

## Enough water for ethanol?

By Sean Hao  
Advertiser Staff Writer



Water trickles down an old waterway formerly used to irrigate sugar cane fields near Waialua. Reviving irrigation systems poses challenges. GREGORY YAMAMOTO | The Honolulu Advertiser

### **BESIDES WATER, THERE ARE OTHER ISSUES**

#### **Finding workers**

Apart from water availability, finding labor to work the sugar cane fields also will be an issue for local ethanol producers. The last time Hawai'i had 120,000 acres of sugar cane in the ground was 1993. Back then, the industry employed 2,500 workers. Last year, only 700 people worked in Hawai'i's sugar cane industry — a 72 percent decline.

"There's land use considerations, water considerations, there's labor considerations — I mean we don't have the farm labor force that we did have 15, 20 years ago," said Peter Rosegg, a spokesman for Hawaiian Electric Co. "So none of this is a shoo-in."

HECO recently announced that it wants to use ethanol in a planned power plant at Campbell Industrial Park, which would generate local demand for another 7 million gallons of ethanol annually starting in 2009.

"There's a lot of questions about how (ethanol production) is going to proceed," Rosegg said. "But there's a high degree of interest."

#### **Behind Schedule**

For ethanol to fulfill the promise of making Hawai'i less dependent on imported fuel, it needs to be processed locally.

Since April, most gasoline sold in Hawai'i includes 10 percent ethanol, but all of the alternative fuel is imported.

Plans for local ethanol production are nearly two years behind schedule.

None of the five companies hoping to produce ethanol locally has broken ground on a plant.

The companies say they are wrestling with permitting requirements, fundraising issues and questions such as where to acquire feed stock.

The five — ClearFuels Technology Inc., Oahu Ethanol Corp., Maui Ethanol LLC, Kauai Ethanol Inc. and Aloha Ethanol Corp. — say they don't expect to begin local production until late 2007 at the earliest. The state has pledged up to \$12 million a year in tax breaks to help the companies build their plants, but the credits won't kick in until the companies start producing.

### **Waiahole Ditch**

The controversy over the Waiahole Ditch illustrates how difficult it may be for ethanol proponents to get water diverted back to sugar cane fields.

The Waiahole Ditch was built in 1916 to carry water from Windward O'ahu to the Leeward sugar cane fields. The ditch runs 25 miles from Kahana to Honouliuli, and draws 27 million gallons of water a day from four major Windward streams and from the mountain water sources that feed the streams.

As sugar cane fields on O'ahu were abandoned, Windward taro farmers and others began arguing that some or all of that water ought to be returned to Waiahole, Waianu, Waikane and Kahana streams. They argued the water was needed to feed streams that create estuaries for marine life, support streamside agriculture like taro, and for scenic and other values.

The state Water Commission decided in 1997 to leave about half of the Waiahole Ditch flow, or 12 million gallons per day, on the Windward side. The Supreme Court has ruled twice on the allocations and they have been adjusted twice. But the basic decision of leaving roughly half of the flow on the Windward side has not changed.

To get the 12 million gallons allocated to the Windward side back to sugar cane fields would likely meet opposition from the taro farmers and others.

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Ethanol may not be the energy panacea many in Hawai'i had hoped for.

Producing the biofuel from sugar cane would help move Hawai'i away from dependence on imported oil while invigorating the farm industry.

Sounds great, but making it happen is far from simple.

The barriers to producing ethanol locally include:

Building production plants.

Getting water rights switched back to sugar cane land.

Repairing irrigation systems.

Finding farm workers.

Among these issues, getting water rights may prove to be the stickiest.

Sugar cane is ideal for making ethanol and has a long history in Hawai'i, but it is an especially thirsty plant. It takes as much water to grow 10,000 acres of sugar cane as it does to keep 67 golf courses

green. And experts estimate Hawai'i will need to increase sugar cane acreage by more than 80,000 acres by 2020 to meet local demands for ethanol.

Hawai'i's large landowners abandoned sugar cane in the past two decades. As they exited the business, the water previously used to irrigate their fields was diverted to other purposes.

Returning that water to the fields will likely draw opposition.

"This is a huge issue that has barely touched the surface of public opinion," said Henry Curtis, executive director of the environmental group Life of the Land. "I think it's going to explode, if the sugar industry decides to tap into irrigation water."

