

THE PROOF IS IN THE TREES

Local inventor says his process is a new way at looking at biofuel production

by Ryan Bentley

Ideas that could change the world sometimes come up from the tootleberries.

And sometimes they're ignored, just because of where they come from.

Michael Maffei knows he has something that could change the world. And he is battling to get it onto the market.

Maffei has developed a process that creates a biofuel, traction control product, fertilizer and biomass fuel that comes exclusively from pine trees.

Maffei, 44, who lives in Entiat and works full-time for the U.S. Postal Service, started experimenting with the process nine years ago and is at the edge of bringing biofuel companies, landowners, biomass energy plants, sawmills and marketing companies together to get his product on the market.

Unlike corn ethanol and rape seed biodiesel, which has a mash left over after the alcohol and oil is extracted, Maffei's process doesn't dead-end with a mash of wood pulp. It is part of a complete energy cycle.

The process begins and ends with pine trees. The first step involves converting woody cellulosic fibers from trees to sugar and then into ethanol. The wood-



RYAN BENTLEY/WBJ

Michael Maffei mixes ash and sawdust together to form what he believes could be the next breakthrough in renewable energy. His idea, now a business called Environmental Innovations, is gaining traction, literally.

waste left from the ethanol production will be dried and turned into pellets or ash. The ash will be mixed with sawdust and either used as a traction control for roads or fertilizer — to help more trees grow.

'What do I know? I'm just a crazy postman.'

Maffei describes himself as an independently minded, environmentally conservative tree-hugger.

He said the government and large business take a long time to get anything done. And being a novice inventor from Entiat with

no formal degree is also a challenge.

Maffei walks with a long gait, developed from years of delivering mail, his long blond hair streaming along next to his thick beard. He doesn't have a college degree in biology or chemistry, but he has the practical ability to see a problem and look for an answer.

He thrives on discovering how the world works and asking questions.

The United States currently burns 140 billion gallons of gasoline a year. Around 4 billion of that came from ethanol in 2006.

"We are at a crossroads

for the environment," Maffei said. "This can be part of the answer. What do I know? I'm just a crazy postman."

When it comes to new energy technology, Maffei said the next step cannot be another Band-Aid. The corn ethanol movement started people thinking and investing in alternative energy, but he said ultimately it is a just a step toward energy independence.

"The land it takes to create energy from corn is just not feasible," he said.

The proof of his project is in the trees, Maffei said, but it often takes more than that

to transform an idea into a reality.

The discovery

Maffei's biofuel cycle started with a knock on the head, literally. It happened while he hauled a pail of fire-place ash outside. As he walked along the icy path in December of 1997, he slipped, smacked his head on the ice and spilled the ash over the sidewalk. When he stood up, the only place he held good traction was on the ash. That got him thinking about a nonchemical, no-slip aid.

Later that winter, driving by the now closed Longview Fiber sawmill in Winton, Maffei noticed snow wasn't accumulating on saw dust piles at the mill. The guys at the mill explained to Maffei

that elements in the sappy cambian layer that feed the trees also repel water.

He headed home with a carload of sawdust and began experimenting.

He came up with the right mix of ash and sawdust that gave him great traction on the ice. The following spring, Maffei noticed that the grass alongside his walkway where he had used his sawdust/ash mixture started growing really well with no additional fertilizer or water.

For the next year he dabbled the traction-turned-fertilizer mixture on his trees in a variety of experiments.

The neighbor's dog killed Maffei's chickens. To make up for it, the neighbor gave

him 200 pine trees that were just a couple years old. Maffei decided to use the trees for further testing of the ash/sawdust fertilizer.

Over the next few years, his trees grew at more than double the usual rate.

Maffei said the sawdust hold the nutrients the trees need to grow. The ash provides the nitrates.

Those fast growing pine trees are the basis of Maffei's energy model. Other types of trees can be used, but without his organic, carbon fertilizer they don't grow as fast. And faster growing trees mean more can be produced on less land.

The energy cycle in Maffei's system feeds into itself with the byproducts of the pelletization and ethanol ending up as fertilizer for more trees and plants.

