



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



15th Africa Fine Coffee Conference (AFCA)

Feed the Future Africa Great Lakes Coffee Program (AGLC)

Topic: Control of Antestia/PTD and Improving Coffee Productivity in Burundi and Rwanda

February 17, 2017 • Addis Ababa, Ethiopia



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Outline of presentation

- 1. AGLC approach to challenge**
- 2. Guiding questions**
- 3. Background**
- 4. Coffee overview**
- 5. Preliminary studies by University of Rwanda and Roger family company as GKI-Link**
- 6. AGLC methodology**
- 7. Preliminary results**
- 8. Conclusion**
- 9. Acknowledgement**



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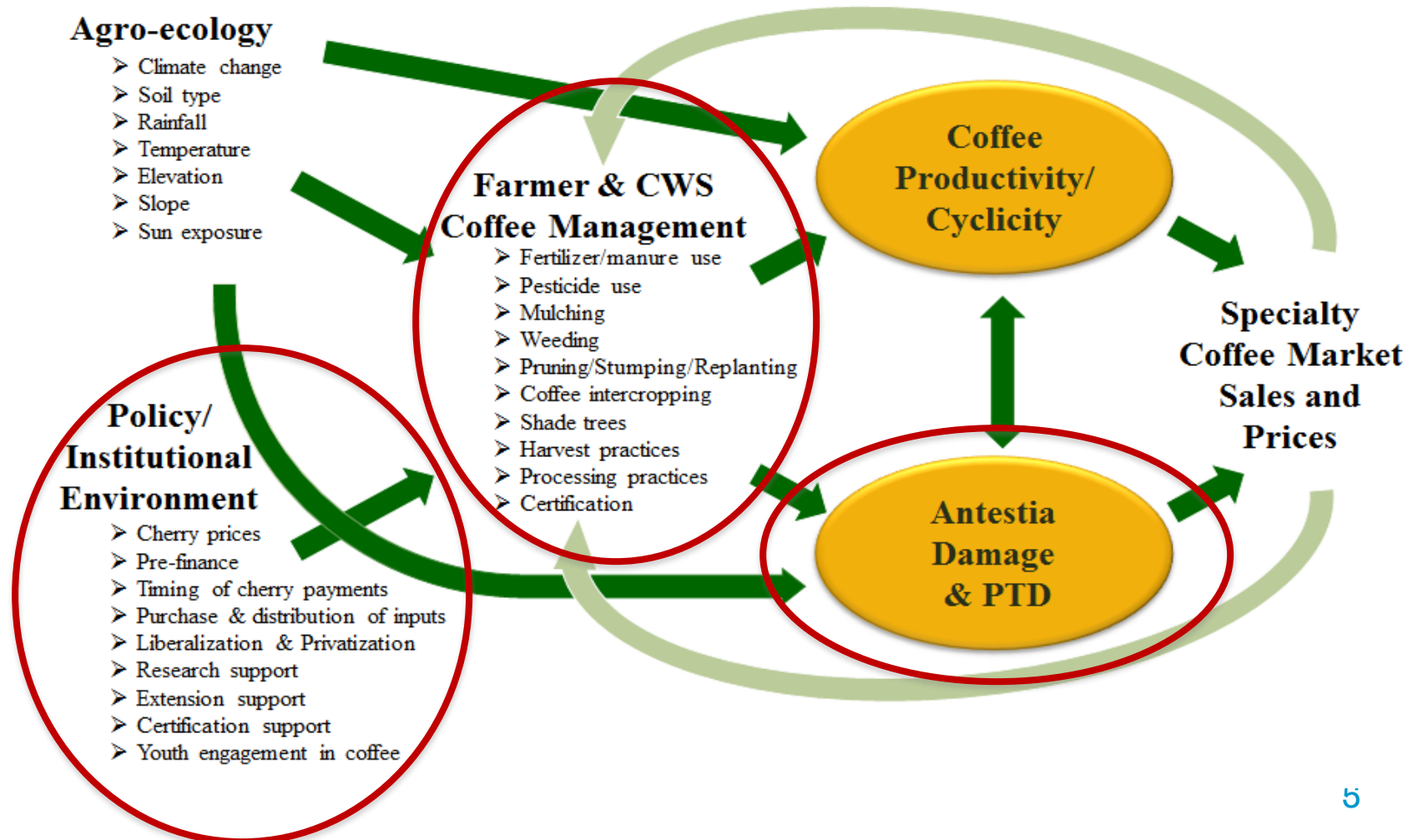
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AGLC- Introduction to the Challenge And Background

Conceptual Framework for Burundi and Rwanda Coffee Productivity, Cyclicity and Potato Taste Defect





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AGLC Background

- AGLC is a 3-year USAID-funded initiative that addresses 2 major challenges in the coffee sector in Rwanda and Burundi
 - Reduce antestia bug/potato taste defect (PTD)
 - Raise coffee productivity
- Partners
 - **Rwanda:** Univ. of Rwanda (UR) and Inst. of Policy Analysis and Research (IPAR)
 - **Burundi:** University of Ngozi, Polytechnic Univ. of Gitega
 - **USA:** Michigan State University (MSU) and Global Knowledge Initiative (GKI)
- **Components:** • applied research • policy engagement • capacity building



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Applied research component

- AGLC draws upon a broad mix of quantitative and qualitative methodologies, including
 - Experimental field/plot level data collection
 - Coffee farmer/household surveys (and CWS survey)
 - Key Informant Interviews
 - Focus Group Discussions
- Comprehensive coffee sector data base
 - Goal to integrate information from these four data collection activities
 - Provide empirical basis for policy engagement and farmer capacity building

Today's topic



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Guiding questions on the Antestia Problem in Burundi and Rwanda



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Agronomic questions being addressed in on-going experimental plots

1. What can we learn about antestia and how it attacks coffee if we study it scientifically?
2. Which types of pest control are most effective against the antestia pest?
3. Can organic methods of pest control be as effective as chemical methods in controlling antestia? Is a combination approach more effective than either on it's own?
4. Antestia damage \neq potato taste defect every time. Which treatments result in the lowest incidents of PTD? Requires cupping.
5. What are the impacts of different pest control treatments on plant growth and productivity?



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Capacity-building questions being addressed in the experimental plots

1. How can we implement experimental plots in ways that improve capacity of the farmers who own them and their neighbors?
2. How can we implement experimental plots in ways that build-up the next generation of extension workers with deep coffee knowledge?



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Household survey

The household and field survey (n=2024) part of the project addresses PTD issues and productivity via large coffee farmer field and household surveys. Important questions related to PTD are discussed in the analysis.

See “Determinants of Farmer Investments” and “Estimating Cost of Production” papers available as handouts.

Mid-line survey (n=1024) completed in January 2017 for Rwanda, currently underway in Burundi.



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Rwandan coffee Background



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21st Century Rwandan Coffee Industry **New Policy 1998**

1. Government of Rwanda targeted coffee as a priority sector
2. Liberalized coffee sector
3. Cooperatives promotion and support
4. **Emphasis was placed on quality**
5. Private sector participation encouraged
6. Cupping laboratories built
7. Cooperative and private promoted
8. Involve development partners

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Quality in all links along the Coffee value chain

1. Cherry picking and selection
2. Flootation for sorting and grading
3. Clean water use
4. Parchment sorting and grading
5. Precise fermentation
6. Linear sun drying
7. Lot creation
8. Lot quality control
9. Regional cupping laboratory
10. Market link and buyers contacts



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Quality in all links along the Coffee value chain



What are the key factors leading to Rwanda's accelerated climb in quality?