On O'ahu, Windward activists and farmers successfully fought to get water previously diverted to Leeward cane fields sent back to their side of the island. They argued the water was needed to feed streams that create estuaries for marine life, support streamside agriculture like taro, and for scenic and other values.

"There is water. (The question is:) What do we decide to do with it?" said Stephanie Whalen, president of the Hawaii Agricultural Research Center and member of the state Commission on Water Resource Management. "If we wanted to be more self-sufficient in biofuels, could we then make different policy decisions?"

### **TRIPLE THE CAPACITY**

To quench Hawai'i's thirst for ethanol, the state's sugar cane industry would need to at least triple in size by reclaiming fallow plantation land, according to state and private estimates. Under state law that took effect in April, most gasoline is required to contain 10 percent ethanol.

But property owners aren't likely to move forward on growing sugar cane until they can be assured they can get the needed water.

"If you can't get water to the crops, you're dead in the water," said Kamehameha Schools chief executive Dee Jay Mailer during a recent public discussion on the issue. "These crops need water."

Kamehameha Schools, which owns 8,700 acres of former sugar land on O'ahu's North Shore, wants the state to take the lead in addressing issues such as water access and irrigation system repairs.

Kamehameha Schools along with two other major landowners, Grove Farm Co. and Maui Land & Pineapple Co., have formed Hawai'i BioEnergy, which is researching the feasibility of growing sugar cane to produce ethanol.

Kamehameha Schools said preliminary research is promising, even though a comprehensive market study won't be completed for six months.

### **TIME, EFFORT HUGE**

The state court and public policy decisions after plantation closures have made it difficult to secure water for agriculture without considerable time and effort, according to Lena Hansen, a project manager for the Rocky Mountain Institute, an energy consultant based in Snowmass, Colo., hired by the state to study some of the issues surrounding ethanol.

Part of the issue stems from state requirements that Hawai'i streams be restored to levels needed to support native life.

So-called in-stream flow standards have yet to be set for most streams, and setting such levels will

likely be a divisive and hotly debated process. Until that occurs, landowners and potential investors may hold off on making major commitments to grow biofuel crops such as sugar cane.

"It makes them nervous if they don't have a long-term contract on water," Hansen said. "If you don't know what that (in-stream flow standard) number is, you don't know how much water you can take from that for agriculture purposes."

The state can't promise land-owners access to more water.

Peter Young, director of the Department of Land and Natural Resources, said the state needs to balance the needs of future biofuel crops against other obligations, including protecting streams.

"It's kind of difficult to answer if there's enough water or not" to irrigate significantly more sugar cane crops, Young said. "We need to have a better understanding first. We need to know what area, what are the water demands of that area, the crop and the water needs of the crop."

### **MAUI ALSO FACES FIGHT**

Water access will likely be a big issue not just on O'ahu but also on Maui.

O'ahu has 38,500 acres of idle, prime agricultural land, according to the Department of Agriculture. Maui has 23,000 idle acres.

Like O'ahu, any attempt to significantly boost water availability for agriculture on Maui could create controversy.

Facing restrictions on use of the 'Iao aquifer and a rising demand for water, Maui County is looking to take control of surface water from the four major streams that are managed by Wailuku Water Co. The company, formerly called Wailuku Agribusiness, has phased out its farming activities and continues to divert water from the streams to sell to other agricultural interests, including Hawaiian Commercial & Sugar Co. and Maui Land & Pineapple.

However, those surface water streams feed Maui's aquifer and also could more than double the amount of drinking water now available to residents, according to Maui County Mayor Alan Arakawa. He has said he hopes Maui County's actions would inspire other government entities statewide to take steps to preserve ground water and surface water.

"With the state moving away from an agricultural base, I think it is a good time in history to start looking at where the priorities should be for these water systems," he told The Advertiser in June.

On the Big Island, which has 108,800 acres of idle agricultural land, and Kaua'i, which has 45,400 acres of fallow farm land, water availability could be less of an issue. That's because much of those lands could rely on direct rainfall, rather than water from irrigation systems.

### **A LESS-EFFICIENT IDEA**

The Big Island and Kaua'i could provide sugar cane to produce ethanol for use on other islands, but it would be more efficient to produce it on the island where it is used. O'ahu generates 80 percent of the demand for ethanol.