Maffei is currently trying to negotiate a business deal with the Confederated Tribes of The Colville Reservation to plant 12,000 acres of trees that he would harvest using a rotational process. Halfway through the growing process, Maffei would harvest half the trees, process them into ethanol and his fertilizer compound that would, in turn, be used to help the others grow.

Maffei also proposes us-

ing the Colville's sawmill, veneer plant and biomass electrical generator to prepare the trees for the ethanol process and for creating the ash and sawdust mixture.

No deal has yet been signed, though, he said, but the talks continue.

The next step in the process as Maffei sees it, involves BlueFire, a California-based ethonal company, that would build a 55-million gallon ethanol plant to create ethanol from the wood processed at the Colville sawmill.

The waste from the sawmill and ethanol plant would then be either turned into pellets to burn, or the scraps would be dried and then burned in the 13 megawatt biomass electrical plant already in operation on the Colville property.

At that point, the ash and sawdust would be turned into traction control or fertilizer by another company and marketed. Some of the fertilizer would be applied to the new plantings and the existing trees.

Maffei's process uses the waste of one step to fuel the next.

Spurting trees in Entiat doesn't mean everyone is onboard, though.

Slip and slide no more

Michael Maffei spread around a little of his sawdust and ash at the Wenatchee Federal Building where he works as a mail carrier.

The results caught the attention of Gary Thompson, the maintenance manager for the building. Thompson said he spread the product with a garden fertilizer spreader over icy areas.

Usually, an average of three people a year file a claim against the building when they slip on the ice. Last winter there were none, Thompson wrote to Maffei in a testimonial letter.

Thompson said he also noticed a change in the plants along the edge of the walkways in the spring.

What is BlueFire Ethanol?

In the past few years, companies like BlueFire Ethanol have developed an enzyme that can take cellulose and hemicellulose and break it down into simple sugars convertible to ethanol by micro-organisms.

Since cellulose is the building block for vegetation, the potential fuel is everywhere.

John Cuzens, a chief technology officer for BlueFire, said the company was one of six companies out of 70 picked in February to receive federal grant money from the U.S. Department of Energy to make cellulosic ethanol a reality on the market. BlueFire, based in Irvine, Calif., received \$40 million in grants. The company currently is building an ethanol plant in Corona, Calif., in the city's landfill.

Cuzens said his company's process is versatile enough that there isn't a pretreatment for the feed stock so the plant can process every cellulose based product from grass clippings to cardboard.

The production cost is low since the feedstock is brought to the plant. Often, the company can actually make money by disposing the material.

"And there are a lot of landfills," Cuzens said.

The landfill ethanol plant is BlueFire's current number one priority.

He said Michael Maffei's pine tree project would be a tier two priority.

He did confirm that BlueFire is very interested in Maffei's proposal, however setting up the infrastructure in California has backlogged Maffei's project for now.

Maffei said people have become so skeptical of anything new that nothing gets done.

Talks with several larger companies never got off the ground. Other companies just wanted to take the idea from Maffei and cut him from the project.

Maffei said it has been difficult to keep his innovation in his hands.

So far he's spent \$60,000 of his own money on U.S. and Canadian Patents and another \$25,000 on other legal fees associated with starting his company called Environmental Innovations.

"You never sit back and relax," he said. "In fact you've almost got to sleep with one eye open."

Gary Mitchell of the Natural Resource Conservation Service was one of the first people Maffei talked to about the idea as Maffei began looking for ways to get his product to the market.

Mitchell said Maffei has high goals for his product, but Mitchell also sees how the carbon-based fertilizer could also infiltrate other aspects of agriculture and society.

Mitchell's job with the NRCS focuses on assisting landowners be more efficient and ecologically sound with their land. He would like to see farmers experiment with the fertilizer on their crops like corn and wheat to increase acre output and cut down on the use of petroleum-based fertilizers.

To Mitchell, one of the greatest attributes of Maffei's idea is its universal application.

"Imagine what could be done with other trees like hybrid poplars? There is real potential here," he said.

He said the fertilizer prod-



Ryan Bentley/WVBJ

Michael Maffei's test trees shows the growth potential of his patent pending carbon-based fertilizer. Four feet of growth is the most Maffei has record in a single growing season in his trees. Three feet a year is the average. His control trees show growth of around one foot a year. The tree above is 11 years old and one of the tallest fertilized trees at around 40 feet. The tree below is 16 years old and is less than 20 feet tall.