Cherries are carefully handled in the field after picking



High intrinsic quality

Cherries are then rushed to wet processing centers on specially designed 'coffee bikes'



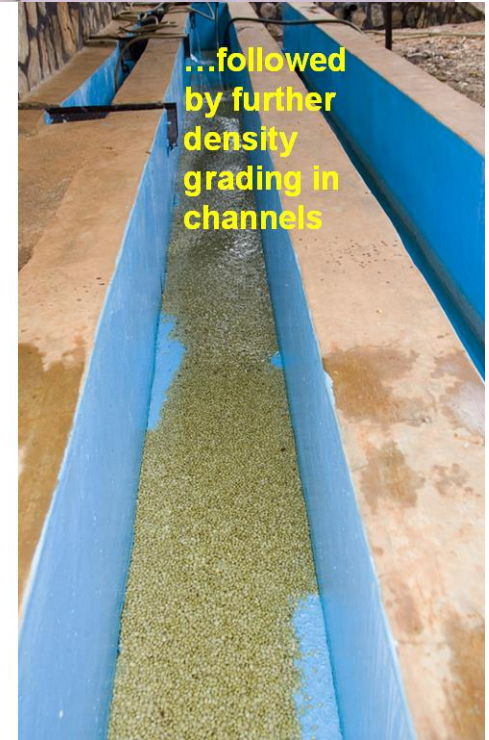
...then they are quality controlled at the washing station upon arrival



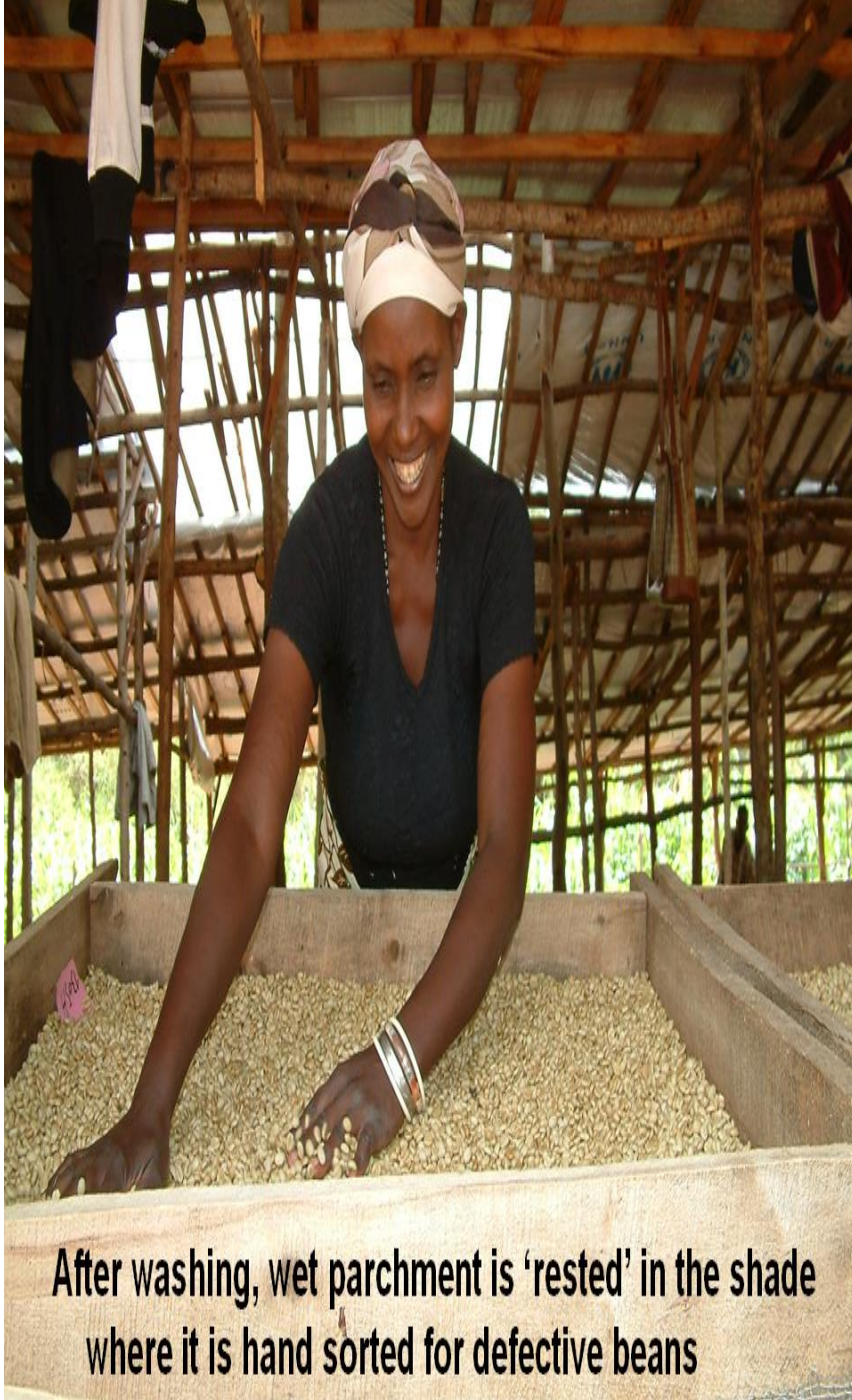
They are then floated to remove damaged cherries leading to the 'potato taste'



