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Recovering banana production in bunchy top-affected areas in Sub-Saharan Africa: developing gender-responsive approaches

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Abstract

Banana bunchy top disease (BBTD), an invasive and devastating viral disease, is widespread in banana-producing areas in Sub-Saharan Africa. Recovery of banana production in BBTD-affected areas was undertaken in a research project through the CGIAR Research Program on Roots, Tubers and Bananas (CRP-RTB) in eight countries. Understanding household and community dynamics is vital to recovery because decision-making on banana production and resource allocation occur at household level, while opportunity structures for men and women to engage in such work are influenced by social norms expressed both at household and community levels. Studies were undertaken to understand gender norms, practices and experiences in intra- and inter household and community dynamics related to banana farming in BBTD-affected areas. A standardized methodology was applied in all sites including household survey, gender seasonal calendar, daily activity schedule and a community profile. Results from analysis of four cases studies from Burundi, Gabon, Democratic Republic of Congo (DRC) and Nigeria indicated that banana is an important crop for both female and male farmers in all pilot sites and considered as both a staple food and a source of income. Men, women and male and female children are all involved in different banana production activities at household level; some mostly done by men assisted by male children (land preparation in DRC (95%), Nigeria (83%), Gabon (82.5%) and Burundi (64%)) while others are mostly done by women assisted by female children (watering, weeding in Kisangani (87%)). Men and women have differential use, control and ownership rights to different types of productive resources within the household which have implications for effective BBTD control and the benefits derived. Insights from the study will be used to develop guidelines for the incorporation of gender-responsive strategies into the design and implementation of BBTD control strategies.

Key words: Africa, bunchy top, disease control, gender-responsive, *Musa*.

INTRODUCTION

Banana, *Musa* spp. (including plantain, other cooking bananas and dessert types) is a key food and income security crop among farming communities. Yet, its production faces major challenges including pests and diseases. One such disease is banana bunchy top (BBTD), an invasive and devastating viral disease caused by the Banana bunchy top virus (BBTV) - genus *Babuvirus*, family *Nanoviridae*). BBTV is transmitted through infected planting materials and by the banana aphid, *Pentalonia nigronervosa*, which is wide spread in most banana-producing areas. The virus stunts the plant and ceases fruit production. Rarely, infected plants produce small bunches with a few deformed fingers. BBTV causes

systemic infection resulting in virus infection in all suckers on a mat. No source of varietal resistance has been identified up to date. In Sub-Saharan Africa (SSA) alone, BBTB is spread in over 16 countries and it is estimated to affect the livelihoods of 6-12 million smallholder households (Kumar et al. 2011, Niyongere et al, 2016; Jooste et.al., 2016). Various studies have highlighted the BBTB threat to banana production in SSA, for instance, in the Democratic Republic of Congo (DRC), the vector *P. nigronevosa* was found on 89% of all assessed mats (Boloy et al., 2014). In, Burundi, DRC and Rwanda, Niyongere et al. (2012) reported a regional BBTB incidence of 25%, 46% and 28% respectively. This would be assumed to cause similar yield loss in the first year and a rapid loss of clean planting materials as the disease spreads. The study also found that similar banana cultivars are grown across the three countries, suggesting disease spread because of cross-border movement of planting materials.

To counter the BBTB problem in SSA, a project was developed under the CGIAR Research Program on Roots, Tubers and Bananas (CRP-RTB) in which technologies to control and contain the disease were identified, developed and disseminated in eight countries in the Central and West Africa. The control technologies comprise: uprooting infected plants; establishing banana-free fallows for a minimum of 3 months to eliminate vectors; monitoring of banana re-sprouting and aphids during the banana-free fallows; use of BBTB-free planting materials in establishing new banana fields while ensuring adequate buffer zones; and monitoring productivity of banana in the cropping system. A study conducted in Burundi showed that applying control practices reduced BBTB incidence to economically acceptable levels within a year (Lepoint et al., 2013). Nonetheless, a significant number of farmers, despite being knowledgeable about the control practices, do not apply them (Niyongere et al., 2012; Lepoint et al., 2013). To be effective in the long run, these technologies require consistent application, which involves a shift in the management of bananas, calling for greater investment of time and resources and more systematic monitoring. This has implications for resource allocation by farmers as individuals and within their households.

