

ON-FARM RENEWABLE ENERGY AND SUSTAINABLE LOCAL FOOD PRODUCTION: A CASE STUDY

In this research brief we present baseline data from a case study of a small-scale, on-farm hydro power facility in Hawai'i County. The hydro power project was intended to demonstrate how a renewable energy source can support farm profitability and increased local food production. Interviews conducted with tenant farmers and key community informants yielded three major themes:

- (1)** the importance of a cooperative family of farms model to the survival of small farmers,
- (2)** the potential for on-farm renewable energy to increase production and profits, and
- (3)** the contributions of local agriculture to regional rural economic development.

The State of Hawai'i, located more than 2,000 miles from its nearest continental neighbors, is unique in the degree to which it depends on food and energy imports. In 2010, Hawai'i imported 94% of its total energy needs and relied on shipped-in oil for 74% of its electricity generation. This contributes to the end result of Hawai'i having the highest electricity prices in the nation.¹ Hawai'i also imports almost 90% of its food.² Again, this tends to increase consumer costs and also leaves the state vulnerable to service disruptions or price fluctuations in the system of mainland and international growers, shippers, and local delivery services that transport food to the islands.³



Small-scale renewable energy projects that produce electricity are now being deployed across the state.⁴ The introduction of such renewable energy projects is occurring at a time when energy systems worldwide are moving from massive, centralized production to systems that consist of interconnected networks of smaller, locally-controlled production based on renewable fuel sources.⁵ A similar transition, i.e., movement from centralization to localization, is also beginning within food, water, and economic systems across the globe.⁶ Given its small population, geographic isolation, and unique vulnerability, Hawai'i may stand to benefit from these trends, especially if there is more widespread development of small-scale renewable energy projects that simultaneously reduce dependence on imported fossil fuels and support the growth of local food production capacity.

The purpose of this study is to assess the potential impact of on-farm renewable energy on local food production. In particular, the study aims to use qualitative methods to examine the impact of a micro hydroelectric power plant built on a farm on the Big Island of Hawai'i. Prior to the installation of the hydroelectric plant, interviews were conducted with the four tenant farmers where the plant was constructed to assess the potential impact on these direct beneficiaries. Interviews were also conducted with five key informants representing a mix of nonprofit and government leaders in agriculture, sustainable, and renewable energy projects. These key informants shared perspectives on the potential wider impact of the hydroelectric plant and other forms of on-farm renewable energy sources for agriculture and economic development in Hawai'i. This report addresses the baseline interview data; a future report will contain the results of follow-up interviews conducted after the hydro system is installed and functioning.

The three major interrelated themes that emerged from the baseline interviews are summarized as follows:



INTERVIEW CONTENT AND ANALYSIS

Farmers were asked to discuss (1) the advantages and disadvantages of farming at Hāmākua Springs Country Farms, (2) their knowledge of and expected benefit from the micro hydroelectric plant, (3) their business stability and productivity, (4) the contribution of the farm income to their household financial stability, and (5) their vision for small-scale agriculture in Hawai'i. **Key informants were asked to discuss:** (1) the expected impacts of the hydropower plant at Hāmākua Springs Country Farms and the potential for micro hydroelectric technology in Hawai'i, (2) other on-farm energy options, (3) strategies for promoting local, sustainable agriculture, and (4) economic development opportunities. Grounded theory techniques were employed to analyze the interview data.

- **The importance of the “family of farms” model for small farmers.**

A prevalent theme, which cut across both farmer and key informant interviews, is the idea that agriculturalists (and small scale farmers in particular) will have to find ways to support each other and work together in order to remain profitable and successful. Both farmers and key informants discussed the challenges the smaller agriculturalist faces in meeting operational costs, especially those related to energy inputs.

The farm owner where the hydroelectric plant was installed has long discussed the idea of building a family of farms that could provide mutual benefits to all members while encouraging greater production of a wider variety of crops for the local market. Whether they referred to it as a “family of farms,” “cooperative farming,” or “agricultural clusters,” interviewees emphasized the importance of such business structures for growing the small farmer’s capacity to remain profitable and competitive by providing various forms of resources and assistance, such as access to better quality land, assistance with marketing and distribution, and sharing supplies to keep operational costs down. Key informants stressed that cooperative structures can be beneficial to agriculturalists of various sizes (not just the small farmer) who choose to share resources, expenses, knowledge, renewable energy sources, etc., rather than working independently.

[Name of Big Island farm owner where plant is located] does have his distribution system, and that’s real important for us. And, actually, that’s like high on the list. So, it makes it real convenient for us to farm [here]. He distributes on this island for us and saves me money. I don’t need all my own trucks for distribution, and putting up a warehouse and for cooling and all that. So to me, it’s a win-win.

– FARMER

People working together and setting up cooperatives allows you to do more in that way because you’re sharing costs and you’re possibly even sharing some labor, “Go help this guy, he’s going to come help you,” that kind of thing... There’s no way that I can have a five-acre farm on my own. I have to hook up with other people to have a five-acre farm, and all of a sudden, we have 30-acre farm and we can afford a cooling plant and a truck to deliver our food. And we can apply for a grant to get photovoltaics to power the plant. But by myself, I couldn’t do that.

