



A Gender Perspective on Pest and Disease Management From the Cases of Roots, Tubers and Bananas in Asia and Sub-Saharan Africa

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Considering gender in research on pests and diseases is increasingly important as it facilitates development of more efficient approaches to increasing the adoption of crop protection technologies and practices by women and men farmers according to their roles, knowledge, and capacities. However, this task is often assigned to social scientists in isolation from agronomists. Meanwhile, agronomists often struggle to understand how taking a gender perspective could enrich their research. Drawing on a number of different cases from both published and unpublished field research in Asia and sub-Saharan Africa, this perspective article illustrates how a gender perspective can broaden the aspects of agronomy research and thereby contribute to improving crop production and scaling up of existing technologies and practices. Its targeted audience are agronomists and development practitioners, in particular, young researchers who are central to transdisciplinary agricultural research in the future.

Keywords: gender, pest and disease control, extension work, roots and tubers, banana

INTRODUCTION

Women and men farmers often play different roles in agricultural production, and they possess different levels of knowledge about, and involvement in, pest and disease management practices. Despite these gender differences, pest and disease management research and training often targets “farmers,” neglecting the specific needs of women and men as well as the power relationships within households and communities. Such oversight is particularly important since providing gender-appropriate support to women and men farmers helps to increase the adoption of appropriate crop protection technologies and practices, reduce farmers’ exposure to pesticides, and improve environmental quality (Christie et al., 2015). While a gender perspective is increasingly recognized in the field of agricultural extension and training (Lambrecht et al., 2016; Mudege et al., 2016; Lamontagne-Godwin et al., 2017), it is often insufficiently considered by agronomists and crop protection experts, who are focused on bio-technical solutions and pay little attention to social-economic factors and power relations among farmers in the field and off the field.

This article seeks to provide specific insights into how a gender perspective can contribute to enhancing agronomy research and extension practices. We specifically focus on roots, tubers and bananas (RTB), which are important crops for poor people in the global south. The control of pests and diseases has increasingly become important for these crops, not only to improve productivity in the face of climate change but also to improve the quality of crops readied for the commercial market with increased attention and demands for safe produce. Several control measures are available to address these concerns, such as: pesticide application; cultural, biological, and mechanical control methods; the use of disease-resistant varieties of crops; botanicals; clean seed; crop rotation; mulching; intercropping; and timely planting. To facilitate the adoption of those control methods, it is critical to explore farmers' perceptions, experiences and practices from a gender perspective. To provide an in-the-field perspective on gender as an entry point, this article presents six cases from our recent field studies in Asia and sub-Saharan Africa. It then discusses the significance of integrating the gender perspective in transdisciplinary agronomy research.

CASES FROM THE FIELD

Below we present six examples of how gender roles influence pest and disease management (cases 1 and 2); how differently women and men perceive and control pests and diseases (case 3); why some farmers do not follow the best measures suggested by scientists (cases 4 and 5); and what considerations are needed when developing and disseminating disease resistant varieties (case 6).

Understanding Gender Roles Is Critical for the Implementation of Pest and Disease Management

In Uganda, Rwanda, and Burundi, there is frequent use of pesticides in potato farming systems to control major insect pests such as cutworms, psyllids, lygus bugs, leafminers, aphids, and armyworms (Okonya and Kroschel, 2016; Okonya et al., 2019a). A recent study (Okonya et al., 2019b) shows that men apply the chemicals in the field usually without any personal protective equipment, while women fetch the water to be used for mixing the pesticides, and also wash the clothes worn during the pesticide application. However, women are often not invited to participate in training about the safe use and handling of pesticides organized by extension workers, who are often men. As a result, women are exposed to the negative effects of pesticides because they frequently do not know about the toxicity levels of the different chemicals being used and their impacts on health as well as the environment. If women were more aware of the hazards, they could influence their husbands to adopt safe practices around pesticide application (see for example, Lambrecht et al., 2016). Therefore, both women and men should be given training about the safe use and handling of pesticides and other agro-chemicals so that both can avoid pesticide poisoning and contribute to effective crop management.