Pulping and density grading in clean water

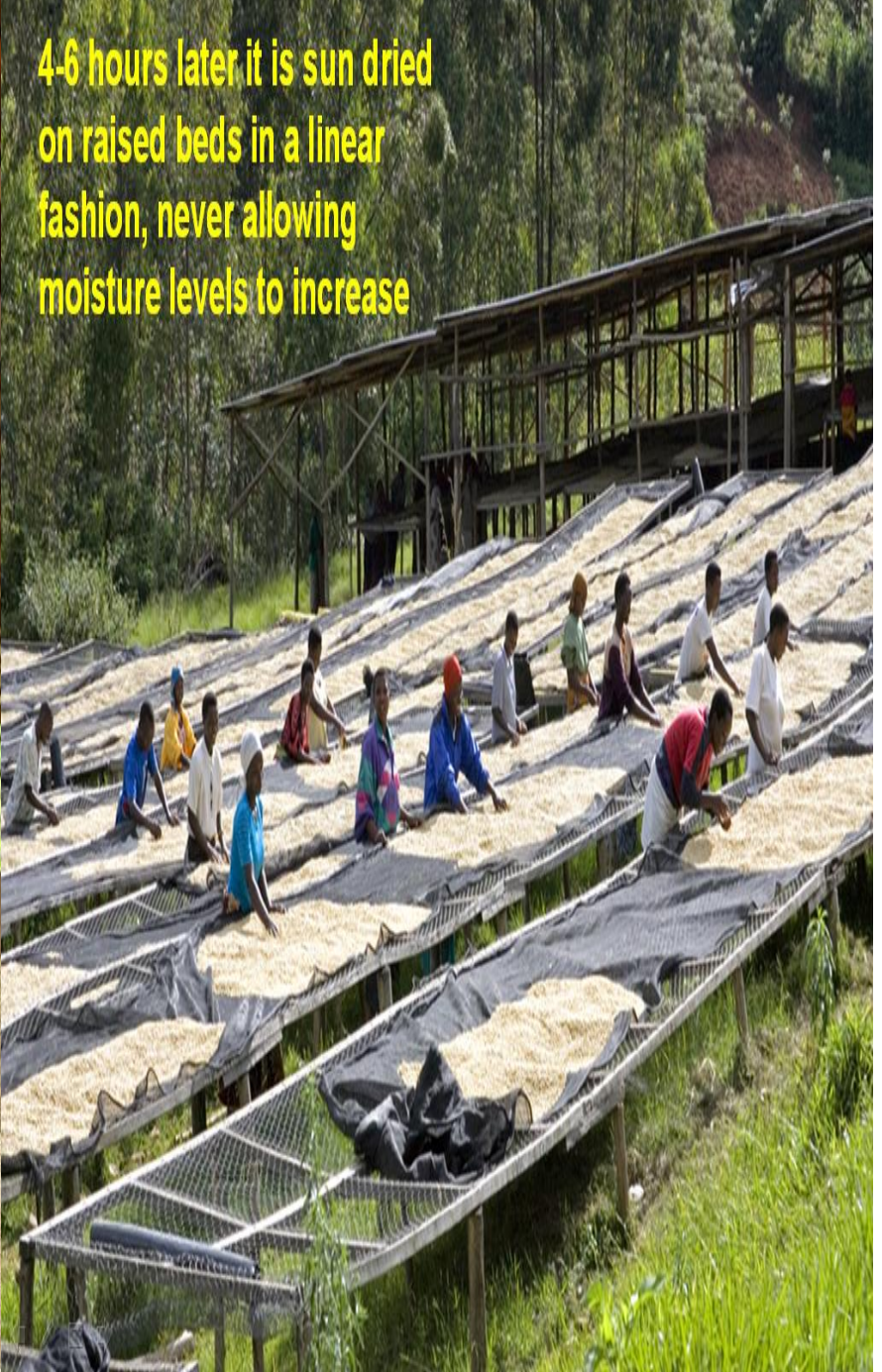


...followed by further density grading in channels

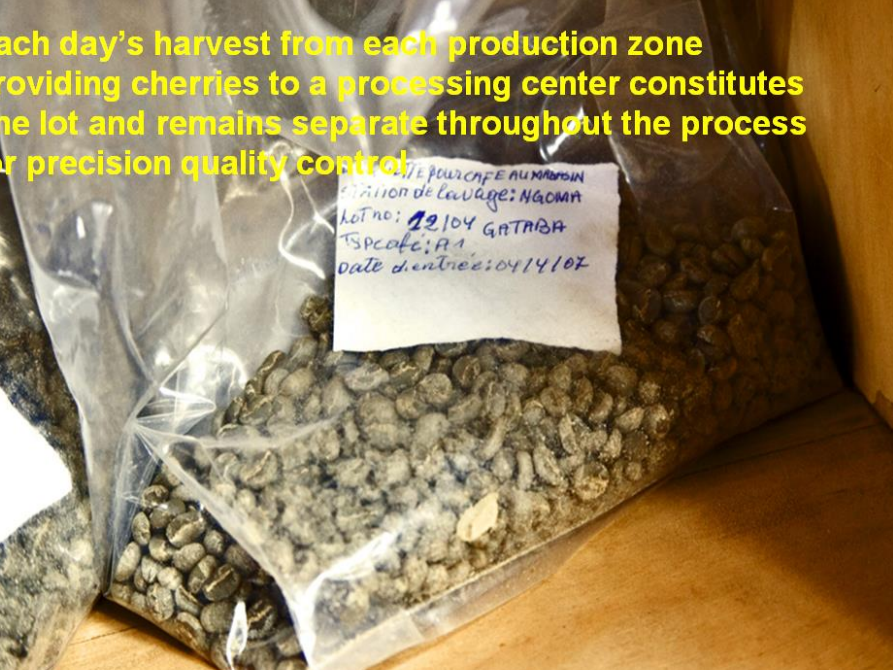


After washing, wet parchment is 'rested' in the shade where it is hand sorted for defective beans

4-6 hours later it is sun dried on raised beds in a linear fashion, never allowing moisture levels to increase



Each day's harvest from each production zone providing cherries to a processing center constitute one lot and remains separate throughout the process for precision quality control



Rwandan cupper skills are constantly updated and synchronized with those of industry experts and buyers

Each sample is cupped by a team of highly trained cuppers





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Challenges to coffee production (from NAEB)

- ◆ Poor soil fertility
- ◆ Lack of knowledge of farmers on good coffee husbandry
- ◆ Old coffee trees (24 % of the total number) which are not productive.
- ◆ Pests and diseases pressure.
 - ◆ main insect pests being:
 - ◆ antestia, (*Antestiospsis* sp.)
 - ◆ coffee berry borer;
 - ◆ Main diseases are:
 - ◆ Coffee leaf rust (CLR) and
 - ◆ Coffee berry Disease (CBD)



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Challenges to coffee production (from NAEB)

- Antestia spread in all the coffee growing zones
- Feeds on berries and green shoots
- It is thought to be linked with the potato taste
- Can cause loss **up to 30%** if not controlled and affect the quality of coffee as well



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Current Antestia bug control

❖ Chemical control:

➤ Use of synthetic pesticides

➤ Use of Natural pyrethrin, Pyrethrine 5EW,
produced locally by the Agropharm
Africa.

❖ Cultural Control:

➤ Training of farmer : eg FFS



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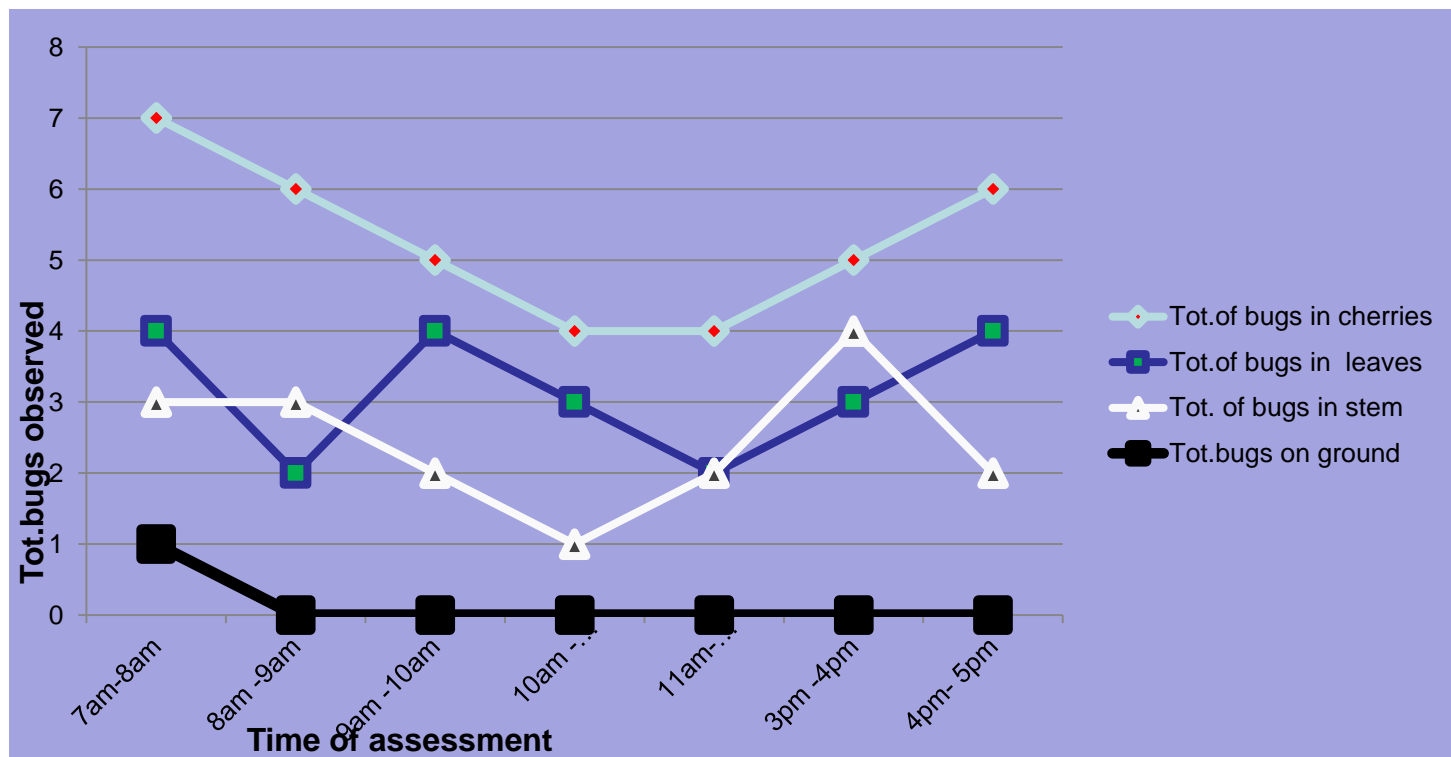
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**Pilot study at University of Rwanda in
partnership with
Roger Family Company/San Francisco
bay**

