A New Approach for Using Payment for Ecosystem Services (PES) to Encourage Adoption of More Resilient Agroecosystems: A Case from Central Haiti

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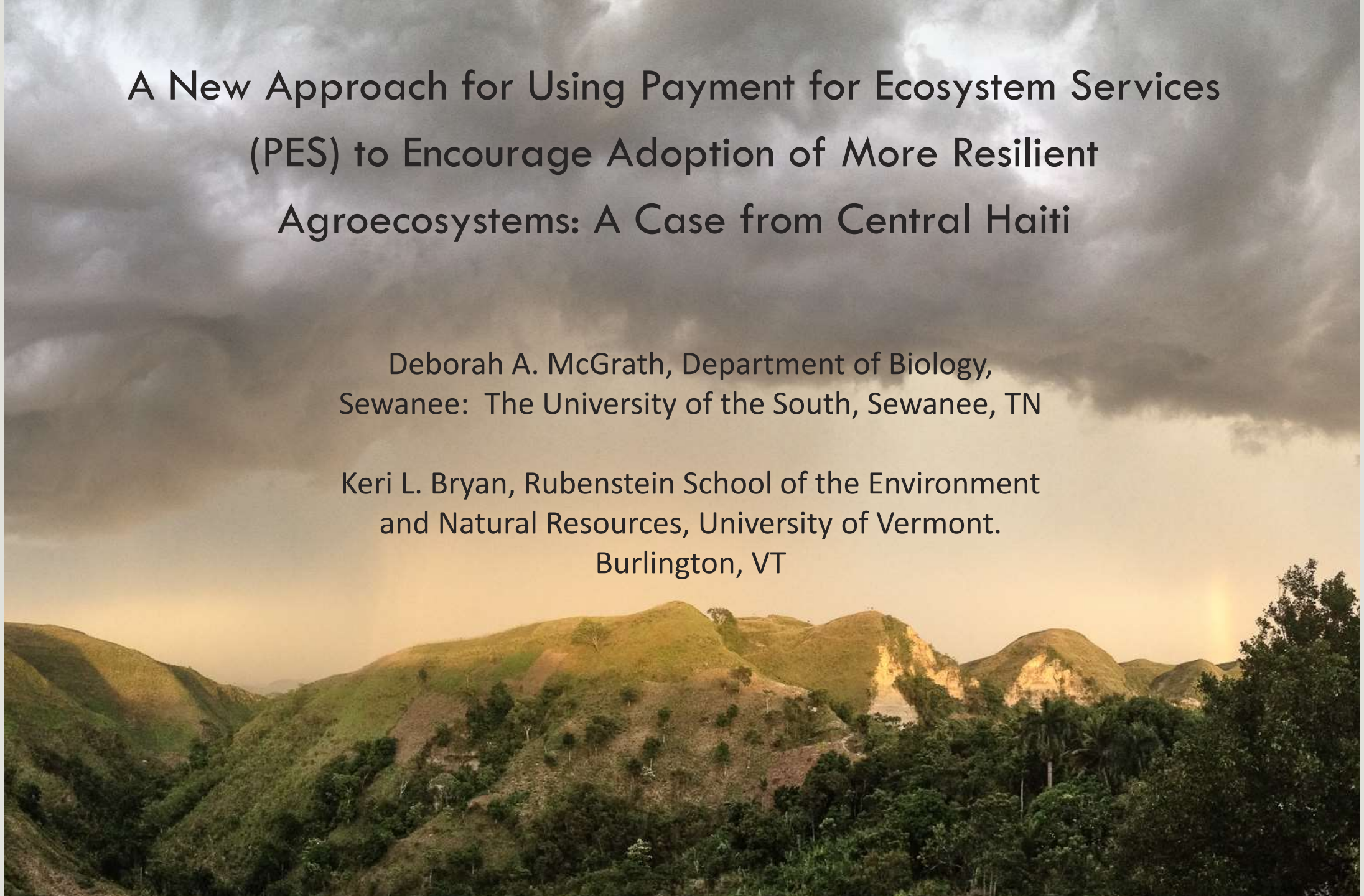


Payment for Ecosystem Services (PES)

Voluntary transactions in which land stewards are paid for management practices expected to result in continued or improved environmental service provision

Charcoal sells for $30-50 per sack

Trees protecting water have no market value

Zanmi Kafe (Partners in Coffee)
Pilot PES program

Partnership among Haitian farmers, Zanmi Agrikol (a Haitian NGO), Haitian agronomy students and Sewanee undergraduate students

Shade coffee-based agroforestry system initiated in 2013 in the Central Plateau (zones of Bois Jolie and Morne Michel)

Sewanee purchases ES directly from farmers. Funded by a green fee paid by Sewanee students that also promotes sustainability education on campus.