Also, rain-fed sugar plantations on the Big Island and Kaua'i historically have had relatively low yields, so growing sugar cane on those islands might require more than the estimated 80,000 acres needed to meet the state's demand for ethanol by 2020.

The push for making ethanol from sugar cane comes from the advantages sugar cane holds. Not only does Hawai'i have existing sugar cane industry knowledge and infrastructure, but the crop has a high

energy content. One ton of raw sugar produces 135 gallons of ethanol compared with 98 gallons of ethanol created from one ton of corn, according to a July U.S. Department of Agriculture report.

However, it's still unclear whether Hawai'i's major land owners will sell their sugar cane for ethanol production.

There are 40,000 acres of sugar cane currently growing in the state. If Hawai'i is going to be growing all of its own ethanol crops by 2020, that 40,000 acres (plus another 80,000 to 85,000 acres) will have to be used for ethanol.

However, landowners don't have to sell their cane or other byproducts for ethanol production. Heavy demand for ethanol may drive up sugar prices. If that happens, it may be more profitable for local landowners to sell their cane for sugar, rather than ethanol, said Steve Holaday, plant manager for Hawaiian Commercial & Sugar Co. on Maui — one of only two sugar companies still operating in Hawai'i. That would mean even more acres would need to be planted to fuel state ethanol demands.

### **TECHNOLOGY MAY HELP**

One hope for Hawai'i's ethanol proponents is that new technologies could cut the need for a large increase in sugar cane acreage.

Maurice Kaya, chief technology officer for the Department of Business, Economic Development and Tourism, said new, more efficient cellulosic ethanol production technologies and sugar cane growing methods may mean Hawai'i's future ethanol demands can be met with its existing 40,000-acre crop.

Ethanol typically is made from sugars and starches. However, cellulosic ethanol is produced from cellulose, or a plant's fibrous material. Cellulosic ethanol techniques are in limited use, but promise to be more efficient than traditional production methods.

"The assumption that you need massive amounts of water is if you plan to expand" sugar plantations, Kaya said. "There's no question that sugar cane demands a lot of water. The first question is whether it even makes sense" to plant new sugar cane crops, Kaya added.

If new sugar cane acreage is needed and the state agrees to sign over water rights for that purpose, the issue remains of how the water will get to the fields. Irrigation systems have deteriorated in the wake of sugar cane plantation closures in the 1980s and 1990s.

The cost of rehabilitating 10 state-owned irrigation systems for sugar-based ethanol production would be more than \$100 million, according to the Rocky Mountain Institute. Repairs to privately owned irrigation systems are likely to cost millions more.

Who will pay for upgrades and where the money will come from remains to be resolved.

Solving the water issue is key to producing ethanol locally and moving Hawai'i away from its dependence on imported fuel.

How long it could take to decide the issue of water availability is unclear.

The state hosted a biofuels summit Aug. 22 at the Hawai'i Convention Center to coordinate efforts. Entry was by invitation only and environmental groups, such as Life of the Land, were not invited.

Environmental activists ultimately could affect the debate over diverting more water to agriculture.

"If we're not at the table, it could drag out for years," said Life of the Land's Curtis. "If everybody sits down at the table and starts talking, it could happen in maybe five years."

*Reach Sean Hao at [shao@honoluluadvertiser.com](mailto:shao@honoluluadvertiser.com)*

# SUGAR CANE CAN MAKE ETHANOL BUT IT'S A THIRSTY PLANT

Hawai'i will need to increase sugar cane fields by 83,000 to 85,000 acres by 2020 to meet local demands for ethanol. Any increase will be gradual and spread over several islands. These crops will require massive amounts of water.

**A**  
10,000-acre plot of sugar cane needs 67 million gallons of water every day. That is equal to:



67 MILLION gallons of water per day



The amount of water it takes to fill 101 Olympic-size pools.



An Olympic-size pool is 27.5 yards wide by 55 yards long.

The amount of water it takes to irrigate 67, 18-hole golf courses.



The average 18-hole golf course is about 150 to 200 acres.

## FALLOW LAND BY ISLAND



## ACRES USED FOR GROWING SUGAR CANE



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Advertiser library photos

Source: Department of Business, Economic Development and Tourism, National Agricultural Statistics Service; Department of Agriculture; Advertiser calculations