Various studies have indicated that gender roles influence the ability of women and men to access information and other resources necessary to adopt technologies. Peterman et al. (2014) and Doss & Morris (2001) recognize gender integration as a key response to technology uptake concerns. Gender integration was suggested as an important tool for organizing the dissemination of technologies (Padmanbhan, 2002). Gender integration can support technology adoption through providing the means of minimising or resolving gender-linked challenges related to access to information (Katungi, 2006), the resources necessary for technology uptake (Doss and Morris 2000) and other social and gender norms and practices that may hinder participation of men and women in technology-related activities. Therefore an understanding of gender relations both at intra, inter-household and community levels is important because what happens at household level also has inter-household and community dimensions (Okali 2011, Doucet, 2000).

This study sought to understand gender relations at intra- and inter-household, and at community levels in BBTB-affected banana farming systems with the ultimate objective of developing gender-responsive approaches for sustainable management of BBTB.

METHODOLOGY

The study was conducted in 2015 in nine communities (pilot sites) in eight countries: Burundi, DRC (two sites, one in Kisangani and in Kinshasa), Congo Brazzaville, Malawi, Nigeria, Gabon, Benin and Cameroon. A standardised methodology was used to collect data in all sites, including Household Surveys, Focus Group Discussions (FGDs) and Key Informant Interviews. Participating households were selected randomly, except in Gabon where participating communities had a small range of inhabitants and over 85% of the

households were included in the survey. A household was defined as a domestic unit consisting of the members of a family who live and have meals together, including non-relatives such as servants (Okali 2011). Within the sampled households, interviews were conducted with the person (male or female) identified as the banana farmer, and information was collected about other household members simultaneously. A banana farmer was defined as a person who owns or manages a banana plot (involved in making decisions or executing them). Data was collected on the different aspects of the banana cropping system and related subjective experiences. For better targeting of BBTB control efforts (trainings, knowledge sharing, input availability), the different tasks or activities related to banana management were studied and a gender division of labour constructed. The aim was to find out who in a household is likely to perform which activities associated with banana management and BBTB control. Descriptive statistics were generated to summarize the data and data analysis involved cross-site comparisons. ANOVA tests were applied to compare the mean values across sites. In this paper, we focus on household surveys from four pilot sites: Burundi, DRC-Kisangani, Nigeria and Gabon. Data from the other sites was not handed over at the time of writing this paper. The sample size per site is shown in Table 1.

Table 1: Number of households surveyed and gender

Country	Total No. of households	Sex of the respondents		Household headship by sex	
		No. Male	No. Female	No. Male-headed	No. Female-headed
Nigeria	150 (23)	123 (82)	27 (18)	134 (89)	16 (11)
Gabon	56 (10)	23 (41)	33 (59)	23 (41)	33 (59)
Burundi	221 (35)	109 (49)	112 (51)	181 (82)	40 (18)
DRC	200 (32)	163 (81)	37 (19)	162 (81)	38 (19)
Total	627 (100)	418 (67)	209 (33)	500 (80)	127 (20)

**Note: Values in the parentheses are percentages.*

RESULTS AND DISCUSSION

Basic characteristics of the study communities, surveyed households and respondents

The study was conducted in the communities of Idologun, Odon and Olokuta in Ogun State (Nigeria); Zogoloumou, Eboro and Ebang Essandone in Woleu-Ntem Province (Gabon); Kagazi, Munyika, Gitebe and Rusagara in Cibitoke Province (Burundi) and Batiabongene11, Batiemaleka, Batiambale and Batiabongene1 in Oriental Province (DRC). Agriculture is the main source of household income in these communities, and banana is an important crop. BBTB is widespread across the communities. Generally, the households have an average of 6.1 members with female headed households (FHH) having slightly fewer (5.6) household members compared to male headed households (MHH) (6.3). Household sizes are largest in Nigeria (8.6 members) followed by DRC (6.4 members) compared to Burundi (4.6) and Gabon (4.2). The majority (82%) of respondents were married. Polygamy was most common in Nigeria where 26% of all respondents were part of a polygamous marriage this likely boosted the average household size. Most respondents (44%) were educated up to primary level. The majority of the FHH heads (31%) did not acquire formal education while the highest educational level attained by the majority (47%) of MHH heads was primary education. The ages of respondents were diverse with ranges from 19-81 years; the average age was 44 years. Characteristics of the surveyed households and respondents by country and gender are given in Table 2.