Students and interns verify and monitor environmental service provision (carbon sequestration, biodiversity) and conduct on-farm research

PES in Haiti offers a bundle of services

Ecological - payments for carbon sequestration and biodiversity conservation can remove barriers to tree planting and maintenance, promoting vegetative cover and soil conservation

Socioeconomic - PES can augment farmer incomes during tree establishment, encouraging adoption of diverse, asset-building agroforests that increase farm resiliency and improve livelihoods

Educational -cross cultural, hands-on, environmental problem-solving aimed at climate solutions and sustainability

PES offers a tool for restoring ecosystem health and transferring income to the rural poor

Why a “new” (pro-poor) approach to PES?

Hundreds of PES programs have been implemented worldwide, but significant barriers to entry remain:

- **Restrictions on carbon offsets** for land-use, land-use change & forests (LULUCF)
- **Eligibility criteria** (legal title to land, minimum size for enrollment, time frame)
- **Cost** (verifying, certifying, monitoring and administering programs)
- **Lack of experience** (technical, scientific, administrative, financial)
- **Market price** of carbon ($5-10/Mt CO_2 equivalent)

Partnerships with academic institutions can help support PES programs

Opportunities offered by partnerships with academic institutions

Environmental sustainability, social justice, community engagement, and problem-based learning are major concerns on college campuses

- American College and University Presidents' Climate Commitment (ACUPCC) has 684 signatories
- Growing recognition and acceptance of novel approaches to carbon offsets (www.offsetnetwork.org)

PES partnership provides highly sought after opportunities for student outreach, education and research in a cross cultural setting

What does a “pro-poor” PES model look like in Haiti? Can it be effective?

http://www.lib.utexas.edu/maps/americas/haiti_rel99.pdf


HAITI

Kajou peyi (*Swietenia mahogani*)

Sèd (Cedrela odorata)

Kafe (*Coffea arabica)*

Mango (*Mangifera indica)*

Students monitor seedling survival, growth and health while they conduct verification surveys

Payments were made in 2015 and 2016 based upon surveys of survival and growth on every farm

Cultivating Collaboration

Partnering with others to make a sustainable project

The Sewanee-Haiti Institute, formed in 2012, consists of faculty, staff, and dedicated students of Sewanee: the University of the South.

Zanmi Agrikol (ZA, *Partners in Agriculture*) is a non-profit organization based out of Mirebalais, Haiti that helps farmers adopt more sustainable agricultural practices and supports a vocational school. It is a sub-group of Zanmi Lasante *(Partners in Health)*, the NGO formed by Dr. Paul Farmer.

In 2008, ZA and the Sewanee-Haiti Institute partnered together to form Zanmi Kafe *(Partners in Coffee)*, an initiative to educate villages and provide the necessary materials to plant coffee. Over 40 Haitian families are part of the program.

Since March 2013, Zanmi Kafe has planted a 15,000 trees nursery of coffee and multipurpose shade trees.

Payment for Ecosystem Services (PES)

Ecosystem services are natural processes that provide benefits to humans. We are dependent on these processes, however most of these services do not have to be paid for and are undervalued and underprovided. PES, a market mechanism, combats this by valuing these natural benefits.

PES provides funds to farmers to keep trees in the ground. The sale of carbon offsets will offer an incentive to plant and maintain trees and the ecosystem services they provide.

Sewanee-Haiti Institute

Coffee + Multipurpose Trees

Coffee used to be a major export for Haiti and was grown all over the Central Plateau. Farmers in this area have previous experience growing coffee and welcome the efforts and guidance Zanmi Kafe provides. One day, they hope to grow coffee in substantial quantities that will add income to their households.