Daily behaviour

❖ Daily distribution in the tree





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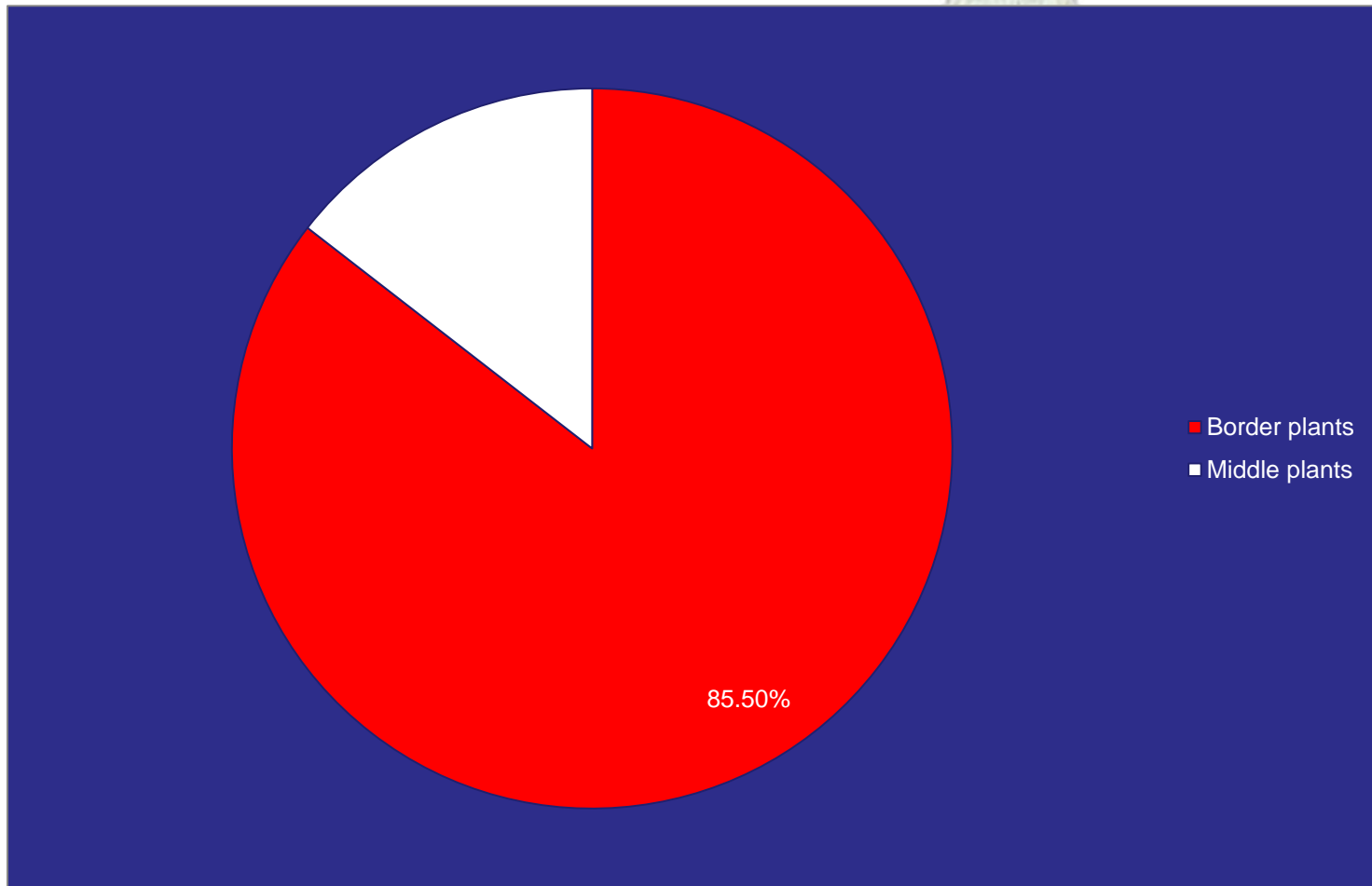


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Distribution in the fields





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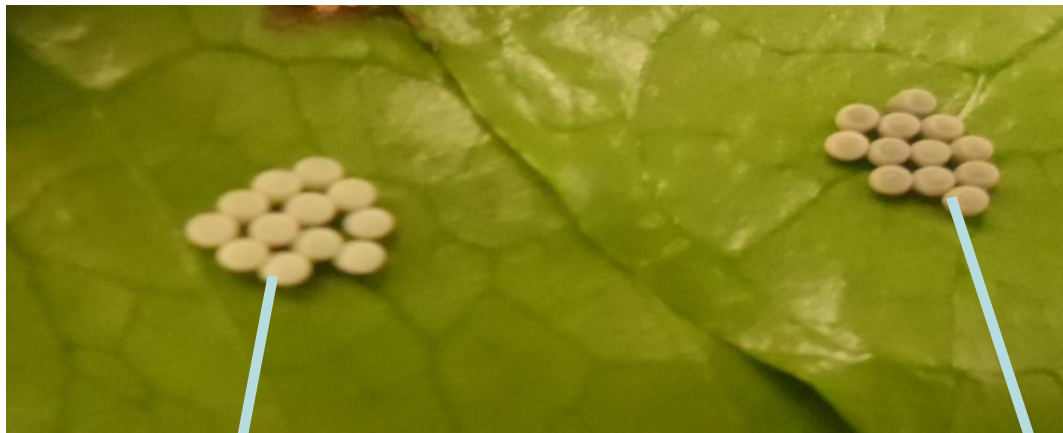
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Pilot study at University of Rwanda in partnership with RFC

Presence of egg parasitoids

Parasitized and un parasitized antestia bug eggs



Unparasitised
Appears white

Parasitized
Appears black



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Presence of egg parasitoids in 2013 and 2014

Coffee plantation management	Number of eggs collected	Number of eggs parasitized (wasps)	Number of eggs not parasitized (wasps)	Level of natural control at egg stage in (%)
Before pruning (2013)	496	230	266	46
After pruning (2014)	1234	619	615	50



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entomopathogenic fung

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- Presence of entomopathogenic fungi at different growth stages
- Infection rate in antestia bugs increased with development stage
 - eggs (40%),
 - ❖ nymphs (60%)
 - ❖ adults (73.3%)



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Entomopathogenic fungi:

Metarhizium anisopliae showed a great percentage of occurrence in all growth stages :

- Eggs(28%),
- nymphs (28%)
- adults (42.85%)
- This implies that *M. anisopliae* has more potential than other entomopathogenic fungi. Especially for adult control





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AGLC- Study Plots Methodology

128 agronomic study plots

- 16 coffee washing stations in each country selected.
- 4 farmers' plots (minimum 200 trees) selected from each washing station.
- 2 countries x 16 washing stations x 4 plots/ws = 128 study plots





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Field work

Year 1:

Field/Farmer selection

Field set-up

Hire/train enumerators

Soil samples



Challenging roads and places



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Field-Farmer Selection



Burundi



Rwanda

Protocol

Insecticide Treatments

Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Confidor (Rwanda)	Pyrethrum EWC [ORGANIC]	Confidor (or equivalent) + Pyrethrum EWC	IPM (EWC spot-spray)	Control (no treatment)
Equivalent, ARFIC recommended for Burundi		Application: 1 blanket spray		
Application: 2 blanket sprays per season	Application: 2 blanket sprays per season	Confidor, 1 blanket spray EWC later in season	Application: Spot spray weekly	



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Field Set-up



Plot

#

1

2

3

4

5

	b	b	b	b	b	b
	b	b	b	b	b	b
1	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	b	b	b	b	b	b
2	b	b	b	b	b	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	b	b	b	b	b	b
3	b	b	b	b	b	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	b	b	b	b	b	b
4	b	b	b	b	b	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	b	b	b	b	b	b
5	b	b	b	b	b	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	n	n	n	n	n	b
	b	b	b	b	b	b
	b	b	b	b	b	b



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Field set-up



Painted tree trunks.





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Enumerator Training





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Soil Samples





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Field work – Year 1 & 2

- Soil analysis (challenges)
- Antestia knock-down and counts
- Tree growth and vigour
- Cupping



Soil analysis at University of Ngozi, Burundi



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Antestia knock-down and count

1. Spray EWC



In the morning



Wait 10 minutes.