Table 2: Basic Characteristics of respondents and households

Sites	Gender	Burundi	DRC	Nigeria	Gabon	Total
No. surveyed		221	200	150	56	627
Respondent gender [No (%)]	Male	109 (49)	163 (82)	123 (82)	23 (41)	418 (67)
	Female	112 (51)	37 (18)	27 (18)	33 (49)	209 (33)
Mean age (Range)	Male	40.7 (21-81)	41.16 (23-78)	49.86 (24-97)	50.82 (28-81)	44.13 (21-97)
	Female	37.4 (19-73)	49.4 (23-75)	45.5 (28-72)	53 (23-72)	43.02 (19-75)
Household size (Mean)	Male	4.7	6.19	8.73	4.21	6.27
	Female	4.2	7.35	8.5	4.57	5.6
Household major source of income						
Agricultural activities [No (%)]		177 (80)	189 (95)	130 (87)	46 (84)	542 (87)
Non-agricultural activities [No (%)]		44 (20)	11 (13)	20 (13)	9 (16)	84 (13)
BBDT presence (%)		62	63	71	69	63
Respondent marital status						
Married monogamous [No (%)]		158 (71)	167 (84)	89 (59)	32 (57)	446 (71)
Married polygamous [No (%)]		21 (10)	5 (2.5)	39 (26)	5 (9)	70 (6)
Single [No (%)]		5 (2)	22 (11)	9 (6)	4 (7)	40 (10)
Widowed [No (%)]		29 (13)	5 (2.5)	13 (9)	13 (23)	60 (10)
Divorced/Separated [No (%)]		8 (4)	1 (0.5)	0	2 (4)	11 (2)
Household status						
Natives [No (%)]		205 (93)	144 (72)	125 (84)	37 (66)	511 (82)
Migrants [No (%)]		16 (7.23)	56 (28)	24 (16)	19 (34)	144 (18)
Household head educational level						
No formal education [No (%)]	Male	41 (19)	11 (6)	42 (29)	1 (4)	126 (21)
	Female	13 (6)	6 (3)	9 (6)	3 (12)	
Adult education/adult literacy [No (%)]	Male	15 (7)	17 (9)	5 (3)	0	57 (10)
	Female	17 (8)	3 (2)	0	0	
Primary education [No (%)]	Male	108 (42)	70 (27)	45 (17)	6 (2)	260 (44)
	Female	9 (3)	16 (6)	0	6 (2)	
Secondary education [No (%)]	Male	8 (10)	33 (42)	26 (33)	2 (3)	79 (13)
	Female	0	6 (8)	1 (1)	3 (4)	
High school [No (%)]	Male	9 (16)	30 (52)	7 (12)	1 (2)	58 (10)
	Female	1 (2)	7 (12)	0	3 (5)	
University [No (%)]	Male	0	1 (11)	8 (89)	0	9 (2)
	Female	0	0	0	0	

*Note: Values in the parentheses are percentages.

Men and women are key stakeholders in BBDT control

Banana is an important crop in all the study sites. When asked to rank crops that are grown by the household in order of importance, banana was ranked in the top 2 by the majority (85%) of the respondents. In Nigeria and Burundi, banana was the first-choice crop for men and women while in DRC and Gabon, it was second to cassava. Overall, 59% of the women ranked it as their first-choice crop, followed by cassava [53%] and maize [46%]. The men ranked it second [35%] to cassava [47%]. This is important for adoption of disease control methods as Asrat et al. (2010) shows that farmer crop preferences have a significant positive effect on agricultural technological adoption.

Land ownership and its implication for BBDT control

Land ownership is often believed to play an important role in directing investment for farmers (Lee, 2005). Farmers are more inclined to invest in crops on land they own, especially for semi-perennial crops such as banana. NGOs and extension workers also tend to reach out to land-owners with agricultural support. Results in relation to ownership of banana fields corroborates Marenya and Barrett (2007)'s finding that land in SSA is mostly owned by men. Overall, male ownership of banana fields is 80%; women own only 14% of banana fields and 6% are jointly owned by men and women. Especially in MHH, ownership of banana fields is low for women (2% owned by women and 5% jointly owned). But even in FHH, only 64% of banana fields are owned by women; 26% are owned by men; and 10% are jointly owned.

