Real-Time Data Refines N_2O Emission Estimates

Carbon dioxide may be the best-known culprit behind global climate change, but Agricultural Research Service (ARS) microbiologist Tim Parkin is keeping tabs on another gas as well: nitrous oxide.

"Nitrous oxide (N_2O) can retain 300 times as much heat as carbon dioxide," says Parkin, who works at the ARS National Soil Tilth Laboratory in Ames, Iowa.

The Intergovernmental Panel on Climate Change uses models to estimate N_2O emissions, but better estimation methods are needed, according to Parkin. "We also need to know how N_2O emissions vary with rainfall, soil conditions, and management practices," he says.

Croplands are a significant source of N_2O, but measuring soil N_2O emissions is expensive and time consuming. So, as part of the ARS GRACEnet project (Greenhouse Gas Reduction through Agricultural Carbon Enhancement network), Parkin assembled a team that compared how accurately model simulations of N_2O emissions from agricultural fields mirror actual emissions.

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Other project collaborators included plant physiologist Tom Kaspar, laboratory director Jerry Hatfield, and AgCert scientists Marek Jarecki, Ray Jones, and Al Chan. AgCert, a subsidiary of the AES Corporation, based in Dublin, Ireland, produces and sells greenhouse gas emission credits from agricultural sources.

The team measured actual N_2O emissions four times daily for several months from an experimental cornfield in Iowa. Following the same schedule, they estimated N_2O emissions from the field using a computer model.

When comparing the two data sets, the researchers observed that the N_2O emissions estimates generally paralleled the actual measurements, but the model underestimated peak events. In addition, there was a time lag between actual and simulated events.

Given their findings, the team concluded that the model still shows some promise for providing estimates of N_2O emissions. But it needs refining and testing so those estimates will more closely mirror actual emissions data. With this additional work, the model could support scientists in fine-tuning their projections about global climate change.

"By comparing actual and estimated nitrous oxide emissions, we could pinpoint more accurate methods for identifying the range of agronomic factors and practices that contribute to global climate change," Parkin says.—By **Ann Perry,** ARS.

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Palm Oil Not a Healthy Stand-In for Trans Fats

In terms of daily diet, the *type* of fat one consumes has a greater effect on heart disease risk factors than the *amount* of fat. And both trans fatty acids and saturated fatty acids are associated with elevated risk, according to authors of an ARS-supported study. The clinical trial was designed to compare the effect—on plasma lipoprotein profiles—of four different oils as they are commonly consumed.

Trans fatty acids (trans fats) are produced in vegetable oils during a hardening process called "hydrogenation." Hydrogenation makes vegetable oils chemically more stable and extends the shelf life of food products made with them.

Manufacturers are now required to state on food labels the amount of trans fats in packaged foods. So the researchers addressed the question of whether palm oil, whose functional characteristics are similar to partially hydrogenated fat, would be a good substitute to reduce trans fats in foods.

Lead scientist Alice H. Lichtenstein and colleagues conducted the study. She is the director of the Cardiovascular Nutrition Laboratory at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University in Boston, Massachusetts.

Fifteen adults, both male and female, volunteered for the study. All were aged 50 or older. Their levels of LDL "bad" cholesterol were moderately high at 130 milligrams per deciliter of blood (mg/dL) or above. Palm oil was studied because it has been touted as a potential substitute for hydrogenated fat.

The volunteers consumed each of four experimental fat diets for 35 days. The fats tested were partially hydrogenated soybean oil (moderately high in trans fat), palm oil (high in saturated fat), canola oil (high in monounsaturated fat), and soybean oil (high in polyunsaturated fat).

At the end of each phase, the volunteers were tested to obtain plasma lipoprotein and fatty acid profiles and other measures related to heart disease.

The findings suggest that consuming either of the diets enriched with equivalent high amounts of palm oil or partially hydrogenated soybean oil resulted in similar, unfavorable levels of LDL cholesterol and apolipoprotein B (a protein that carries bad cholesterol throughout the bloodstream). That's when compared to consuming either of the diets enriched with canola oil or soybean oil, which are high in monounsaturated and polyunsaturated fats, respectively.

The results suggest that palm oil would *not* be a good substitute for trans fats by the food industry, the study authors wrote. For online information on healthful dietary oils, go to www.mypyramid.gov/pyramid/oils.html.—By **Rosalie Marion Bliss,** ARS.

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