PIRE—Energy Poverty in Africa

Economic and Solar Energy Internship

Jessica Xu

Oregon State

RTI INTERNATIONAL

Background Information

- Off-grid solar and electrification in sub-Saharan Africa
- Solar-powered irrigation could generate revenue to interest private investors
- Previous work done on this project looked at groundwater hotspots, particularly in Ethiopia
- My internship tasks focused on increases in crop yield through irrigation, looking at all of sub-Saharan Africa

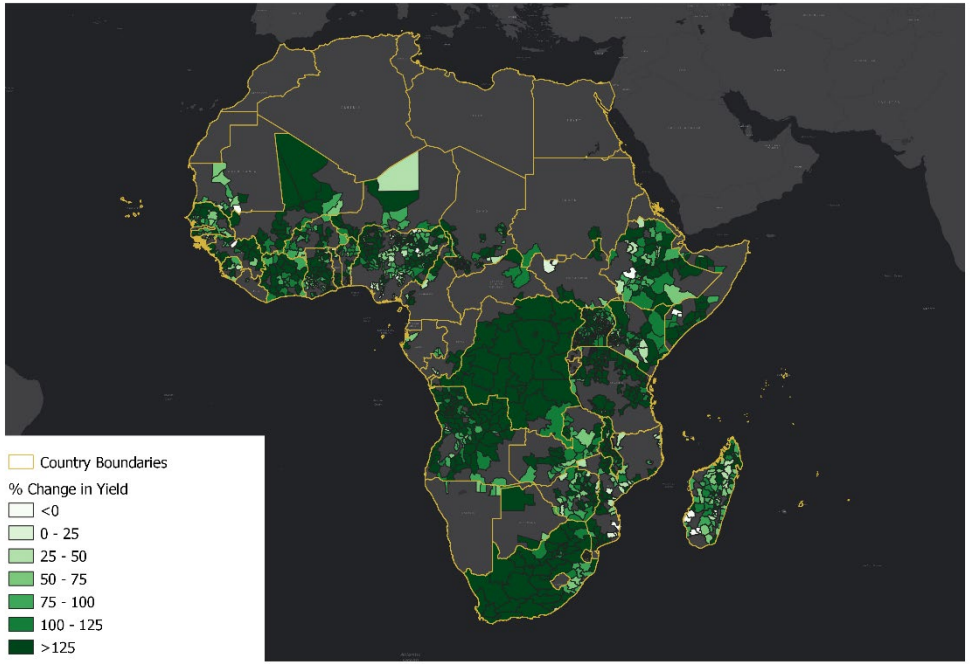
Used R to Calculate Unweighted and Weighted Percent Change Between Rainfed and Irrigated Crop Yields by Country and Crop Type

Country	% Change (unweighted)	% Change (weighted)	Country	% Change (unweighted)	% Change (weighted)
Angola	96.40%	99.63%	Madagascar	94.65%	10.44%
Benin	181.98%	92.11%	Malawi	144.53%	144.53%
Botswana	87.16%	102.73%	Mali	123.06%	125.04%
Burkina Faso	109.87%	94.31%	Mauritania	77.72%	43.57%
Burundi	107.98%	115.59%	Mauritius	89.07%	89.07%
Cameroon	94.63%	87.07%	Mozambique	89.62%	83.26%
Cape Verde	-	-	Namibia	122.57%	108.83%
Central African Republic	111.13%	111.24%	Niger	92.49%	75.58%
Chad	126.22%	102.70%	Nigeria	108.82%	83.65%
Congo	104.58%	104.58%	Rwanda	121.23%	121.75%
DR Congo	150.86%	101.91%	Sao Tome and Principe	-	-
Djibouti	99.88%	99.94%	Senegal	81.37%	92.45%
Equatorial Guinea	-	-	Seychelles	-	-
Eritrea	-	-	Sierra Leone	106.65%	106.65%
Ethiopia	85.72%	83.83%	Somalia	115.87%	102.84%
Gabon	104.12%	104.12%	South Africa	66.53%	64.57%
Gambia	-46.39%	-46.39%	South Sudan	429.31%	429.31%
Ghana	98.15%	96.57%	Swaziland	97.98%	99.66%
Guinea	104.21%	100.52%	Tanzania	118.53%	96.85%
Guinea-Bissau	82.06%	82.14%	Togo	100.06%	97.70%
Ivory Coast	104.92%	100.59%	Uganda	111.44%	182.37%
Kenya	92.68%	106.79%	Zambia	73.78%	0.75%
Lesotho	512.53%	512.53%	Zimbabwe	92.09%	85.81%
Liberia	101.38%	101.38%			

Crops	% Change (unweighted)	% Change (weighted)	Production quantity (Total, metric tons)
Cassava	99.74%	99.88%	170,209,006.3
Maize	101.42%	102.20%	71,049,356.9
Yams	-	-	70,851,141.9
Sugarcane	121.30%	79.70%	69,581,581.4
Vegetables	96.85%	91.56%	46,432,744.2
Rice	133.415	111.12%	27,592,239.0
Tropical Fruit	88.79%	91.72%	26,431,779.0
Sweet Potato	139.67%	109.49%	25,225,188.6
Sorghum	130.50%	108.92%	23,345,655.8
Plantain	-	-	23,267,573.4
Oilpalm	84.90%	84.79%	19,188,190.0
Banana	87.96%	92.71	17,761,423.5
Other Roots	180.52%	188.26%	14,938,688.7
Potato	111.33%	92.78%	12,686,426.8
Pearl Millet	149.70%	149.70%	10,974,072.1
Groundnut	97.38%	80.73%	10,878,230.4
Temperate Fruit	100.62%	100.62%	8,076,791.4
Wheat	93.96%	91.27%	7,071,557.5
Cowpea	-	-	6,614,403.8
Other Cereals	73.77%	61.13%	6,580,269.3
Bean	90.19%	67.81%	6,254,989.7
Rest of Crops	105.72%	90.90%	4,510,468.6
Cotton	100.19%	92.20%	4,071,660.6
Cocoa	-	-	3,570,440.6
Other Pulses	86.55%	79.44%	3,176,061.8
Soybean	57.80%	46.09%	3,023,146.7
Barley	72.30%	62.26%	2,635,310.9
Sesame Seed	126.36%	130.19%	2,482,031.8
Other Oil Crops	113.35%	85.96%	2,192,902.5
Sunflower	78.12%	42.57%	2,156,308.4
Coconut	-	-	1,940,818.4
Small Millet	163.22%	165.36%	1,409,516.2
Pigeonpea	-	-	851,815.6
Tea	79.93%	71.40%	779,229.0
Tobacco	98.76%	96.87%	707,437.7
Arabica Coffee	94.33%	98.14%	620,471.8
Chickpea	75.53%	77.67%	617,633.2
Robusta Coffee	-	-	527,774.5
Lentil	73.75%	74.62%	172,490.9
Rapeseed	99.22%	83.47%	154,868.0
Other Fiber Crops	107.09%	109.47%	128,419.2
Sugarbeet	-	-	7,853.7

- Overall, the average difference between yields of irrigated versus rainfed crops was about double.

Used QGIS to Analyze Raster Layers and Map Out Currently Irrigated Areas with Associated Percent Changes in Yield



- Next step: Use crop pricing data to calculate potential revenues from irrigation

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Thank you

Image Sources

- Tables and maps in this presentation were produced as part of my work this summer.