household labor in addition to contributing to family farms (Pierotti et al., 2022), they often find it difficult to attend events that are not conveniently located or that conflict with their other responsibilities (Glass et al., 2015; Ilahi, 2000; Marter-Kenyon et al., 2023). Studies have also suggested that a lack of female leadership in extension programming can decrease the likelihood of women attending programming, as women may feel more comfortable working with other women or it may not be culturally appropriate for women and men to mix freely in social

settings (Adebayo & Worth, 2022; Petrics et al., 2015; Witinok-Huber et al., 2021). Written program or teaching materials can also create obstacles for women, particularly in cases where women's literacy rates are low (Mudege et al., 2017).

Lastly, many pesticide safety programs focus only on mitigating exposures from mixing and applying pesticides or cleaning spraying equipment (Damalas & Koutroubas, 2016). However, studies have shown that exposures for women commonly occur outside of these activities. For example, in many LDCs women are responsible for household tasks including washing clothing that may be contaminated with pesticides (Asmare et al., 2022; Christie et al., 2015; García, 2003; Panis & Lemos, 2024; Pierotti et al., 2022; Tsimbiri et al., 2015). In the Senegal case study, women reported that they and their teenage children were responsible for weeding, watering, and harvesting and that REI was not a concept they were familiar with. Women from the focus group additionally shared that pesticides were used to treat household pests, creating potential exposure risks within the home.

Recommendations

It may be tempting for educators to assume that, even if women do not directly participate in pesticide safety programs, information obtained by male farmers may “trickle across” to women and other community members. However, the Senegal project and studies on the transmission of pesticide safety knowledge, suggest that this is often not the case (Croppenstedt et al., 2013; Manfre et al., 2013; Rice et al., 2019). Furthermore, as previously highlighted, programs may not contain the content that women need to make choices that align with their day-to-day activities and pesticide safety goals.

Educators seeking equitable outcomes for women from pesticide safety programs should, therefore, endeavor to learn about culturally relevant and gender-sensitive practices for engaging women in research and education efforts, as well as the content pertinent to the women in their community, *before* designing their final program. Conducting a pre-program design process directly with women can support the success of the final program in two important ways. First, by identifying appropriate strategies to engage women in the pre-design process and evaluating the success of those strategies, educators will then be able to apply that learning to recruit women for their final program. Second, by working with women to assess their pesticide knowledge and goals, educators will also be able to identify content and learning experiences that can be incorporated in the final program to support women in meeting those goals.

However, as illustrated within this research note, accessing and engaging with women to participate in these discussions can pose significant challenges (Dey de Pryck & Elias, 2023). To overcome these barriers, it is recommended that educator's partner with locally based organizations (e.g., NGOs, government

agencies, in-country academics) with experience addressing women's issues in agricultural contexts. These organizations can support educators by advising on inclusive language when recruiting women to participate (e.g., "women in agricultural contexts" vs. "women farmers"), offering strategies for overcoming logistical challenges (e.g., locations, times, days, languages, and data collection formats), and providing insights on whether female representation on the project team might increase the likelihood of women participating in the project. Such organizations may also help educators build trust and rapport with women in the community, enhancing recruitment efforts (Carnes et al., 2019; Jiggins et al., 1997; Rivera & Corning, 1990).

Once women have been engaged, educators can work to uncover women's goals related to pesticide safety and potential exposure pathways. Discussions on exposure pathways may begin with inquiries regarding women's typical daily work. As contexts exist where women directly mix and apply pesticides for agricultural uses (Asmare et al. 2022; Halbleib & Dinsdale 2023), these conversations should reference these activities. However, as previously illustrated, many exposures for women occur outside of mixing and spraying (e.g., washing clothes, entering still toxic treated fields to weed, water, or harvest, using pesticides in the home). Unfortunately, these exposures are often underreported (Damalas & Kourtroubus, 2016). Therefore, conversations and questions about "women's work" should be broadened to include non-agricultural, as well as agricultural, activities.

Since women may not know how they and their families are exposed, educators should begin conversations on women's pesticide safety goals by assessing underlying pesticide safety knowledge (Mergia et al., 2021; Ndayambaje et al., 2019). Through discussions on what is already known or not known, educators may provide suggestions on what technical knowledge or tools could assist women in achieving their desired outcomes from a program. Educators can then receive feedback from participants on the recommended approaches and act upon the identified knowledge and skill gaps in the design of the final educational program.

Conclusions

The consequences of pesticide safety programs not understanding women's day-to-day activities and determining their gendered routes of pesticide exposure can be severe and are well-documented in the literature (García, 2003; Mrema et al., 2017). As has been illustrated, culturally specific gender norms and dynamics can create barriers that are unique to women for accessing and benefitting from pesticide safety programming. After recruiting and engaging with women to learn about their needs, educators will be better able to develop new or adjust existing plans to increase women's access and participation in the final program.

While the recommendations made in this research note can support educators in achieving more equitable outcomes for women from their programs, additional support may be required to ensure that pesticide safety educators take the actions necessary to operationalize gender their program designs.

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