Coffee requires cooler temperatures found at higher elevations, like the Central Plateau. To buffer this agricultural system against a multitude of environmental disruptions, a diversity of multipurpose trees are planted amongst the coffee.

Multipurpose trees provide shade required for healthy productive coffee agroforests. Fruit produced by these trees provides families with additional food and income. Paying farmers to sequester carbon further incentivize tree maintenance while the saplings are still growing.

This diverse agroforestry system has many benefits:

- Soil conservation
- Watershed protection
- Resilience to environmental or economical change
- **LIVELIHOOD SECURITY**

Sewanee-Haiti Institute

At Sewanee, we have a Student Green Fee, a part of your tuition that goes to green energy initiatives purchased through the Physical Plant Services. Never heard of this Fee? Because we do not know what the Fee is supporting, we are unaware of how it is helping the environment. But now, there's a way to use it in meaningful and useful way....

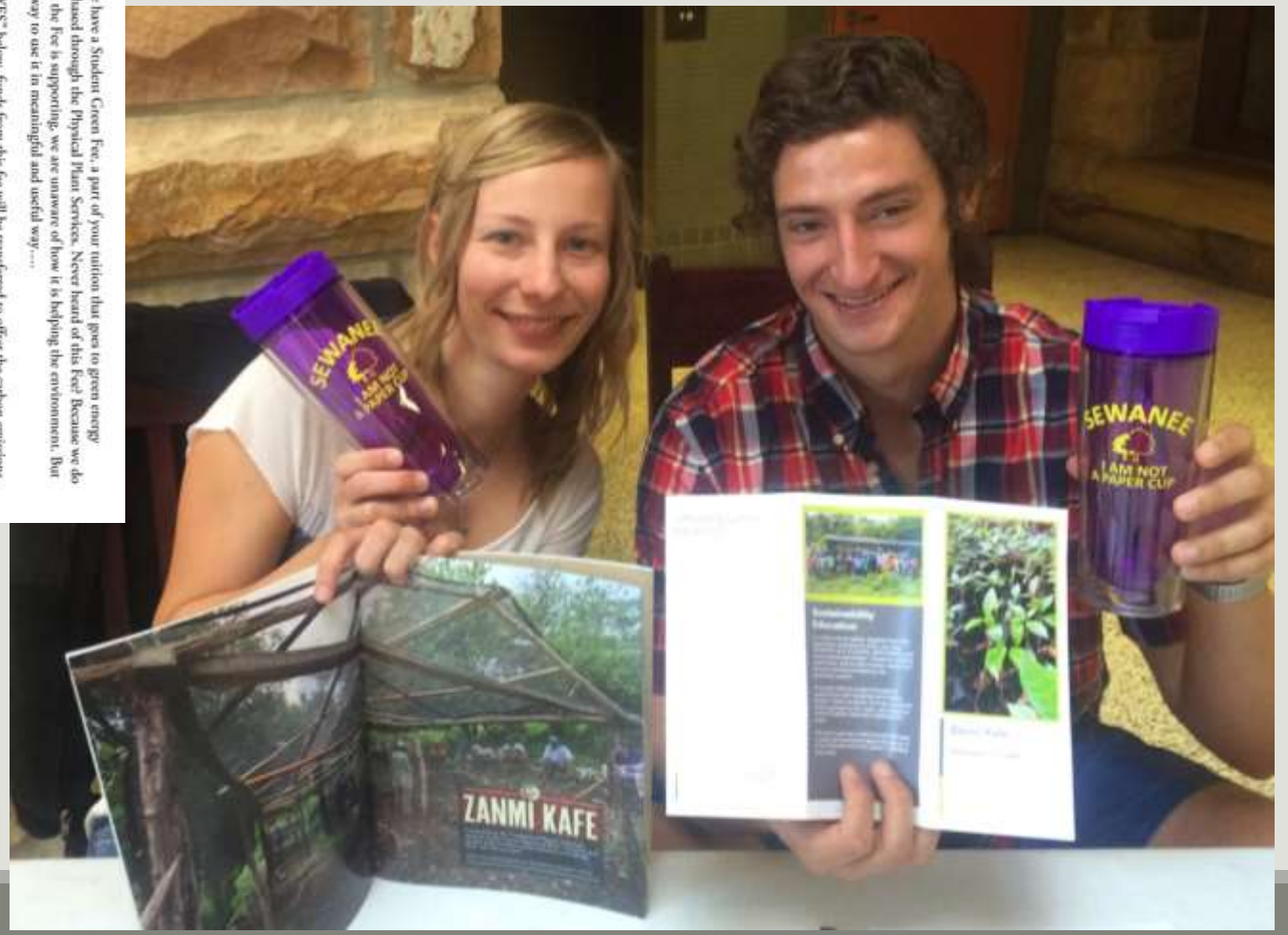
If you check, "YES" below, funds from this fee will be transferred to offset the carbon emissions from your (outreach/study abroad/athletic) trip air travel! In Haiti, there's a reforestation project called Zanmi Kafe (Partners In Coffee) that was started by Haitian farmers in collaboration with Sewanee students. One goal of this project is to pay farmers (using your Student Green Fee, if you agree) to maintain coffee and other productive trees on their land. These trees sequester carbon, offsetting your carbon emissions! The trees also improve soil, protect water quality and provide useful products for Haitian families, enhancing their quality of life.

