

# System significantly reduces greenhouse gases and odor

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The system eliminates the problem created when some dairies fertilized their fields with wastewater, which can contaminate groundwater with nitrates. It also significantly reduces greenhouse gases and odor from what was the wastewater lagoon, which is now used to store the irrigation water.

"It turns liabilities into assets," says Allred, who figures he will recoup in about five years the approximately \$1 million he's spent on the system.

The system is called BIDA — for biodynamic — and was developed and patented by BioFiltro, a Chilean company now headquartered in Fresno, Calif. Alex Villagra, 50, a Santiago civil engineer, developed the system and co-founded BioFiltro. It is one of several types of cutting-edge systems under development that treat dairy waste.

"BIDA has the potential to change the future of dairy nutrient management," says Mai Ann Healy, BioFiltro USA manager.

Frank Mitloehner, a professor at the University of California-Davis who has researched the system, says more research is needed to replicate his studies but that BIDA could be important in the San Joaquin and Yakima valleys. It reduces nitrate groundwater pollution and nitrous oxide and ammonia air emissions by turning them into harmless nitrogen gas, which makes up 70 percent of the air people breathe in the atmosphere.

"I measured air emissions from the top and bottom and entries and exits of the filter and found this filter can take 90 percent of the nitrogen out of the air, and that's very unique," Mitloehner said.

### Big business

Dairy is a big business in Washington state and the U.S. Washington ranks 10th in milk production and sixth in milk production per cow, according to USDA's National Agricultural Statistics Service. In 2016, Washington produced 6.65 billion pounds of milk valued at \$1.1 billion from 276,000 cows. Overall, the U.S. produced 212.4 billion pounds of milk valued at \$34.7 billion from 9.33 million cows.

One challenge facing dairy farmers is how best to handle the manure those cows produce. The issue came to a head in the Yakima Valley of Washington after dairies there were sued over the alleged infiltration of nitrates in the groundwater. A 2015 settlement agreement between several Lower Yakima Valley dairies and the Environmental



Photos by Dan Wheat/Capital Press

Dairy industry representatives check out Royal Dairy's new BIDA wastewater treatment system near Royal City, Wash., on Aug. 22. Wastewater is sprinkled over the large beds of wood chips, worms and microbes in the background to take out most of the total nitrogen, which includes ammonia, nitrogen and nitrate-nitrite.



Frank Mitloehner, University of California-Davis air quality professor.

Protection Agency to keep nitrates out of the groundwater is costing those dairies millions of dollars every year for double-lined water storage lagoons, monitoring wells, consultants, attorneys and paperwork, Jay Gordon, policy director of the Washington State Dairy Federation, has said.

A 5,000-gallon-per-day BIDA pilot plant at Allred's Royal Dairy removed an average of 93 percent of total nitrogen from dairy wastewater over two years along with 97 percent of total suspended solids and 90 percent of total phosphorus while using 95 percent less energy than similar systems and reducing greenhouse gases by 90 percent, Healy said.

Total nitrogen in the two-year pilot was reduced to 160 milligrams per liter compared to 2,263 milligrams when it entered the system untreated, Healy said. That's total nitrogen, which includes ammonia, nitrogen and nitrate-nitrite, she said. Total nitrogen is what is in wastewater dairies typically apply to their fields, she said.

It's done with no chemicals in four hours and produces irrigation water, which requires no minimum amount of acreage for application, she said.

BIDA has also been used at human wastewater plants, slaughter houses, milk processing plants and wineries to turn wastewater into clean water that could, with further treatment, even be made drinkable, she said.

No one else developed such a system sooner because "no one wants to believe worms and microbes can do what chemicals and machines are doing," Healy said.

### How it came about

In the early 1990s, Villagra was a student and teaching assistant of University of Chile professor Jose Toha Castella, who was studying whether worms could digest municipal waste sludge. He determined they could. The first commercial application was in 1996 and involved a rural municipal wastewater system in Chile, she said.

Since then, Villagra has overseen 143 installations of the systems in Chile, New Zealand, Brazil, Mexico, the U.S., Spain and Antarctica.

The first at a dairy was in Chile in 2003, followed by one in New Zealand in 2006 and one in Fresno in 2013. Another has been installed at a dairy in Hilmar, Calif. A dozen others were built for food processors, wineries and other services in the U.S.

Allred's is the largest BIDA dairy system in the world, capable of handling 200,000 gallons per day.

