Defining Whole System Sustainability in Hawai‘i

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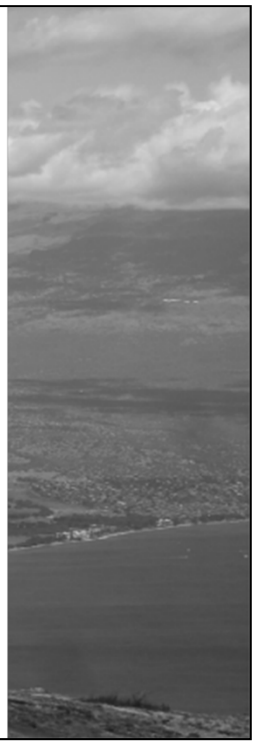
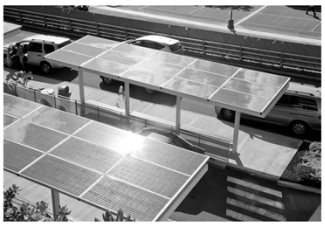


What is the Ulupono Initiative?

- Ulupono is a Hawai'i-focused impact investment firm that uses for-profit and non-profit investments to improve the quality of life for island residents in three key areas:

Founders:
Pam & Pierre Omidyar

More Locally Produced Food



More Renewable Energy

Waste Reduction

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Objective:

Take a systems approach to understand whether there is enough water to meet society's goals for energy and food self-sufficiency

- Climate change reflecting in the persistent drought raises serious questions about whether we can achieve our food and energy goals while balancing urban, indigenous, and environmental needs
- Understanding water adequacy fundamentally requires a systems approach
- Maui was selected because it is a harbinger for the impending water crisis across the rest of the state

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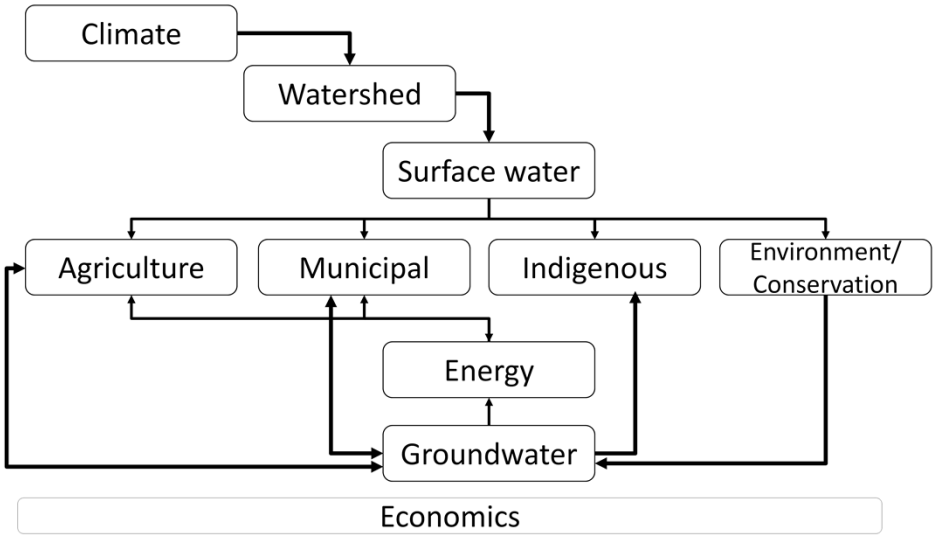
Systems Perspective for Maui study



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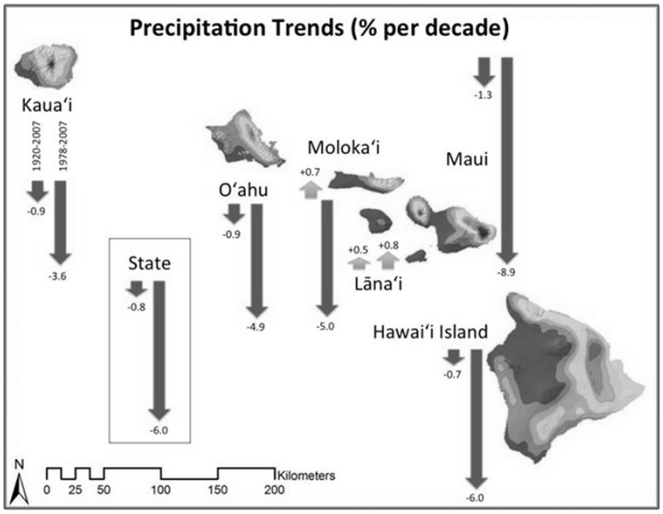
The Problem: The Hydrological System is in Deficit, and Climate Trends Indicate Decreasing Rainfall