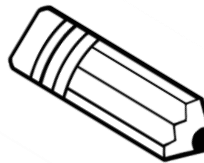
2. shake



3. Count bugs



4. Record



A. Juma

ANTESTIA KNOCK-DOWN AND COLLECTION SHEET - RWANDA

Location: *BUKURU*
 District: *RUHUKUMUKU*
 Village: *BUKURU*
 Date: *2014/07/01*
 Time: *10:00 AM*

Number of Antestia: *100*

Species	Number	July		August		Total
		Antestia	Other	Antestia	Other	
Antestia						
Other						
Total						





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Tree growth and vigour

Location									
					B:	border			
					M:	Middle			
Plot Nbr	Treatments	Plant Nbr (net plot)	Height (cm)	NoSt em	No Branches	no branches with fruits	Average fruits/branch	Vigour(scale 1-3)	Location
1	Confidor	1							
1	Confidor	2							
1	Confidor	3							



1 vigorous: green leaves, dense canopy

2 medium : not dark green, sufficient light penetration

3 Stressed: not green, poor canopy formation, light penetration



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Cupping to assess incidence of PTD

Potato Taste
Yes/No

UNIVERSITE POLYTECHNIQUE DE GITEGA POTATO TASTE RESEARCH														
COFFEE ANALYSIS RESULTS														
SAMPLE CODE	FARM	PLOT	PARCHMENT COFFE ASPECT		GREEN COFFEE ASPECT.AGRONOMIC DEFECT			POTATO TASTE		OTHER DEFECTS			SCORE	
			FW	OTHER	DAMAGED	BLACK	SOUR	YES/no	NO	SOUR	FERMENTED	PHENOLIC		
225	CH 1	P1E1	A1		1	0	0	0	0	0	0	0	0	80
226	CH 1	P2E1	A1		1	0	0	0	0	0	0	0	0	80
227	CH 1	P3E1	A1		1	0	0	0	0	0	0	0	0	82
228	CH 1	P4E1	A1		1	0	0	0	0	0	0	0	0	83
229	CH 1	P5E1	A1		1	0	0	0	1	0	0	0	0	70
230	CH 1	P1E2	A1		1	0	0	0	0	0	0	0	0	79
231	CH 1	P2E2	A1		1	0	1	0	0	1	1	0	0	78
232	CH 1	P3E2	A1		1	0	0	0	0	0	0	0	0	84
233	CH 1	P4E2	A1		1	0	0	0	0	0	0	0	0	83
234	CH 1	P5E2	A1		1	0	0	0	0	0	0	0	0	79
235	CH 2	P1E1	A1		1	0	0	0	0	0	0	0	0	80
236	CH 2	P2E1	A1		1	0	1	0	0	1	1	0	0	78
237	CH 2	P3E1	A1		1	0	0	0	0	0	0	0	0	79
238	CH2	P4E1	A1		1	0	0	0	1	0	0	0	0	70





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Initial Research Findings from Experimental Fields



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Progress update - no conclusions yet

- Antestia incidents high in dark, bushy canopy. “Pruning on its own can reduce antestia by half. “ ~ Dr. Dick Walyaro, RAB.
- Organic and domestically available pyrethrum of high interest. Cost issues. Testing “spot” vs. “blanket” application.
- Expect soil analysis to show lack of potassium in Rwanda, which reduces sweetness in the cup.¹ Distribution of fertilizer issue.
- Fly crop issues.

¹ Malliavin Nzamurambaho: San Francisco Bay Coffee

Early results.

Treatment 1 has highest incidence of antestia and highest yield.

Ngozi + Kayanza, Burundi		Year 1 Quarter 4 Update	
		Avg. # of Antestia bugs	Yield – KG cherry/tree
1a	Treat 1 (Confidor):	0.9	1.98
1b	Treat 2 (Pyrethrum):	0.4	1.73
1c	Treat 3 (Confidor+):	0.7	1.50
1d	Treat 4 (IPM – Pyrethrum+):	0.5	1.47
1e	Treat 5. Control:	0.0	1.64



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Expecting 2017 study plot data

More precise estimates of % yield reduction due to antestia damage. (We typically use 30%, is it accurate?)

Correlation between antestia presence and PTD in the cup.

Disaggregation of antestia and PTD incidence by geography, type of input use, plant and soil characteristics.

Better understanding of antestia habits and lifecycle.



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Capacity building

Farmers



Future Extensionists





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Research Findings from Household & Field Surveys



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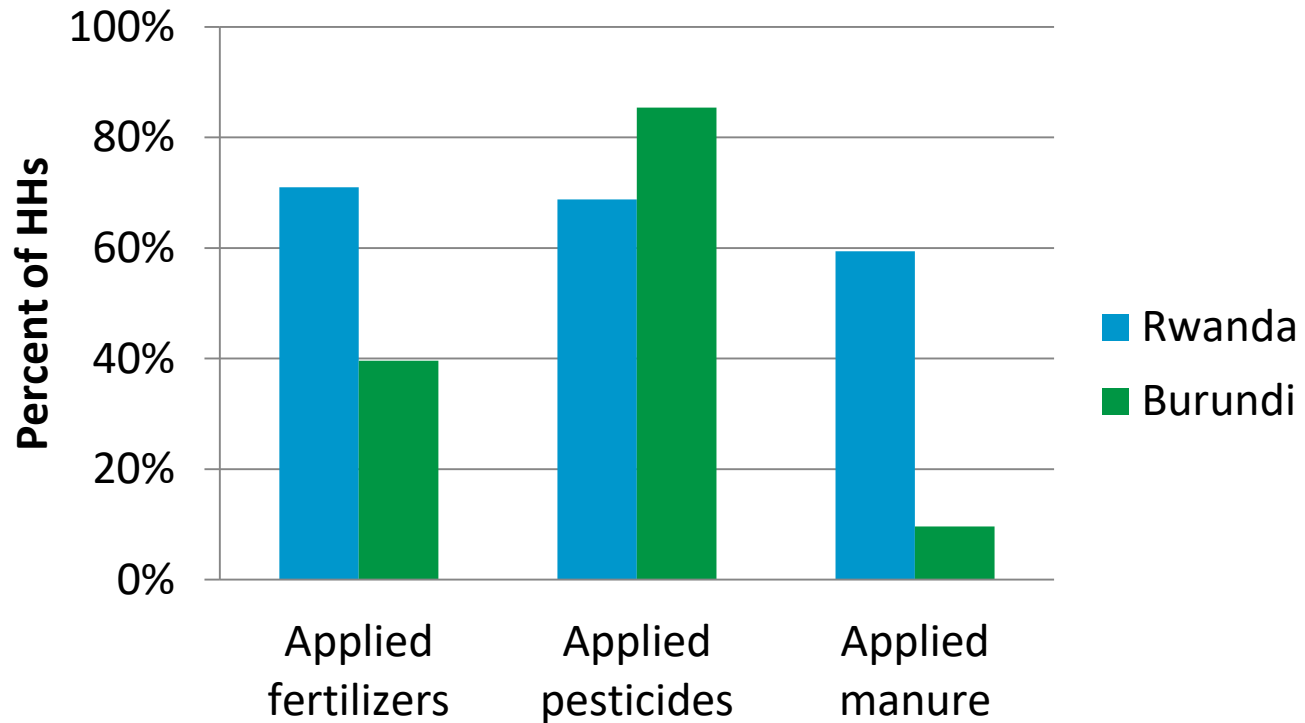


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Input Application Rates

Percent of HHs Applying Inputs





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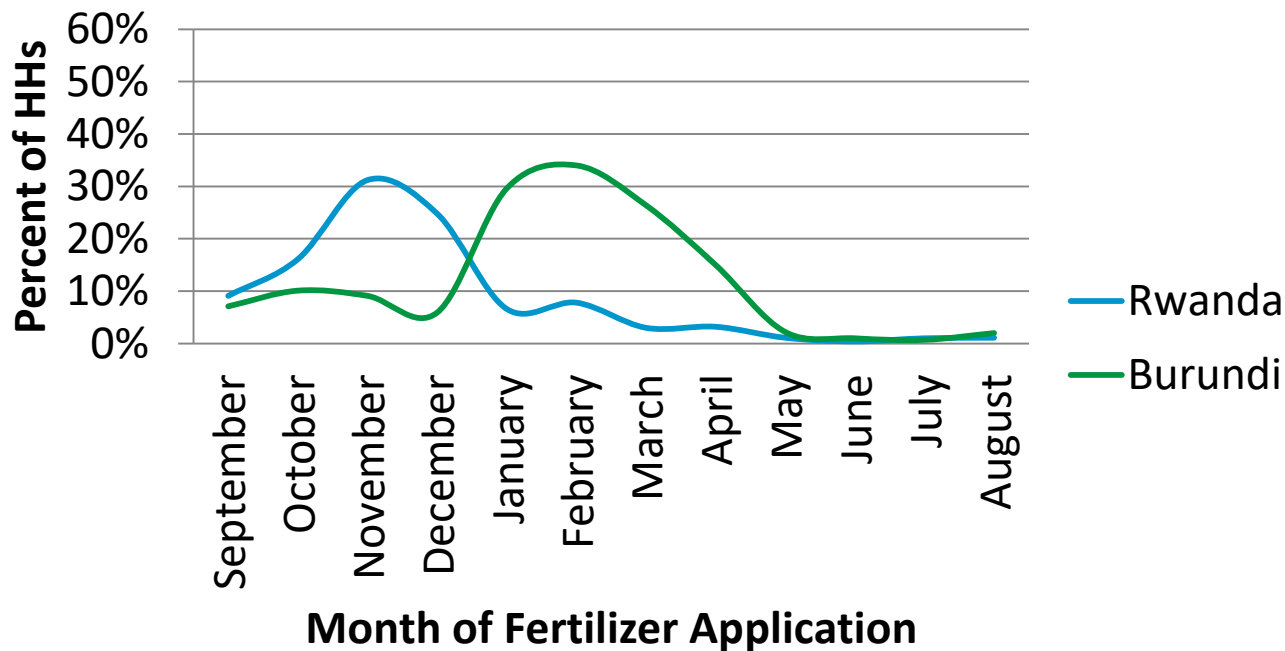