The stats on growing trees:

Michael Maffei began seriously working on testing his carbon-based fertilizer a few years after his initial tests with the substance as a traction control on ice.

The grass along the walkways began to grow really well so he began experimenting with his mixture as a fertilizer.

When the neighbor's dog ate Maffei's chickens, the neighbor, who had a landscape business, gave him 200 pine trees he couldn't use in his business.

Those trees were just what Maffei was looking for. Maffei transplanted 15 trees on a south facing hill above his house. He planted the trees so they would receive the same amount of sun and moisture. He fertilized half and left the others alone as a control. Now, more than five years later, only one of the control trees is alive and it's not much larger than when it was planted. Those he fed are all taller than five feet and growing fast.

The rest of the 200 trees he left in his neighbor's yard and fed them yearly, to something of his neighbor's amusement. Now 11 years old, the smallest tree is more than 30 feet tall. The tallest one is almost 45 feet tall.

By comparison, he said, pine trees growing along the bank of the Entiat River that are older than Maffei's trees are shorter and smaller around. Several 16-year-old trees show growth of around one foot a year without any fertilizer but they have close proximity of the Entiat River, he said.

"That's what a normal tree does," he said. "My trees are five or more years younger than those trees and already more than twice their height and much wider in the trunk."

The test trees are fed every year and receive some irrigation. The average is around three feet worth of vertical growth a year.

If Maffei's projections are right, in 12 years the trees will grow to 42 to 46 feet tall with a girth of around 12.5 inches.

Every ton of woody fiber could yield around 65 gallons of ethanol. Harvesting 500 acres of trees a year could yield around 800,000 tons of woody material, which would yield 52 million gallons of ethanol a year.

Maffei dreams big. If throughout the United States 1.2 million acres are put into tree ethanol production, Maffei said process could be a big step in the U.S. reaching energy independence.

The beetle battle

In addition to growing fast, the test trees show a remarkable ability to battle disease and insects. Michael Maffei pointed out several places on one tree where bark beetles tried to burrow in. The beetles' invasion points were marked with huge gobs of sap full of the carcasses of the beetles.

"You just don't see this," Maffei said. "Usually, if a tree is under attack, its growth will slow. It just doesn't seem to phase these trees."

Maffei said his trees grow so fast they are not strong enough to be used as structural wood. A person can take their thumb and push on the bark of the trees. The cambian layer is so thick, the person will be able to feel the bark bend with the pressure.

uct could be manufactured in any town that has access to sawdust and ash.

“You don’t need a big chemical plant,” he said. “It comes from stuff that people would consider waste.”

Maffei said his goal is to see his process in motion around the world and not keep it a secret.

He does, however, want to see production complete a cycle and use trees grown specifically for the ethanol process versus chopping down mature forests.

Mitchell said nothing with this much potential has ever crossed his path. And at this stage, it is potential.

He classified Maffei as an inventor.

Maffei is striving to be a promoter.

Mitchell said Maffei still faces tough decisions. The barriers are great, he said, and many people want to cut him out.

Mitchell is helping Maffei with technology grants that could help fund product studies.

“Once the research is done, then investors are easier to find,” he said.

Maffei wants studies done on his invention, but not at the delay of its usefulness.

Tests are welcome, Maffei said. He admits he is not a formal scientist. It’s a rough plan, he said. Tests on his product could help it become more efficient.