Courtesy of Abby Frazier and Tom Giambelluca (U. Hawai'i, Rainfall Atlas)



Agriculture is the dominant user based on cheap surface water

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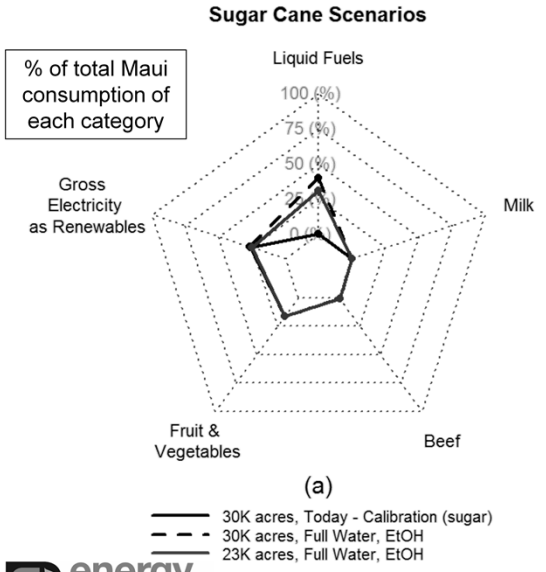
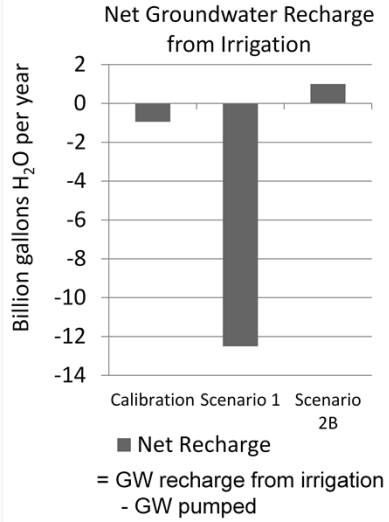
Where Maui Stands Now: Plantation Economy Mining Its Natural Inheritance





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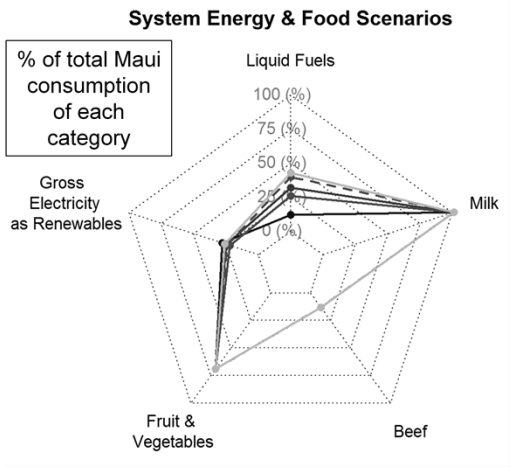
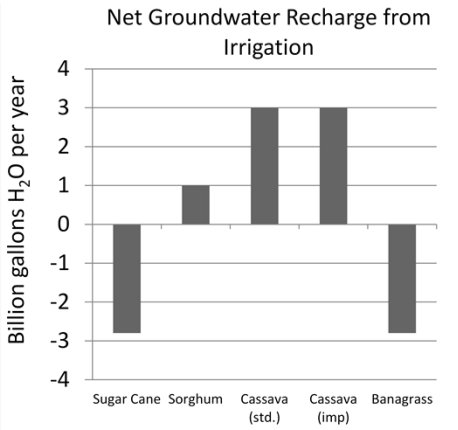
Where Hawai'i Could Be: More Local Food and Energy While Restoring Natural Capital





Net Recharge
= GW recharge from irrigation
- GW pumped

Yield assumptions (fresh weight, with moisture):
Sugar Cane: 91 tonnes/acre/harvest (2-yr cycle, 50% harvested/yr)
Sweet Sorghum: 37.4 tonnes/acre/yr over 3 harvests in a year
Cassava: 20 tonnes/acre/yr ("Standard"), 30 tonnes/acre/yr ("improved")