Results also show inter-country differences in ownership of banana fields by gender (Table 2). Nigeria (90%) and Burundi (91%) have the highest percentage of male-owned banana fields and Gabon has the highest percentage of female-owned fields (47%). The highest percentage of jointly owned fields is recorded in DRC with 18%. Although banana fields are only owned jointly and by women in a minority of cases, it is essential for effective BBTd management that control efforts are also applied on these fields. Not only does banana recovery matter for all farmers, but failure of a single farmer or household to consistently apply management practices increases vulnerability of the surrounding banana fields to the disease (Niyongere et al., 2012; Lepoint et al., 2013).

Table 2: Ownership of banana fields by country (mean values-% expressed as decimal)

Ownership of Banana field	Countries				F-statistics
	Nigeria	Gabon	Burundi	DRC	
Male (Vs others)	0.90 (0.30)	0.43(0.50)	0.91(0.29)	0.70(0.46)	31.19***
Female (Vs others)	0.10 (0.30)	0.47(0.80)	0.09(0.29)	0.12(0.32)	21.05***
Joint (Vs Others)	0	0.10(0.29)	0	0.18(0.39)	26.02***

*** Significance at less than the 1% level or better. Standard deviations are in parentheses. F-statistics are from ANNOVA of inter country differences. Dummy variables were used where male=1 and others =0; female=1 and others=0 and Joint =1 and others=0.

The gender division of labour and its implication for BBTd control

Literature suggests that women often contribute labour to banana management even when they don't own banana plots (Nkwiine and Tumuhairwe, 2004; Kabahenda and Kapiriri, 2010). Results of the gender division of labour showed that men, women and their children engage in various banana management activities. Overall, land preparation (85%) and planting (76%) are mostly done by men, while weeding (87%) is mostly done by women (see table 3-the figures in the table represent percentage of households per category (male, female adults and male female children) where labour was recorded).

However, gender roles in banana management varied for the different countries. For example, seed sourcing and planting in DRC was predominantly a woman's role (80%) while in the other countries, it was conducted by both men and women. The level of involvement of men, women and children in banana management also varied across countries. In Nigeria, all household members contributed labour to some extent but activities were primarily conducted by men. In Burundi and Gabon, most activities were done by both spouses, and children mainly participated in weeding and transporting of planting materials. In DRC on the other hand, men and women engage in specific activities, and, like in Gabon and Burundi, the children mainly participate in weeding and transportation of planting materials. The minimal involvement of women in banana management in Nigeria can be attributed to their predominant role in plantain processing and marketing activities which is time consuming (Tijani et al., 2009; Josh et.al. 2013, Randriamaro, 2008).

Table 3: Gender division of labour for selected banana/ plantain production activities

		Nigeria (%)	Gabon (%)	Burundi (%)	DRC (%)
Land preparation (Felling trees, burning etc.)	Male adult	83	83	64	95
	Female adult	1	14	100	-
	Male children	14	-	-	3
	Female children	1	-	-	-
Sourcing and transporting planting materials	Male adult	68	100	100	2
	Female adult	67	100	100	80
	Male children	16	-	100	1
	Female children	10	-	100	17
Planting	Male adult	65	87	100	-
	Female adult	13	54	100	90
	Male children	27	2	-	-
	Female children	1	6	-	15
Weeding	Male adult	60	56	100	25
	Female adult	10	55	100	85
	Male children	32	4	-	5
	Female children	3	4	-	10

Men and women and their children are most likely to engage in BBTB control activities that are aligned with their current banana production roles. For example, activities that require physical strength, such as uprooting infected plants, are likely to be done by men. For women that cannot mobilize male labour within their households, alternative methods to destroy banana mats could be promoted such as 'meristem destruction' or 'injecting with pesticides'. Sourcing of BBTB-free planting materials is likely to be done by both men and women in Nigeria, Gabon and Burundi while in DRC it is likely to be done primarily by women. Similarly, establishing of new fields which involves planting is likely to be done by men and women in Gabon and Burundi while in DRC it is likely to be done by women and in Nigeria by men. In countries like Nigeria and Gabon, where men and women manage separate banana fields, it is likely that they will both initiate BBTB control in the fields they manage. These results highlight the anticipated need for BBTB-free planting materials for men and women. Furthermore, they suggest that children under the supervision of their parents can be an important resource in monitoring and evaluation.