The largest BIDA of any type in the world is a 2 mil-

lion gallon-a-day system at a Chilean food processor.

"I was at the 2014 World Ag Expo in Tulare, Calif., and ran into BioFiltro's booth. Four months later, I visited their first unit at Fresno State University. I liked the simplicity, the ease of management and the positive environmental impacts using biology and minimal energy," Allred said.

### How it works

BIDA consists of an above-ground concrete containment structure of walls, floor and an open top. The base is graded to allow the processed water to drain from the exits. There's a bottom layer of plastic-like pallets to maintain an air chamber. On top of that is a layer of rock and geotech mesh or cloth. On top of that is a 3.5-foot-deep layer of wood shavings.

Wastewater coming from the primary solids separator is dispersed through sprinklers over the wood shavings. About 12,000 California red worms per cubic yard are in the wood shavings. A mix of bacteria and microbes is introduced and together with the worms digest and remove solids, nitrogen, sugars, fats, oils, phosphorus and ammonia, Healy said. Metals and salt are about the only things not removed, she said.

The worms aerate the shavings and with the microbes form a casting, or biofilm, that's usable as a soil amendment. The biofilm within the top foot or two of the wood shavings is harvested annually with excavators and sold.

Water that flows through the system in four hours is clean enough for use in irriga-

tion and stored in what once was the wastewater lagoon.

### Concerns, potentials

Allred was concerned whether BIDA would work in cold weather. He tested the 5,000 gallon-per-day pilot operation for two years. The worms, microbes and bacteria all continued to work down to 15 degrees below zero, Healy said.

Allred said pumps and sprinklers were kept going by being partly underground and by maintaining minimal flow.

In August, Allred began using his much larger new BIDA, which covers almost 2 acres.

Once cleaned, the water is applied to 300 acres of farmland, versus previously having to spread treated wastewater over 4,000 acres, he said. It eliminates the need for trucks to haul wastewater.

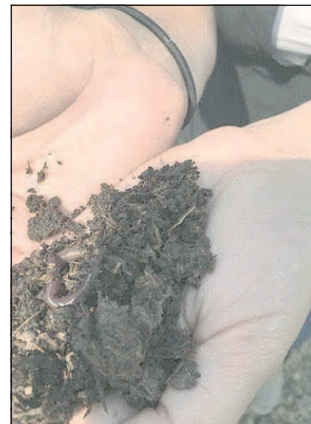
The system would allow him, if he decides, to increase his 6,000-cow milking herd without having to add more land to disperse treated wastewater.

While Allred is spending about \$1 million to own his BIDA, BioFiltro also offers total system construction and management to dairies at about 1 cent per gallon and no money upfront, Healy said.

### What others say

At an Aug. 22 open house at Royal Dairy, Scott Kinney, general manager of Dairy Farmers of Washington, presented Allred with a check for \$100,000 for his research on BIDA.

"We're really excited about this, and we have four or five other projects of digesters and other types of sys-



California red worms used in the BIDA system convert manure water into irrigation water. About 12,000 worms are used per cubic yard of wood shavings.

tems with similar goals in the state," Kinney said.

Steve Rowe, CEO of Newtrient in Chicago, a collective of leading dairy cooperatives, Dairy Management Inc. and the National Milk Producers Federation, are watching Allred's system since it's the largest in the nation, Kinney said.

Rowe was formerly general counsel of Darigold in Seattle.

Sarah Taydas, a Darigold spokeswoman, said Allred's system is an example of innovation that improves environmental performance.

Kirk Robinson, deputy director of the state Department of Agriculture, called Allred's BIDA "very impressive" and that it's one of several new technology options for dairies in managing nutrients.

State Sen. Shelly Short, R-Addy, said the BIDA system "is huge," given issues the state Department of Ecology has raised with dairies regarding nitrates and groundwater. She said she likes that it can be tailored in size and cost to fit various dairies.

Mitloehner said the number of dairies in California has decreased from about 2,000 to 1,300 in the past 15 years, largely due to more regulations, which often start in Germany and migrate to California and Washington.

For example, California has passed a law requiring a 40 percent reduction of methane gas by 2030 — "a very ambitious goal," he said, and dairy owners are "scratching their heads" on how to comply.

"There is a perfect storm of issues in California — animal welfare and environmental quality — big issues to put farms out of business," Mitloehner said. "This is a technology and system that can allow you to buy more cows on the same amount of land by decreasing nitrogen and ammonia. What's attractive to many is BioFiltro will run the waste management and be responsible for it and you can milk your cows."

