

Study: Soybean oil reduces carbon footprint in swine barns

February 26 2009, by Steve Leer

One of agriculture's most versatile crops could one day play a role in combating climate change, Purdue University research shows.

In addition to using soybeans in beverages, biofuel, lip balm, crayons, candles and a host of other products, Purdue agricultural engineers Al Heber and Jiqin Ni found that soybean oil reduces greenhouse gas emissions when sprayed inside swine finishing barns.

Heber and Ni led a team of Purdue and University of Missouri researchers in the yearlong project, which monitored the effectiveness of soybean oil on dust and odor within hog facilities. Additional research is needed to address problems with oil spraying and substantiate the study's findings, the researchers said.

"This project provided baseline measurements of the greenhouse gas contributions of swine finishing barns," Heber said. "In addition to the baseline measurements, we now have some data on an abatement technology to reduce the carbon footprint contribution of a pound of pork."

Greenhouse gases are chemical compounds that contribute to the greenhouse effect, a condition in which heat is trapped in the lower atmosphere, producing global warming. In 2005, agricultural practices were responsible for 7.4 percent of total greenhouse gas emissions in the United States, according to the U.S. Environmental Protection Agency.

The Purdue study was conducted at a northern Missouri farm during a 12-month period ending in July 2003. Oil was sprayed in one of two monitored barns. Each barn housed about 1,100 pigs, Ni said.

The treated barn was sprayed with five cubic centimeters of oil per square meter of floor for one minute per day. The spray system was similar to the spray technology used to treat cropfields with pesticides.

"We tested three different methods of pollution mitigation: soybean oil sprinkling, misting with essential oils, and misting with essential oils and water," Ni said. "Our original intent was to see if those three methods would control dust, as well as odor emissions, ammonia, hydrogen sulfide, methane and carbon dioxide emissions."

Compared with the unsprayed monitored barn, the oil-treated barn showed an average 20 percent decrease in methane emissions and a 19 percent average reduction in carbon dioxide emissions. Methane and carbon dioxide are greenhouse gases.

Dust reduction was even more significant. The treated barn emitted about 65 percent less particulate matter than the untreated barn. Researchers suspected controlling dust also would lead to reduced greenhouse gas escapes, Heber said.

"The spray takes out dust, and since dust carries odor and it absorbs other gases, there was a scientific reason why it might take out those greenhouse gases," Heber said.

"We saw a reduction in odor, but it wasn't statistically significant. That may be because we didn't take enough air samples. All we can say is that there was a trend in odor reduction."

Several challenges stand in the way of using soybean oil in swine barns,

including safety, cleaning and the cost of application, Heber said.

"First of all, soybean oil is more expensive now than it was when we did the study," Heber said. "Whereas we thought it would cost less than a dollar per pig marketed to treat the barn - around 60 cents - since then the price of soybean oil has increased dramatically, and so the economics are not as good. Also, the application of oil can create a safety hazard for the producer.

"In addition, some of the oil ended up on the floor, the pigs, the feeders and fans. This makes the cleaning process more difficult. The producer we worked with indicated it took an additional day of power washing to clean that barn. That's an extra expense."

While soybean oil shows promise as a greenhouse gas control agent, it is too early to declare the findings conclusive, Heber and Ni said.

"There are technical problems with this practice, but those may be overcome through good engineering," Heber said.

"We need to do more research to get a better idea of the effectiveness of this technology and its benefit on environmental protection," Ni said.

More information: The oil spraying study appeared in the November-December issue of *Journal of Environmental Quality* To read the full paper, "Methane and Carbon Dioxide Emission From Two Pig Finishing Barns," go online to jeq.scijournals.org/cgi/reprint/37/6/2001.pdf .

Source: Purdue University

Citation: Study: Soybean oil reduces carbon footprint in swine barns (2009, February 26)

retrieved 20 April 2024 from

<https://phys.org/news/2009-02-soybean-oil-carbon-footprint-swine.html>

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