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Fertilizer Application Rates per Month

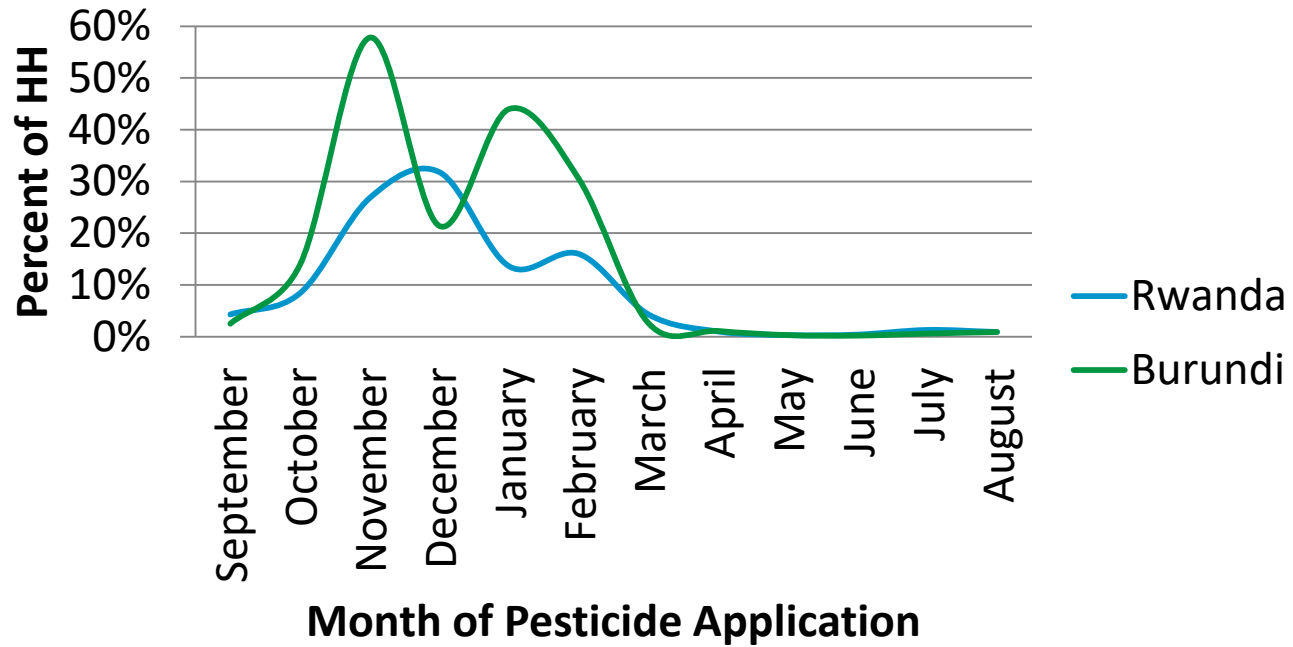
Percent of Farmers Applying Fertilizers per Month





Pesticide Application Rates per Month

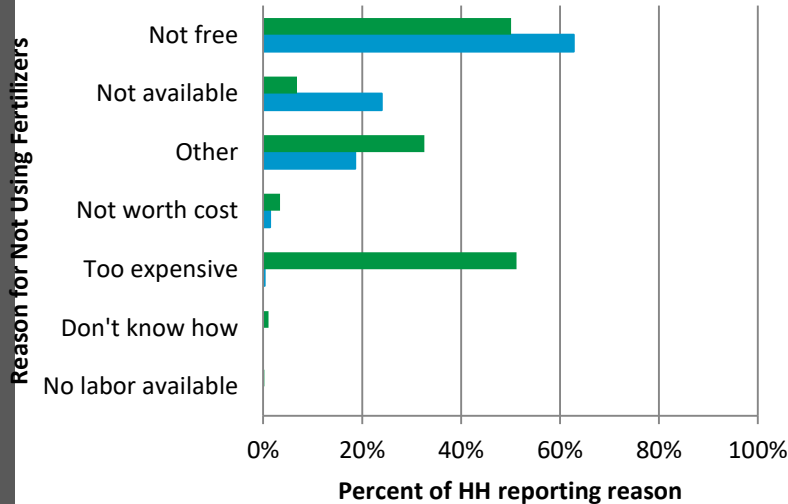
Percent of Farmers Applying Pesticides per Month



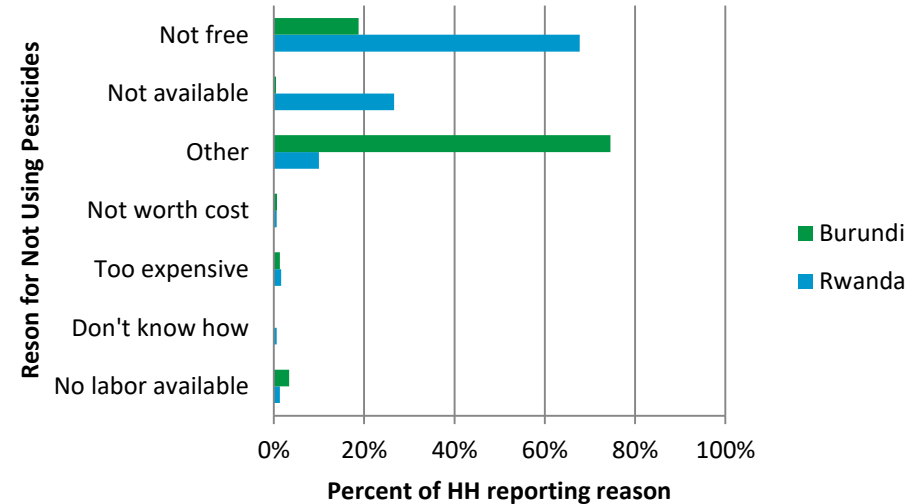


Reasons for Not Using Inputs

Reasons for Not Using Fertilizer (for HH not using fertilizer)



Reasons for Not Using Pesticide (for HH not using pesticides)





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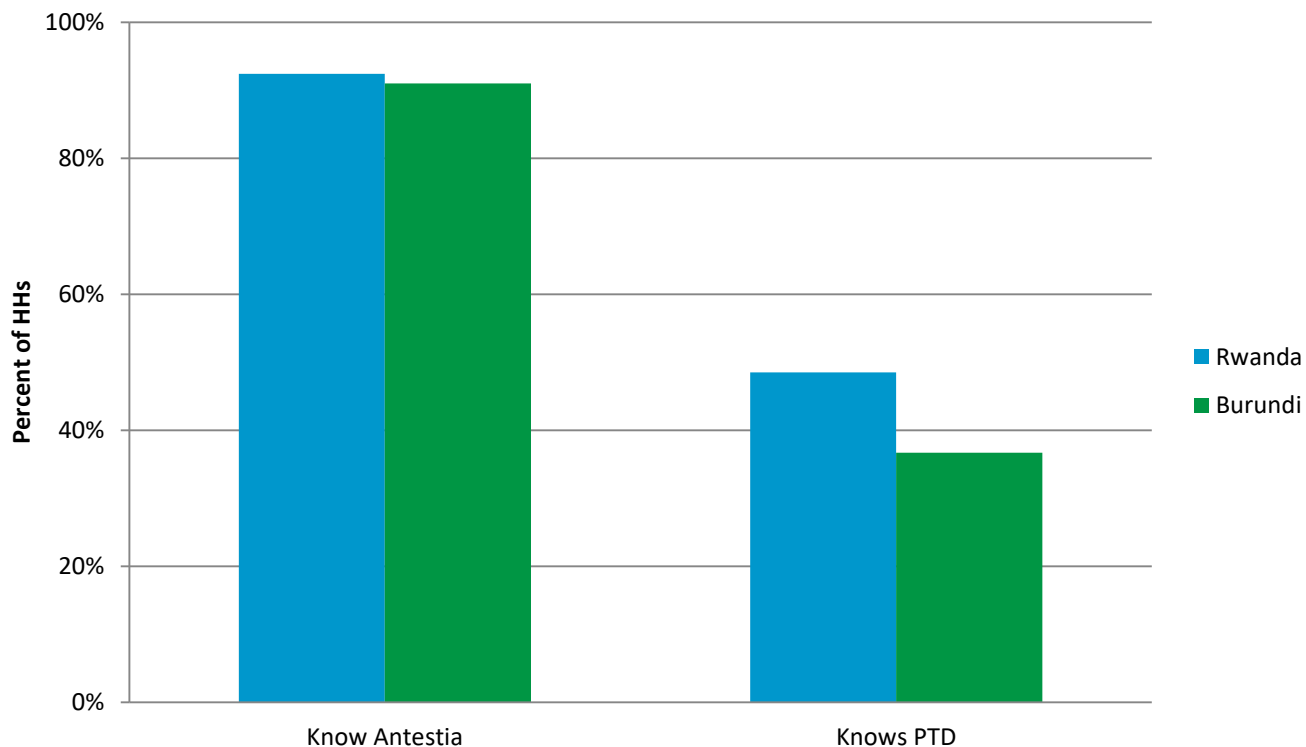
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Antestia and PTD: Do Farmers Know What They Are?