Understanding Gender Roles and Relationships Helps Control Banana Xanthomonas Wilt in the East-African Highlands

Banana Xanthomonas Wilt (BXW) poses a major threat to banana production in the East-African highlands. The Single Diseased Stem Removal (SDSR) control package is highly effective in controlling the disease and less labor intensive compared to other management practices, as farmers do not need to uproot complete banana mats. Instead, they simply cut stems that show any symptoms of BXW at soil level (McCampbell et al., 2018). In this region, banana production is primarily controlled by men, and extension services have often targeted men. In the RTB Scaling fund project; broadening the scaling of BXW management in East and Central Africa, we found that such targeting proved to be problematic for many banana producing households since many men have migrated to mines and urban centers while women have remained behind and manage banana production. This means they often manage all tasks in a banana plantation in the absence of their husbands, including managing disease, although they do not own the plots. It also means that they may harvest bananas for consumption or sale. In the training in this project in the DRC, both men and women were therefore targeted.

A study in Burundi (Irادukunda et al., 2019) provides another example. In many households in Burundi, bananas are intercropped with food crops, such as climbing beans which uses the banana stem as climbing support. The beans are commonly managed by women to meet food security needs. SDSR procedures to remove infected stems during the bean growth season can negatively influence bean production because bean plants may be damaged. Nevertheless, reducing BXW remains a priority because banana yield losses also impact household nutrition and income. Since household conflicts over crop and tree management can undermine efforts to improve livelihoods, strategic management of crops and trees will require improved intra-household decision-making and practical joint efforts to support the knowledge of both women and men (Rietveld and Farnworth, 2018). Such a gender-responsive approach can be copied in neighboring countries in the region where similar gender dynamics exist.

Men and Women Use Different Languages and Have Different Views on Pests

Women and men from the same community perceive pests in very different ways. This was found in our recent fieldwork in Ethiopia and Ghana in the case of sweet potato. In East Badaawacho Woreda Hadiya zone, Southern Ethiopia, women call one particular pest (millipedes, *Omopyge sudanica*) "Daafura", while men call the same pest "Bini". Men further noted that the pest spreads in dry seasons and likes lodging in fertile soil. Men and women also adopted different control methods which are in line with their gender roles: men practice early planting to prevent infestation as they are in charge of plowing, while women spend their time in the field

hunting the pests and killing them as they are responsible for routine management.

In field work carried out in a community in Gushegu district in northern Ghana, we found that women consider an insect (adult sweet potato weevils, *Cylas* spp) called “Zunzuli” to be the most serious pest for sweet potato. After harvesting, they carefully check for the presence of adult weevils in all roots, cutting off infested parts before storing them. They think that treating vines with insecticides could be a solution, since the eggs of the pest may be hidden in the vines. In contrast, men consider maggots (the larval stage of sweet potato weevils) the most serious pest, not the adult stage of the sweet potato weevil mentioned by the women. Consequently, men harvest early to prevent weevil infestation of the sweet potato roots. These cases show that understanding women’s and men’s knowledge of pests and their control methods based on years of practical experience. Is important in addressing their concerns and providing appropriate practices in response to their gender-related understandings and practices.

Providing More Knowledge or Technical Skills to Women Is Not Enough

In Ethiopia, potato late blight represents a serious problem for farmers in almost all major potato-growing areas (Woldegiorgis et al., 2008; Tsedaley, 2014). To collectively address this issue at a community level, a social learning exercise was conducted as part of a broader joint research project of Wageningen University and CGIAR Research Program on RTB. A study conducted in this project shows an important gender aspect (Damte et al., 2020). The farmers’ group initiated a disease monitoring system for early diagnosis of late blight and a community by-law to ensure implementation of various management practices. The group identified that it is mainly women farmers who fail to regularly implement agreed practices, such as joint field scouting for disease diagnosis. Moreover, some of the women farmers were not able to spray their fields as per the collective agreement due to lack of financial resources to purchase fungicides at the time of late blight incidence. This led to sanctions and monetary fines that mainly affected women farmers, who already had less access to financial resources than men. Understanding the socio-institutional problems of late blight management has enabled the group to address some of the gender-based constraints that women potato farmers face. The women farmers’ inability to spray their fields made the farmers’ monitoring committee realize that putting a system of sanctions in place would not guarantee the full compliance of all farmers, especially the women. After a deliberation process, they decided to financially support the female farmers, highlighting the risk of disease spread if those female farmers are unable to spray. One key lesson from this research approach is that addressing the gaps in women farmers’ knowledge is by no means sufficient to deal with the problem of potato disease management: there has to be a corresponding learning process on how to deal with existing and emerging gendered socio-institutional constraints.