– KEY INFORMANT

The conversation often is that agriculturalists are independent and don’t work well together, and a strong case can be made with that in Hawai’i, but the realities of the volatilities in the energy markets are going to change this equation. So, if you want to be competitive, you need to cooperate. And the agriculturalists that will thrive, that will flourish, will be the ones that are cooperating with their fellow agriculturalists in what we find to be clusters.

– KEY INFORMANT

- **The potential of micro hydroelectric for increasing agricultural production and profits.**

Interviewees discussed how the high cost of energy has presented a significant challenge to achieving sustainable agriculture in Hawai'i given the energy inputs required for farming and local reliance on fossil fuel imports for electricity generation. When energy costs are high or unpredictable, and when other operational inputs have to be imported (e.g., fertilizer), the capacity for greater local food production may be limited. If the high costs of local production are passed on to the consumer, locally grown products become less affordable and less competitive in local markets. On-farm renewable energy sources are a strategy to manage operational costs for the individual farmer, and perhaps make the industry in our island state more viable. This, in turn, could increase the local food supply and decrease the state's reliance on imported food.

Farmers discussed more specific examples of how the power generated from the micro hydroelectric plant may result in their increased productivity and crop diversification. For example, one farmer talked about how the low-cost power from the micro hydroelectric plant could provide an opportunity to begin processing animal feed from grains grown on-site or elsewhere in the region. With local ranchers exploring options to raise more livestock on the island, this farmer saw a growing demand for animal feed and an opportunity to supply the feed from local farms, perhaps processed by energy-intensive machinery that could be powered by the on-farm micro hydroelectric plant. Another farmer discussed the potential to run a greenhouse around the clock with the lower-cost power generated from the micro hydroelectric plant, allowing him to diversify what he grows regardless of weather conditions.

Well, your key word here is "sustainable," and as far as energy prices go, the lack of control that a farmer has over the prices of oil and the resulting utility prices make it hard to predict cash flow and plan ahead. So, the key to on-farm renewables is their predictability and the opportunity to levelize out your energy costs. ... So, to make something sustainable, you've got to have your costs predictable so you're not blown out of the water the next time somebody decides to go to war in the Middle East. And that's the big advantage of generating your own electricity.

– Key Informant

The metric to define food security, food sustainability, is going to be import replacement. What commodities can we start growing now in the current economic climate that we can be competitive on? And energy is going to be a key in the context. And so, energy prices go up, we become more competitive if we are producing our own energy on our farms. ... We see we're currently importing somewhere between 85% and 90% of our food, we've got a large opportunity to go in and capture our own market and do that with the import replacement.

– Key Informant

Now with the power plant, I can probably do other things now ... you can make [livestock feed] cubes, you can make pellets... As long as you got the power, you can make anything.

– Farmer

- **Agriculture provides an opportunity for rural economic development.**

Key informants point out that sustainability is not just about growing enough food for our local population; it is also about growing the local economy. Given Hawai'i's strong foundation of natural resources and long agricultural history, key informants believe that growing more food locally could help stimulate a needed diversification of the state's economy.

Informants reiterated the importance of small-scale farmers working together in a variety of formats, in this case, to develop rural economies through agriculture. Formal cooperative structures (i.e., a group of farmers owning and operating a farm business together and for mutual benefits) have long been a part of agriculture and rural life throughout the world.⁷ In this particular structure, a group of farm and/or allied food and agricultural enterprises work together on shared interests.⁸ Informants also elaborated on the potential of agricultural industrial clusters as a mechanism for rural economic development. A growing body of research evidence suggests that the presence of industrial clusters promotes economic development, therefore, the development and upgrading of clusters is now seen as an important agenda item for governments, companies, and other institutions.⁹

I don't propose local food because I'm scared. I don't have a fear thing. I'm not afraid that if the boat's not coming, we're going to start having a war amongst ourselves. ... I think it's all about our local economy that we need to grow our agriculture and become locally self-sufficient and food-secure, because why wouldn't we?

– Key Informant

I think the opportunities are there, I mean, one of the top 10 trends in business across the world is called collaborative consumption and it's all about collaborating. ... Cooperatives are about business structure, and about investments and pay out and just legal agreements and financing and all that kind of thing. There's probably different ways to do it... And that's the kind of thing that can happen all over those rural communities. ... A business

person could invest in the facility and be a hub for the farms in that region. They could have their farmers' market there. They could have their regular food all the time, main grocery store with whatever is grown there. It doesn't even have to be a farmers' market that's just open on Saturdays. It could be a grocery store that has all the fresh and processed products from that region.

– Key Informant

Summary

The micro hydroelectric plant that is the subject of this study is an important project being watched by agriculturalists and other key stakeholders throughout the state. In the shorter term, the project will directly benefit the farm owner and tenant farmers at the site. The expectation is that this new source of reliable and cost-efficient power will allow these individual agribusinesses to increase and diversify their productivity, which should increase future profits. Community-wide impacts, however, may not be experienced for some time to come and may only occur when a critical mass of small farmers in the area also install and benefit from on-farm renewable energy sources. In the long run, on-farm renewables are seen by farmers and community informants as having the potential to strengthen the viability of small farms and increase local food production.



CITATIONS

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