Percent of Farmers Who Know Antestia and PTD





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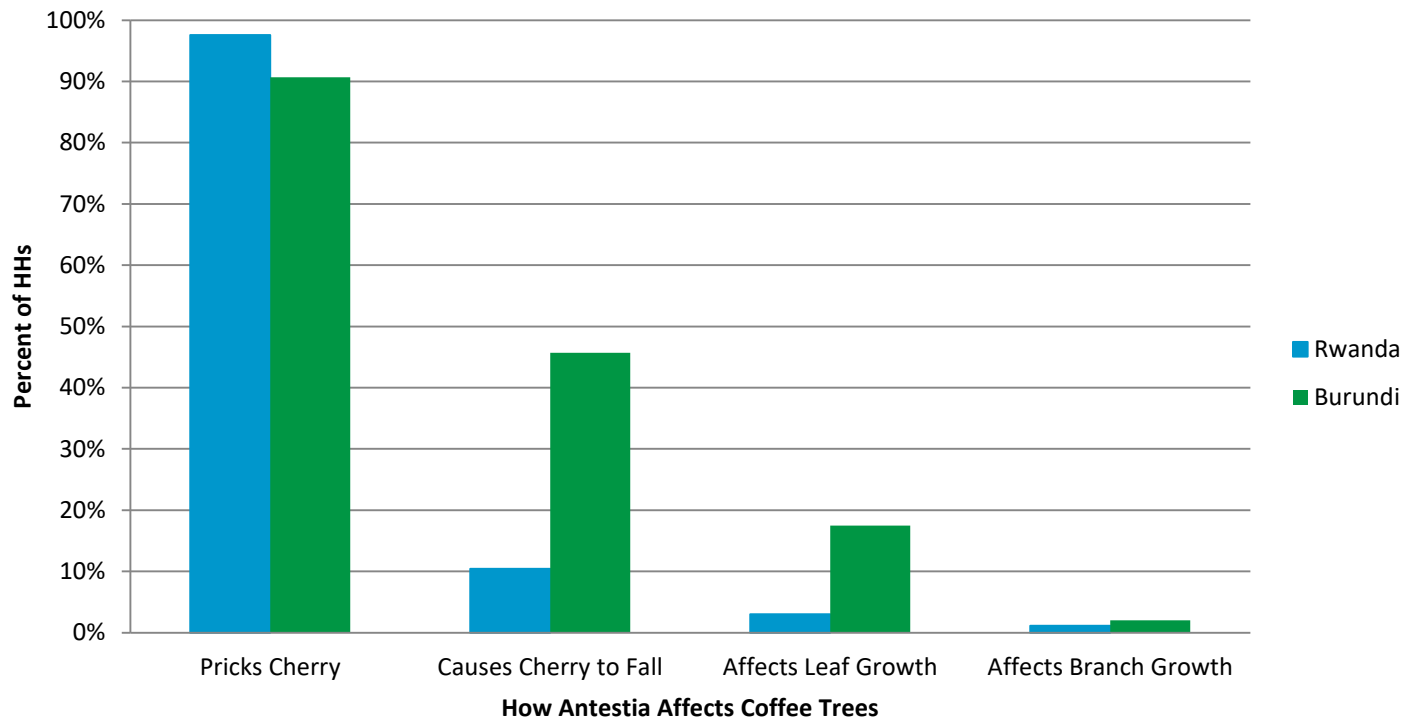


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Antestia and PTD: How do farmers identify antestia?

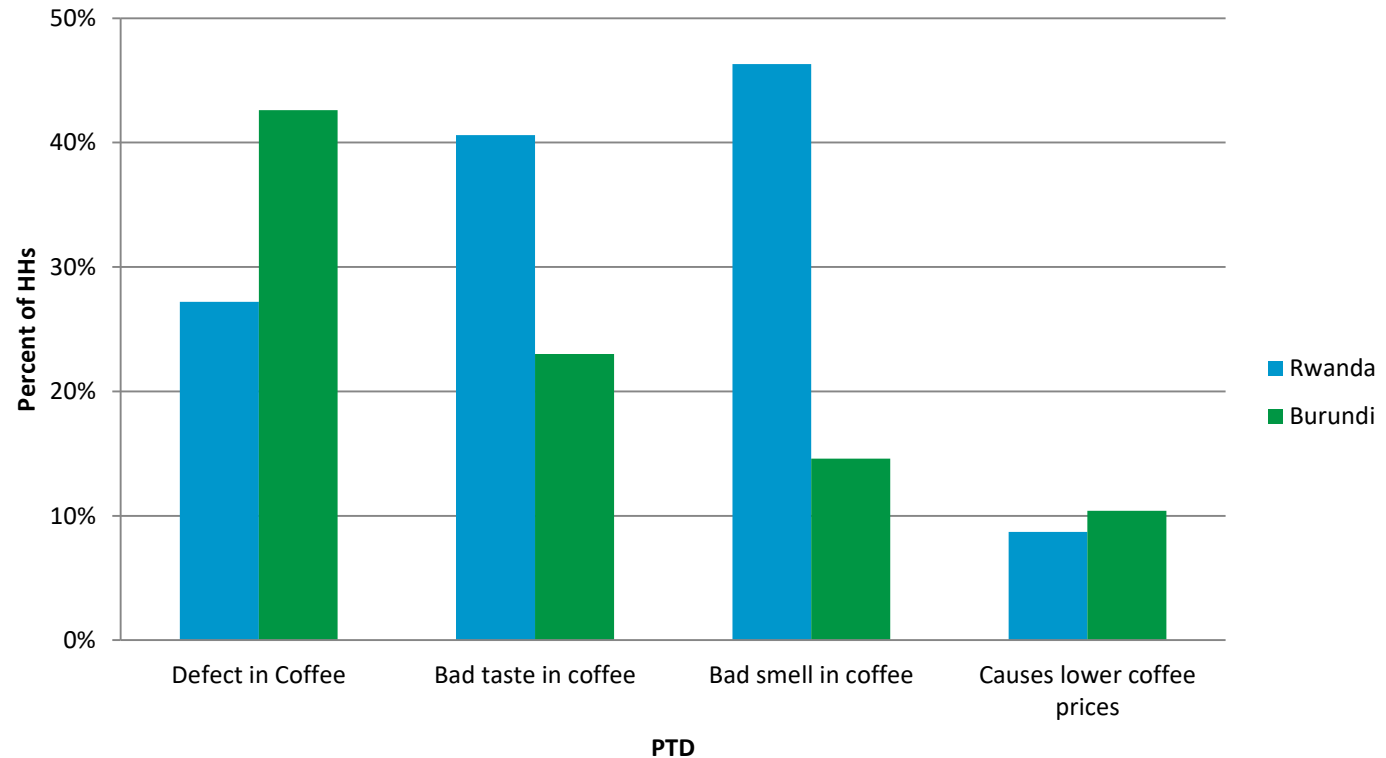
Impacts of Antestia on Coffee, as Identified by Farmers





Antestia and PTD: How do farmers identify PTD?