Do you want to offset your carbon dioxide emissions for this trip? We hope you do!

Name: _____

Yes ☐ No ☐

Students opt to have their green fee used to offset travel-based carbon emissions by supporting Haitian agroforesters



Raising funds for Zanmi Kafe and awareness on campus about climate change action

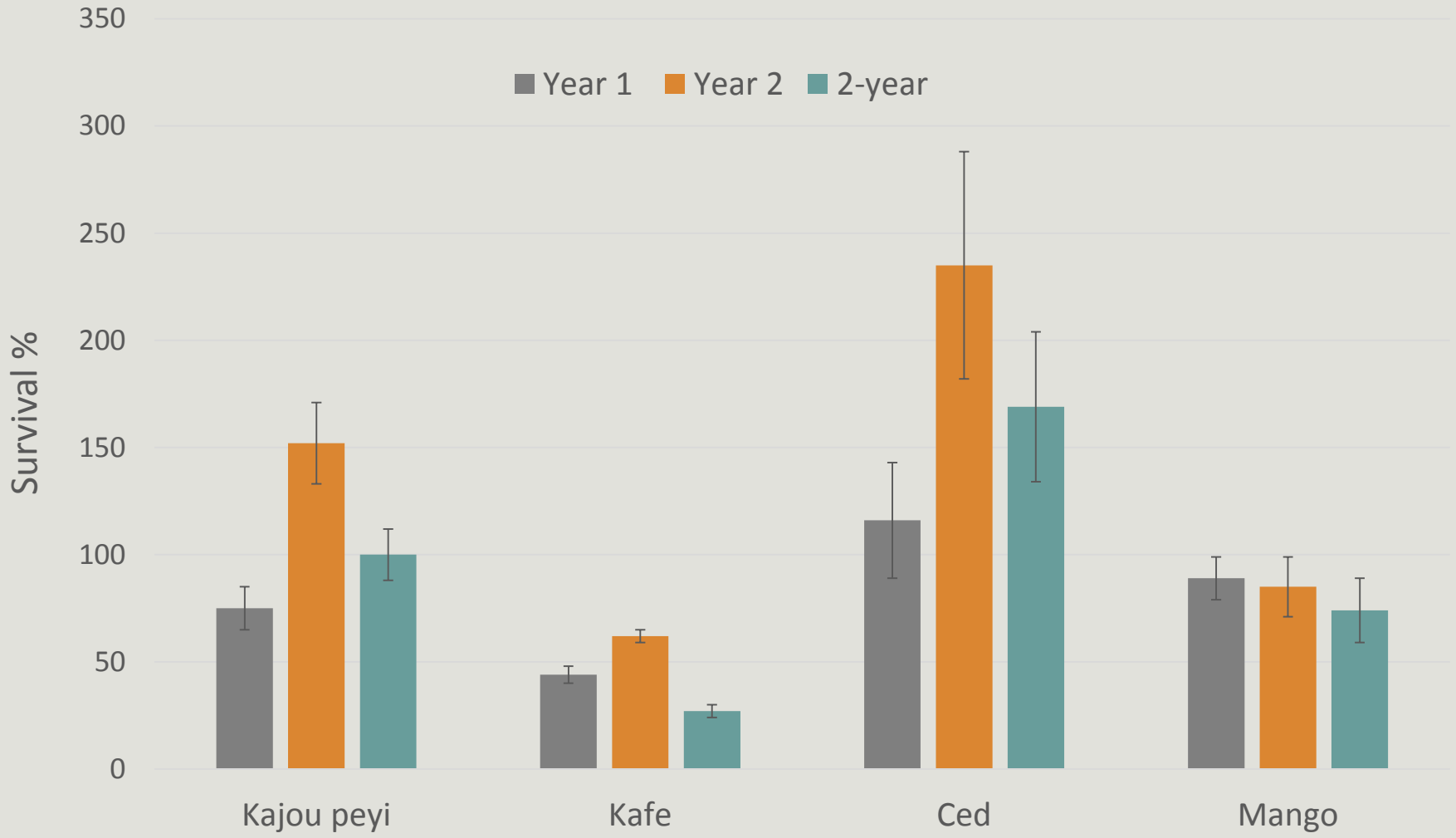


Fig. 1. Mean (± one std err) first, second and two-year survival of Kajou peyi (*Swietenia mahogany*), Kafe (*Coffea