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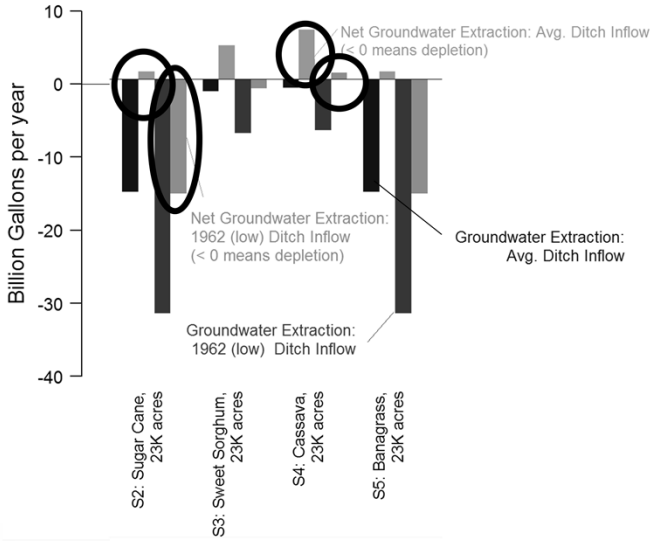
What if drought patterns persist? Cassava can tolerate low-flow years



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Maui Could Triple the Economic Value Derived From Water Use Through an Integrated Food-Fuel Approach

				Proportion of Total Maui Consumption				
	Efficacy: $/1000 gal. H_2O	**Efficacy: $/1000 gal. H_2O (w/RIN)**	**Efficiency: mill. gal. H_2O/acre**	**% Fuel**	**% Gross Electricity**	**% Div. Ag**	**% Beef**	**% Milk**
Scenario 7: Diversified Ag. (1,000 acres)	**$48.2**	$48.2	0.50	0%	19%	69%	1%	0%
Scenario 8c.2: **Cassava High** (EtOH), cattle and div. ag.	**$3.38**	$4.12	1.31	40%	24%	69%	13%	101%
Scenario 4: Cassava High (23,000 acres - EtOH)	**$2.88**	$3.74	1.45	40%	24%	16%	1%	0%
Scenario 8c.1: Cassava Standard (EtOH), cattle and div. ag.	**$2.57**	$3.06	1.31	26%	22%	69%	13%	101%
Scenario 8b: Sweet sorghum (EtOH), cattle and div. ag.	**$2.31**	$2.57	1.08	12%	28%	69%	13%	101%
Scenario 6: Grass-fed beef and dairy (5,850 acres)	**$2.01**	$2.01	0.91	0%	19%	16%	13%	101%
Scenario 4: Cassava standard (23,000 acres - EtOH)	**$1.92**	$2.49	1.45	26%	22%	16%	1%	0%
Scenario 8d: Banagrass (EtOH), cattle and div. ag.	**$1.90**	$2.30	2.61	43%	26%	69%	13%	101%
Scenario 5: Banagrass (23,000 acres - EtOH)	**$1.54**	$1.98	3.13	43%	26%	16%	1%	0%
Scenario 8a: Sugar cane (EtOH), cattle and div. ag.	**$1.54**	$1.83	2.61	31%	25%	69%	13%	101%
Scenario 3: Sweet Sorghum (23,000 acres - EtOH)	**$1.43**	$1.75	1.15	12%	28%	16%	1%	0%
Scenario 2: Sugar cane (23,000 acres - sugar)	**$1.32**	$1.32	3.13	0%	25%	16%	1%	0%
"Today": **Sugar cane** (30,000 acres - sugar)	**$1.18**	$1.18	3.11	0%	26%	16%	1%	0%
Scenario 2b: Sugar cane (23,000 acres - EtOH)	**$1.14**	$1.45	3.13	31%	25%	16%	1%	0%

[1] Gross electricity includes current generation from other renewable sources, primarily wind
[2] Diversified Ag = cabbage, romaine lettuce, bananas and onions

Implications

- Current course is unsustainable – climate change will only accelerate this, ultimately creating a crisis
- Significant improvement towards self sufficiency is attainable with sustainable water use if we can shift agricultural lands to more productive and profitable approaches
- Investment approach: Partner with major landowners on commercial trials in 2014; shift grass-fed beef initiatives to wetter areas of Maui, convert lands to food production
- Mindset Shift Approach: Use systems framework to launch statewide dialog on sustainable water use

Mahalo!

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