Gender Matters in Controlling the Spread of Cassava Diseases in Mainland Southeast Asia

In Mainland Southeast Asia, cassava is grown predominantly as an industrial crop for the global starch, livestock feed, and biofuel markets. It is an important cash crop for the poor. In general, both women and men work together in cassava production with some tasks, such as harvesting, divided (e.g., during harvest men often pull out the roots, while women cut the roots from the stem). Cassava mealybug, cassava witches’ broom disease and cassava mosaic disease are three major pests and diseases for farmers in this region (Graziosi et al., 2016; Minato et al., 2019). Mealybug, which once caused widespread crop losses, has largely become controllable by using biological controls. However, cassava mosaic disease is very new to the region and cassava witches’ broom disease remains poorly understood to the extent that the vectors remain unknown. Access to clean stems and the increased awareness of diseases can slow the spread (Delaquis et al., 2018).

A recent study, applying multiple regression analyses to survey data from Cambodia and Lao PDR¹, revealed intriguing results about women and men farmers’ interest in purchasing clean planting material. When the incidence of disease is rather low, as in Laos at the time of the survey, all farmers reported low interest in purchasing clean planting material with no significant gender differences in those indicators. When the incidence of pest and disease is high, as in Cambodia, farmers’ interest and willingness to pay for clean planting material is also high. However, women household heads, most of whom were widowed, separated or living in households where the spouse was away, were significantly less interested in purchasing clean planting material than men or women in male-headed households, controlling for other characteristics including income. The gap was nearly 30 percentage points. Several factors may explain this, including women’s lower knowledge and access to information about controlling certain diseases through the use of clean planting material, and lower levels of access to agricultural training and resources than men. The results indicate that specific support is needed for female-headed households to understand their attitudes toward and constraints concerning the use of clean planting material. This is an area that deserves more attention in order to reduce the risk of spreading diseases within and across communities.

Women’s Trait Preferences Should Be Considered When Replacing Existing Varieties With Disease Resistant Ones

In Nigeria, cassava is an important crop for home consumption and selling. There are a variety of cassava fermented food products such as gari, eba and fufu/akpu, that are mainly processed by women. Currently, cassava disease pressure is relatively low. However, with the gradual movement of Cassava

¹The survey samples consisted of 311 cassava-producing households in two provinces in Cambodia (Kratie and Stung Treng provinces) and 360 cassava-producing households in two provinces in Lao PDR (Bolikhamsay and Xayabouly).

Brown Streak Disease from East to West Africa (Patil et al., 2015), it is expected that this destructive disease will cause major losses in West Africa as it directly affects root quality. As breeders and other stakeholders work to prevent such diseases by replacing existing varieties with resistant ones, gender must be considered as an important factor influencing future use and adoption of these varieties. Research carried out by IITA within the Cornell University led Nextgen cassava project shows that women attribute more importance to cassava variety traits related to processing and food product quality than men because of their gendered roles as cassava processors (Teeken et al., 2018). Although both men and women farmers sell fresh roots, these roots are mainly sold to women processors for value addition or processed directly by women farmers. Since fresh cassava prices are relatively low in Nigeria, processing cassava into storable products adds significant value, especially for women processors and their households. Therefore, breeding programs must directly work together with women end-users, the national variety release community and extension services to make sure that new disease resistant varieties that are released and promoted, accommodate women's cassava processing and food quality preferences.

DISCUSSION

The above cases from the field have shown that adopting a gender perspective while conducting agronomic research and extension work has a great potential to provide more efficient approaches to managing pests and diseases at the field level. A gender perspective promotes new ideas and approaches to agronomy research and crop protection. First, it allows researchers to move beyond exploring the issues of pests and diseases in a single crop and single scientific discipline toward exploring crop systems as women and men farmers' strategies for controlling pests and diseases are closely associated with their interests and priorities in other crops (case 3). Second, it also enables researchers to explore a broader value-chain process of the targeted crop rather than focusing on the particular stage of production where pests and diseases take place. For example, it is critical to understand seed systems and gendered constraints therein in the case of controlling cassava diseases in Southeast Asia (case 5), while

considering post-harvest market demands can be a first entry point in replacing local varieties with disease resistant ones (case 6). Third, research from a gender perspective necessarily explores problems and solutions from the viewpoint of women and men farmers instead of "scientists." Understanding how women and men perceive the issues and what women and men do and do not is a first step in providing appropriate solutions (cases 1 and 2) and a critical analysis of gendered power dynamics is essential to find appropriate solutions (cases 4). To achieve these, gender-responsive participatory research and participatory approaches in extension work are essential. It is also important for agricultural organizations to provide enabling conditions for researchers to adopt a gender perspective, such as facilitating transdisciplinary research and increasing female researchers and female extension workers.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

The first author led the writing of this article. The following co-authors provided cases and technical guidance (alphabetical order by family name).

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