Size of banana fields and its implication for BBTB control

Apart from land ownership, land size is another important factor for targeting BBTB control strategies. On the one hand, large banana fields might seem too large to handle at once for smallholder farmers, and on the other hand, the size of banana fields might be an indication of the relative importance of the crop for farmers' livelihood and farmers with large fields might be more motivated to control BBTB. This is in line with Isgin et.al (2008)'s finding that farm size is positively correlated with agricultural technology adoption.

Overall results showed that the average area under banana per household is about 1.9 ha ranging from 0.1 to 12.1 ha. Nigeria has the largest area under banana (4.2ha). FHH have less land under banana compared to MHH; on average, area under banana for FHH is 0.84 ha compared to 2.2 ha in MHH (significant $t = -4.5279$, $p=0.0000$). When comparing countries, it was only in DRC that significant differences [$t = -3.4388$, $p= 0.0007$] were observed between area under banana for MHH and FHH. FHH have an average of 0.6 ha compared to 0.72 ha in MHH, a difference of 0.13 ha. These results are consistent with Wakhungu (2010), Guloba (2014) and Doss (2001) who found that FHH in SSA tend to have less access to land than MHH. Access to land in the study was defined as having the right to use the land, the right to make decisions about how the land should be used and the right to sell what is produced on the land.

Decision-making related to banana production and its implication for BBTB control

Limited control over resources is believed to reduce the likelihood of adoption of agricultural technologies (Lee, 2005) because it undermines the ability of farmers to mobilize other resources necessary to adopt technologies. Results in relation to decision-making related to banana confirm that men are the primary decision makers (Quisumbing, 2003). Overall, men primarily make decisions related to banana production in 67% of the households, women are the primary decision makers in 21% of the households, and in 12% of the households the decisions are made jointly. Particularly in MHH, primary decision making by women is low (women are primary decision makers in 7% of the households and in 10% of the households, decisions are shared). Even in FHH, women are primary decision makers in only 56% of the households; in 35% of the FHH, men (spouses and sons) are the primary decision makers, and in 9% of the households, decisions are made jointly. This was not different for decisions related to specific banana production activities except in Gabon where women were the primary decision makers for activities related to intercropping banana. Decisions about the cultivars planted were primarily made by men in 54% of the households, by women in 33% of the households, and shared in 13% of the households. Significant ($F=31.72$, $P=0.0000$) differences were however observed between the countries. Burundi had the highest (86%) number of households in which decisions were primarily made by men and Gabon had the highest number (39%) of households in which decisions were primary made by females. The highest number of households with joint decision making was recorded in DRC with 22%.

Although the involvement of women in decision making related to banana production is minimal, it is essential for BBTB control efforts to involve them. Given their involvement in banana production activities - with some owning banana plots, others managing separate banana plots from men - their potential contribution to BBTB control cannot be overlooked. To increase their participation and benefits however, efforts that aim to increase their bargaining power within the household may be appropriate. These may be easier to implement if they are accompanied by material benefits that can be shared by other members of the household (Quisumbing et al. 2014).

CONCLUSION

Development of gender-responsive approaches will draw from the insights generated from this study. For effective gender integration, it will be necessary to employ various approaches especially those that focus on promoting participation for both men and women and their children. Women, men and children engage in banana production either as independent banana producers or as members of banana-producing households, in which case they engage in various banana management activities. Development of gender-responsive guidelines should pay attention to the complementarity of their banana production roles as well as their interests, needs and potential contributions in BBTB management. Women have more limited ownership of land and banana fields as well as decision-making power. To promote more equitable participation and benefits, approaches that aim to especially increase their bargaining power may be appropriate. Attention to the kinds of community investments required for BBTB control such as labour, time, assets and resources and who in the community has access to and controls them is necessary. In addition, anticipation of the gender relations that are likely to constrain the participation of men, women and children and development of interventions aimed at addressing and/or minimizing their effects is essential.

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