## Harl Butte Pack operates where several herds graze

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2016 and added at least four pups this past spring.

As Wallowa County rancher Todd Nash put it, "big dogs" eat a lot of meat.

The apparent spike in livestock attacks in August raised questions. ODFW said Oregon's unusually warm and dry summer — even Portland went 57 days without rain — caused deer and elk to move to higher ground. With their natural prey more scarce, wolves then turned to attacking cattle, went the explanation.

But as Northeast Oregon research scientist Jim Akenson pointed out, deer and elk go to higher ground every summer. That's not new, although conditions were more severe this year.

Instead, Akenson believes the packs may be "habituated" to eating cattle. For that reason, he said, ODFW's incremental response — killing two adults at a time and monitoring the effect on pack behavior — probably won't work.

Once the pack members "flip that switch" in terms of prey selection, it is tough to deter them, he said.

"They're habituated to easy pickings," Akenson said. "Plucking out a couple individuals is probably not going to change that behavior."



Capital Press file photo

A wolf researcher says that an incremental approach to culling wolves from Oregon's Harl Butte Pack will likely fail if the wolves have become habituated to eating cattle.

Akenson is conservation director for the Oregon Hunters Association. His wife, Holly Akenson, is a wildlife biologist and member of the ODFW Commission, which is expected to revise and adopt the state's wolf management plan this year. The Akensons live in Enterprise, in Wallowa County, and have extensive wildlife and wilderness experience in the Pacific Northwest.

John Stephenson, a U.S. Fish and Wildlife Service biologist based in Southwest Oregon, said larger packs tend to go after livestock.

Online  
Oregon wolf depredation reports: [http://www.dfw.state.or.us/Wolves/depredation\\_investigations.asp](http://www.dfw.state.or.us/Wolves/depredation_investigations.asp)

"There's a relationship between pack size and increased incidents of depredation," he said.

Location is another factor, he said. The Harl Butte Pack operates where several herds graze on a mix of public and private land. All of its attacks over the past year were within 9 miles of each other, according to ODFW. The Imnaha Pack formerly prowled the territory and was known for attacking livestock. ODFW shot four Imnaha Pack wolves in April 2016 after repeated attacks on calves and sheep.

Meanwhile, all of the Meacham Pack's attacks in August took place on the same private pasture.

Conservation groups oppose killing wolves and have asked, without success, for Gov. Kate Brown to intervene in ODFW's decisions. The groups, including Oregon Wild, believe ODFW should not be taking lethal action until Oregon's outdated wolf management plan is reviewed and revised. The ODFW Commission is expected to take action on the plan this year.

## 'I think yields may be down and that might be a saving grace this year'

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Myers said his company was "fortunate" in that its buildings were some of the first to collapse so it got a relatively quick start on rebuilding.

Because most of the 1 billion-plus pounds of Spanish bulb onions grown in the region are stored and marketed later in the year, it's important for the storage sheds to be rebuilt in time to house this year's harvest.

Owyhee Produce will have its storage sheds rebuilt in time for harvest, but barely.

"We will have them done just in time for harvest," Myers said.

Across the Snake River in Payette, Idaho, Partners Produce lost four buildings to the snow and ice, including its main onion packing line.

Despite its best efforts and people working seven days a week, Partners' lost storage capacity will not be replaced before this year's harvest begins in earnest. Its new packing facility won't be ready until about Thanksgiving.

"We're scrambling, all right," said Eddie Rodriguez,



Sean Ellis/Capital Press File

Onion growers and packers are racing to rebuild storage and packing facilities after many were destroyed or damaged by last winter's heavy snows. A light crop this year may take some of the pressure off.

director of sales and part owner of Partners. "I will have some problem finding storage and may have to rent some storage, if available, from other packers or growers."

Partners' packing facility in Ontario was not damaged and continues to operate.

While some rebuilt storage sheds won't be ready in time, industry leaders say onion yields could be down significantly this year, which means the lost storage capacity won't be quite as important.

"I think yields may be down and that might be a

saving grace this year," said Stuart Reitz, an Oregon State University Extension cropping systems agent in Ontario. "That might take some of the pressure off."

"With the yields we are going to have, it's likely to be less of an issue than it could have been during a normal onion production year," Myers said.

Myers and Rodriguez said the industry will bounce back stronger in the long run because companies like theirs that have to rebuild are putting in state-of-the-art equipment and more automation.