Arabica*), Cèd (*Cedrela odorata*) and mango (*Mangifera indica*) growing on farms in the zone of Bois Jolie, Central Plateau Haiti (n=45 farms).

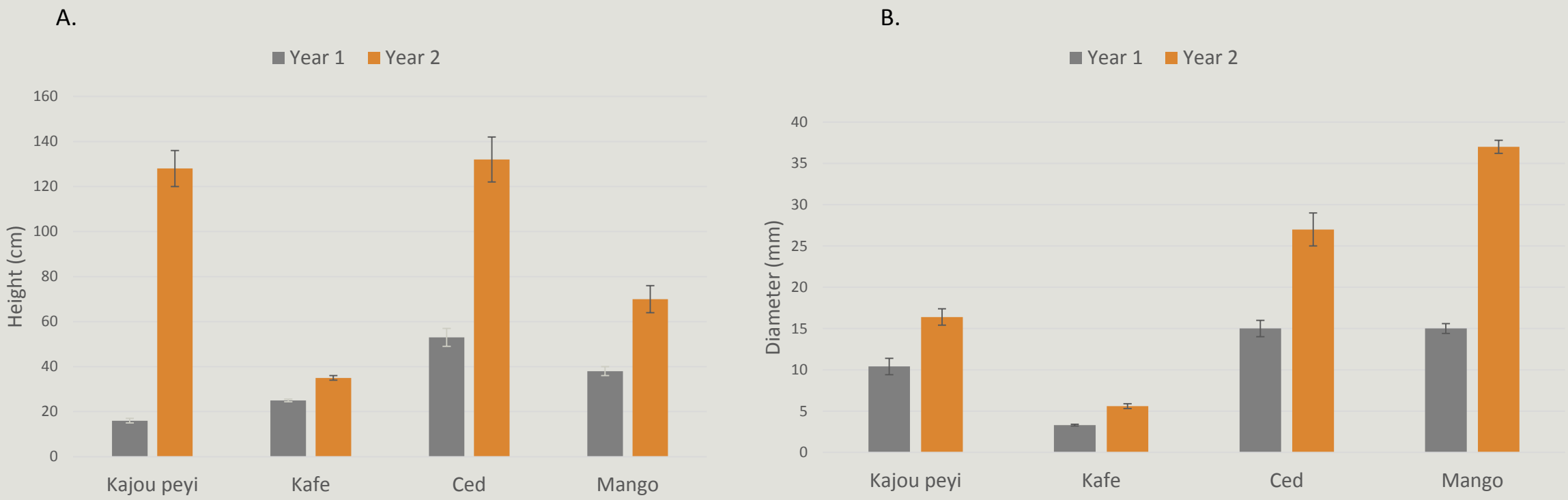


Fig. 2 A and B. Mean (± one std err) first and second-year heights (cm) and diameters (mm) of Kajou peyi (*Swietenia mahogani*), Kafe (*Coffea Arabica*), Cèd (*Cedrela odorata*) and mango (*Mangifera indica*) growing on farms in the zone of Bois Jolie, Central Plateau Haiti (n=45 farms).