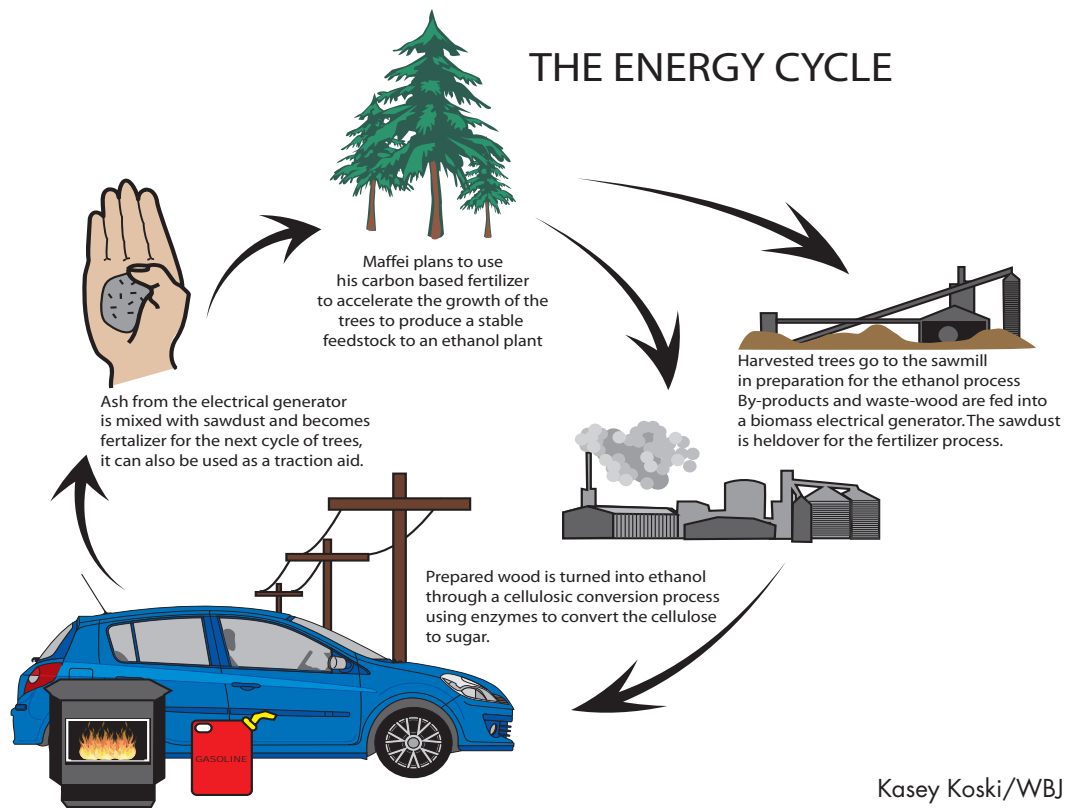
“Let’s just not wait until it’s absolutely perfect before it gets underway,” he said.

Maffei said the journey to make his idea work as a business has meant a lot of trial and error.

“You find what works and you don’t give up,” he said.

The next step

Maffei has been making



some progress on the business end, but the whole plan is far from complete.

Ernie Clark, administrator for the Colville Tribes, said Maffei has made an unsolicited proposal to the tribes for his project.

He said at this point it is anyone’s guess where it will go.

Clark said the proposal would have to go from his desk to the tribal council, which would then have to make a recommendation to the council committee before a contract could be worked out.

Clark said BlueFire Ethanol has contacted him about the project.

“We need some feasibility for the project,” he said. “We haven’t carried it forward yet. We need to see more first.”

Maffei said he understands their concerns.

“They want to know what is in it for them. Why should

they just fork over 12,000 acres? People have tried to use them before,” he said. “They want to make sure I’m not going to do that.”

At BlueFire, John Cuzens, chief technology officer for the company, said preliminary introductions have taken place.

“We are still in the early stages,” he said. “On the surface this (project) shows positive opportunities for us.”

Cuzens said if the companies want this to go forward, they’ve got to put more effort into it.

Cuzens acknowledged the difficulty of joining several large companies and governmental bodies like the Colville’s.

“We all need to sit down and lift our skirts up a little to show that we are all committed to this project,” Cuzens said. “I think that is something that will happen soon.”

Maffei said he would like to see ethanol and fertilizer plants established around the world.

He said the pine tree can grow almost anywhere and thrive with a little help.

Whenever Maffei discusses his project the conversation always returns to serving society, which he says is his ultimate goal. He said he is willing to share his information once the business end is underway. To him his ultimate goal is to stop the effects of global warming and work to increase the health and longevity of the forests.

“There is no horizon with this,” he said. “If done properly, it never runs out. We’ve just got to stop talking and make this work for everybody. Because it has the possibility to help everybody. Not just me, not just business, but everyone who is reliant on energy.”