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# Pork Industry Aims to Cut Methane

## Anaerobic digesters transform proverbial sow's ear into silk purse

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When the workday is over for Wen Murphy, more often than not, he continues to think about his job. A fourth-generation farmer, he constantly keeps top of mind the staff, the animals, the productivity, the supplies, the cash flow and myriad other details that must be attended to. In short, the sustainability of being a hog farmer. But above all, he is preoccupied with what he will leave for his family members and others who will someday walk the path of those who went before him.

According to Frank Mitloehner, that's not uncommon for people who work the land. An animal agriculture expert and air quality specialist with University of California, Davis, he spends his days teaching, researching and partnering with agriculturalists to help them improve their environmental footprints. It's not only concern for the environment that spurs them on – although that certainly is critical right now – it's also about ensuring the viability of their operations.

"Oftentimes, I meet with farmers who are fourth-, fifth-, sixth-generation farmers, and all they can think of is how to maintain the best quality of land, of animals ... of the natural resources to pass them on to their kids' generation," he says. "And to me, that's really what matters: that we have a food supply system that doesn't just take it out of the ground and deplete natural resources, but that is really regenerative."

Based in North Carolina, Murphy is a principal in Murphy Family Ventures, a large and diversified agricultural enterprise and one of the biggest swine producers in the United States. These days, in addition to a wide array of other challenges facing farmers, there's a desire, some pressure and even legislation aimed at cutting greenhouse gas emissions. People like Murphy and Stewart Leeth, chief sustainability officer for Smithfield – the world's largest pork producer and America's No. 1 pork supplier – are finding ways to rise to the occasion.

Fortunately, they're not on their own. In addition to Mitloehner, scientists worldwide are conducting research in labs, on farms and at universities to reduce agriculture's greenhouse gas emissions. Once findings are validated, there are other teams ready to help with adoption and implementation of them at the farm level.

Where global warming and animal agriculture are concerned, the issue most often is methane, the second-most plentiful greenhouse gas. Methane is a problem because of its short-term warming potential – it traps solar radiation in the atmosphere at a rate roughly 25 times that of carbon dioxide over 100 years, but only for a decade or so after it's emitted. Ten years in, it's broken down; its high warming potential is destroyed.

That makes it distinctly different from carbon dioxide, the No. 1 greenhouse gas. Methane is "special," Mitloehner says, because whenever you can reduce its emission and thus, the amount in the atmosphere, there will be a reduction of warming from that source that can offset warming elsewhere.

"Methane is a potent greenhouse gas. But methane is an interesting gas because it's not just produced – by let's say animal manure – but it's also naturally destroyed ... and it has a short lifespan. And that really is special because what it means is that animal agriculture, which has the main greenhouse gas as methane, can reduce that gas and by doing so, reduce the warming," he explains.

Nevertheless, methane can do some damage in a decade's time, and we need to be better about managing emissions, experts say. So much so, California is mandating a 40% reduction in methane emissions by 2030.

Granted, when it comes to methane emissions, pigs aren't at the top of the heap. In fact, they expel a mere fraction of the methane that escapes from cattle operations. That's because swine – like chickens, horses and people, for instance – are monogastrics; they have only one stomach. More to the point, they lack the multichambered organ characteristic of ruminant animals; a system that allows cows, sheep, goats, buffalo and the like to break down plant matter that's undigestible by humans. The downside? This ruminant superpower comes at the cost of methane-laden burps.

Yet, pig farms shouldn't get overlooked, something Mitloehner, Leeth and Murphy wholeheartedly support. While it's true pigs' enteric emissions are relatively small, their manure, when stored in traditional open lagoons, combines with methane-producing microbes to become a significant source of what Mitloehner often refers to as a "fast and furious" greenhouse gas.

Fortunately, there's a better way.

Storing manure in sealed systems, called anaerobic digesters, has emerged as one of the best approaches to taking a bite out of farms' methane emissions, with the EPA naming them the top tool in our arsenal. In addition to putting a literal lid on methane emissions, these closed systems produce biogas, a fuel that can be piped out to replace petroleum-based sources of energy, the primary contributors to global warming and climate change.

"What used to be considered a problem – a waste – which is the manure of those animals, is now turned into a solution," Mitloehner says.

For Leeth, it doesn't get any sweeter.

"We've been looking at ways to get energy out of the manure for many, many years. The old style of dealing with that was really trying to capture the manure biogases produced under the digesters and burning it on the farm through microturbine," he says. "What's really neat about these [newer] projects is it's ... a different model. We're capturing the biogas, pooling it together with other farms and selling it really as a product. And the value of that product is many, many times more valuable than a commodity fossil gas, and it's a real opportunity for farmers in North Carolina."

Not only do the digesters offer a double environmental win – that is, reducing methane emissions while producing a climate-friendly fuel – selling off the biogas is a new revenue stream for farmers; one that can help fund the pricey digesters. Depending on size, the specialized systems can cost $500,000 to $750,000 each, according to Kraig Westerbeek, chief development officer for Monarch Bioenergy. Monarch is partnering with Smithfield, who is an investor in the company, to tap into the green gas that comes from manure digesters, a model for something he believes has the potential to revolutionize farming.

"Smithfield's got a tremendous goal here in North Carolina that they'd like 90% of their finishing capacity to be involved in manure-to-energy projects in the next 10 years," Westerbeek says. "That's transformative in the business here because ... the majority of finishing farms will have the opportunity to hopefully add digesters if they choose."

From his base in the College of Agricultural and Environmental Sciences at UC Davis, Mitloehner has seen firsthand the difference anaerobic digesters are making in emissions from the state's prolific dairy farms. California is leading the nation in implementing anaerobic digesters, cutting its methane emissions and demonstrating the impact public-private partnerships can have.

"Farmers who say, 'We want to be part of a solution here, and we do want to use technologies, are financially supported and there's actually now a carbon-credit system that helps farmers financially benefit from reducing emissions by first and foremost using the technology that we are talking about here – anaerobic digesters," he says. The resounding message seems to be: "Work with – and not against – farmers if you want to achieve good environmental outcomes."

After all the work farmers do feed a swelling population.

"We provide not only food for all across the world, but we also provide a lot of opportunities for people in our communities to make a living. Through the years as farmers, we've always tried to do what was best for our surrounding areas and for our communities," Murphy says.

To be sure, their feet are being held to the fire, but that's nothing new. American farmers are the best, the most productive in the world, Mitloehner maintains. And that didn't happen by accident or without goals.

"We want to make sure that there is a future in this industry and that we can continue farming," Murphy says.

https://www.youtube.com/watch?v=To6H4vOSCu0&t=2s