Description of PTD by Farmers





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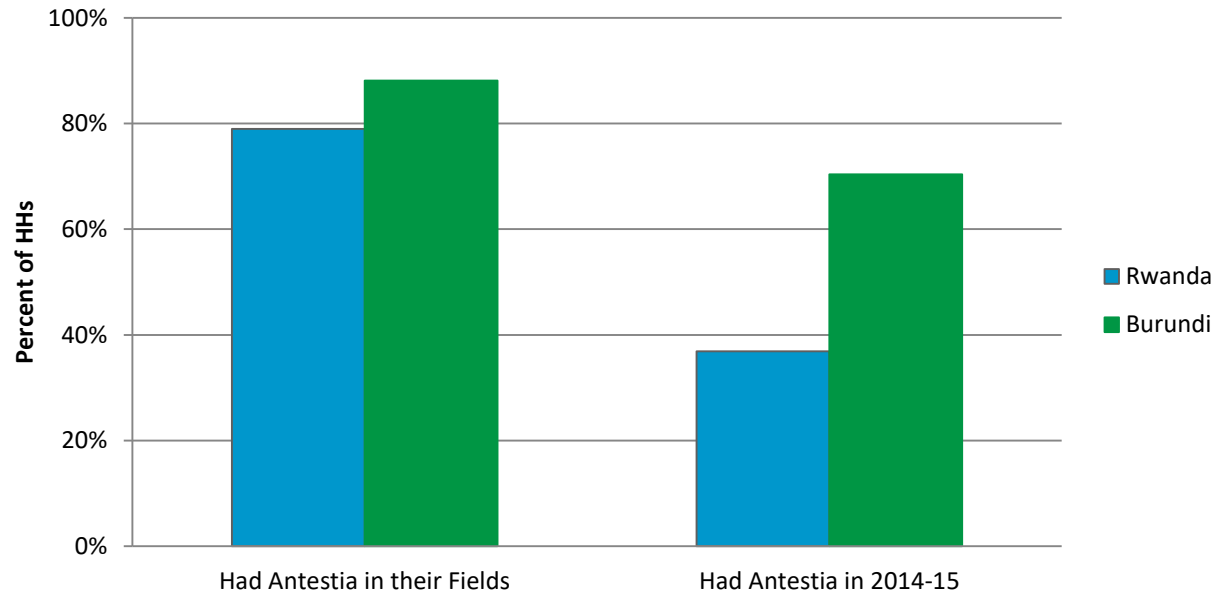


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Antestia in Farms

Percent of Coffee Farmers Observing Antestia in their Coffee





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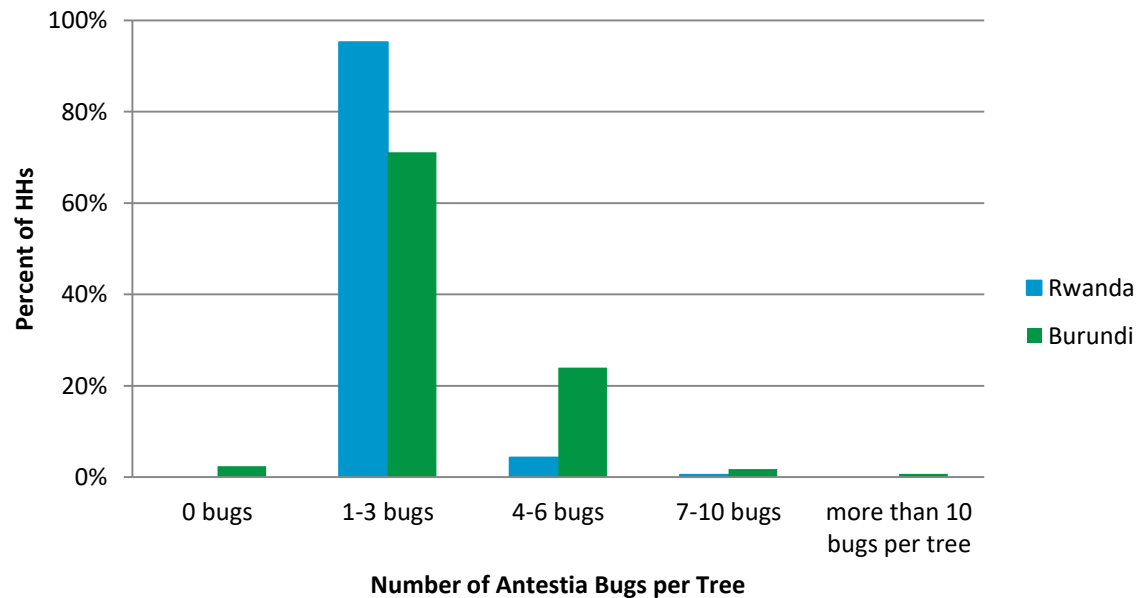
Institute of Policy Analysis and Research - Rwanda

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Université Polytechnique



Antestia in Farms

Average Number of Antestia Bugs per Tree Observed by Farmers (of HHs reporting Antestia)

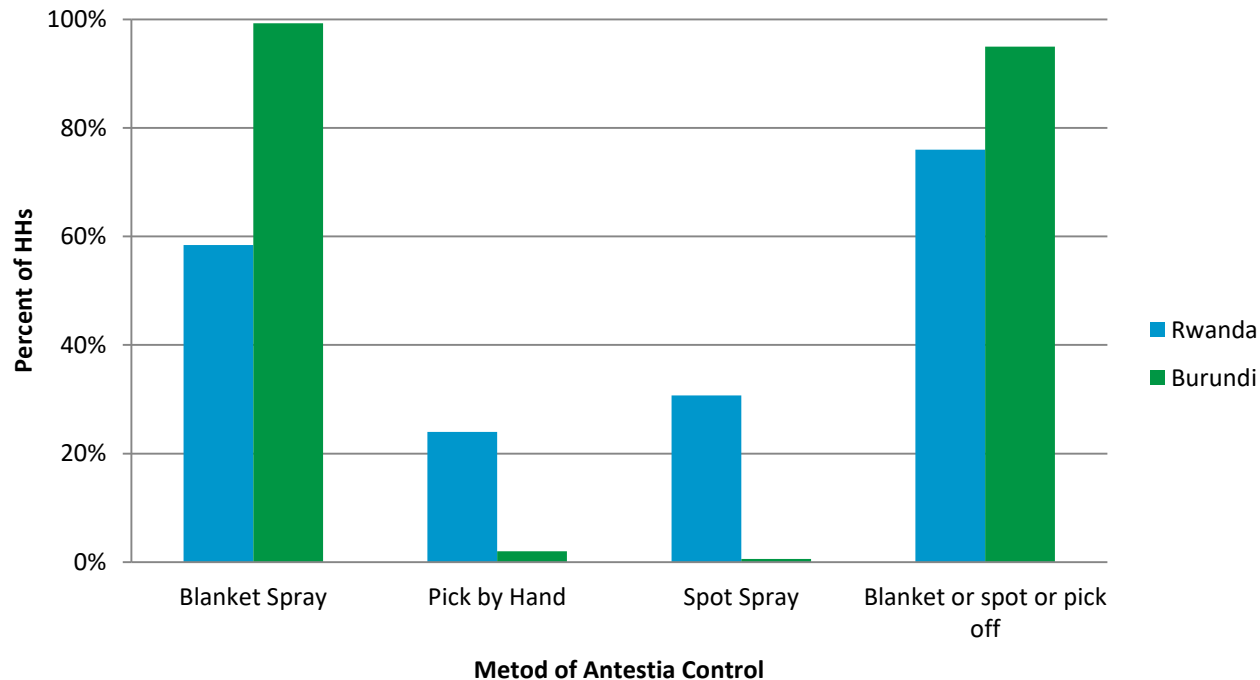




Antestia Control

95% of farmers in Burundi and 76% of farmers in Rwanda who have had Antestia in their coffee trees reported having taken some form of Antestia control

Percent of Coffee Farmer Using Selected Methods for Antestia Control (Among those taking control measures)





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- ❑ Coffee farmers in both Rwanda and Burundi for their willingness to work with the AGLC project
- ❑ Coffee stakeholders in Rwanda and Burundi for the willingness to help us in many ways

Thank you for Listening