On-farm research informs management

Household and farm surveys
- socioeconomic & health data
- site characteristics (soil, canopy cover)
- existing vegetation & carbon stores

Biodiversity indicators
- ants, birds, butterflies

Tree planting verification
- Seedling survival, growth, health

DNA sequencing of healthy coffee plants

In other zones, some coffee trees remain healthy and productive after decades

Table 2. A comparison of farm characteristics in 3 regions in Haiti's Central Plateau (n=farms sampled).

	Bois Jolie n=15	**Morne Michel n=15**	**Baptiste n=3**	**ANOVA P-Values**
Elevation	653 ± 11	757 ± 13	988 ± 117	0.0003
Canopy openness %	30 ± 4	18 ± 4	5 ± 2	0.02
Soil pH	7.2 ± 0.04	7.3 ± 0.1	6.8 ± 0.3	0.01
Ca (mg/ka)	9754 ± 598	8954 ± 1381	3724 ± 904	0.02
P (mg/kg)	20 ± 3	60 ± 18	25 ± 5	0.001
% OM	13 ± 1	16 ± 2	18 ± 1	0.03
Forest floor Mg/ha	3.8 ± 0.5	4.4 ± 0.8	6.7 ± 0.8	0.21
Forest floor N%	1.3 ± 0.05	1.7 ± 0.07	2.1 ± 0.06	0.0001
Forest floor P%	0.08 ± 0.01	0.12 ± 0.01	0.09 ± 0.01	0.005
Ant species richness	11 ± 1	9 ± 1	9 ± 1	0.18

Ecological relationships in the shade coffee community

Solenopsis geminata

Wasmannia auropunctata

These species, found in highly disturbed habitats, tend the coffee pest scale (*Coccidae).*

Coffee is vulnerable to many pests (this one has scale). Half the seedlings sampled had rust

Ongoing and future activities

Calculate carbon stores and predict sequestration – scale up with GIS

Bird diversity survey

Formalize technical specifications

Economic analysis of PES program

Conduct farmer-to-farmer workshops on best practices

Seek alternatives to shade-coffee for farms where it has not thrived

Build partnerships with other academic institutions and NGOs

Benefits of this approach

Agroforestry is an asset-building practice that offers smallholders opportunities for selling environmental services (ES)

ES payments encourage tree maintenance and planting

Higher payments to farmers for a bundle of services sold (i.e. education)

Comprehensive monitoring by students and on-farm research inform management at reduced costs

Relationships engender trust, collaboration and enhance human capacity

Emphasis is on agroecosystem health and improved livelihoods

Model is adoptable, scalable and takes advantage of academic partnerships

Table 3. Summary of annual costs incurred for Zamni Kafe PES program

Expense	**Green Fee**	**Other sources**
Stipends for Haitian students & technicians for on farm monitoring (spring break)	$1000	??
Nursery materials (sacks, seed)	$900	
Stipends for nursery attendants	$800	
Field support for Haitian agronomists & interns	$2800	
Annual PES disbursements to 45 farmers	$2000	
Sewanee student monitoring (spring break) $170/day x 3 days x 15 students (trip fees paid by students)		$7650
Summer research internships ($2,800 x 4)		$11,200
Faculty travel (4 trips/year)		$4,800
Research materials		$2,500
Total Expenses	**$7500.00**	**$26,150.00**

Appreciation for Our Collaborators and Supporters

Zanmi Agrikol (Partners in Agriculture): Gillaine Warne, Noel Maxo, Bosquet Wupey, Marcellus Watson, Roselaure LaMontagne, Pierrre Wakenfort, Jean Francique, Thony Fontaine, Paulverel Marvel, Montclaire Joseph, Alos Louis
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