

Study Finds Low Ammonia Emissions at Area Dairies

Improved Cattle feed Credited with Cutting Amounts of Manure

Air quality in the Yakima Valley gets worse during the winter months, from November to February, when too many residents keep warm with wood burning stoves that, when blended with vehicle emissions, bring significant air-quality challenges.

The Yakima Regional Clean Air Agency continues to work on improving air quality with local residents and businesses, including farms. Although research reveals small amounts of ammonia emissions from farms, experts say these emissions are insignificant and do not pose an overall threat to public health.

Pius Ndgwa, PhD., is an associate professor of biological systems engineering at Washington State University and a nationally recognized expert who was Washington state's principle investigator in a two-year ammonia emissions monitoring study that involved 15 universities across the U.S., measuring ammonia concentrations in dairy barns and from lagoons.

Research findings, published in peer reviewed journals, revealed that ammonia emissions were "very low" in the barns and in the immediate air outside the barns.

"Our long-term studies indicate concentrations or levels of ammonia in the barns and air outside the dairy barns are significantly below the permissible exposure limits set by the Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety Health (NIOSH)," Ndgwa said. "The data indicates that even in the rare event that a farm worker is in a barn for an entire eight-hour shift, there should be little safety or health concern from exposure to ammonia."

"In an open dry lot, ammonia concentrations averages approximately 1 parts per million, which is also significantly lower than OSHA and NIOSH levels to trigger any health concerns," he said. "Other research data indicate that ammonia emissions from field land following surface manure application fall in the same order of magnitude as that in barns or dry lots and much lower if manure is directly injected into the soil – hence the issue of health from these emissions would not be applicable, too. And for those living adjacent to fields where manure nutrients are applied, the concentrations they would receive or perceive are much less because ammonia in the air is dispersed during transport downwind."

Although ammonia from dairies have little impact on air quality, Valley dairy farmers are reducing emissions with feed combinations that the cow's body uses to bur energy, reducing the amount of manure and ammonia emissions.

The DeRuyter Brothers Dairy in Outlook, for example, employs two full-time veterinarians who work “cow-side” every day on all aspects of milking cow health, and in consultation with two professional dairy cow nutritionists for optimal health – and less manure.

“We have a computerized feed program that is connected from the scale to the feed truck.” Ginny DeRuyter explained. “The computerized (automated) program directs feed staff on how to mix the feed and what amount of each ingredient is needed. Every new feed is tested in the lab for nutritional analysis.”

The veterinarians and nutritionists develop feed combinations that the cow’s body uses to burn energy, reducing the amount of manure, while providing optimum natural milk production. The DeRuyter dairy operation regularly monitors cow manure emissions for air quality and, according to the Yakima Regional Clean Air Authority scorecard the DeRuyter farm did very well by not putting feed into the cow that the cow does not need or use.

Basic nutrition comes from understanding the cow’s physiology. How the cows digest nutrients in feed results in less manure and ammonia emissions.

“The ammonia comes from the manure that is a combination of feces and urine of whatever protein was not used or burned by the cows,” Ndgwa said. “While farmers reduce emissions through feed/nutrition science the amount of ammonia emitted is low and becomes lower the farther away from the barn, field or lagoon.”

A Yakima Regional Clean Air Agency (YRCAA) task force report on air quality management policy for dairy operations followed farm site visits by YRCAA teams to 61 Valley dairy farms. The agency assessed and evaluated each farm’s Best Management Practices utilization, across eight air pollutants within a dairy operation: ammonia (NH₃); nitrous oxide (N₂O); hydrogen sulfide (H₂S); volatile organic compounds (VOC); odor; particulate matter (PM); methane (CH₄) and oxides of nitrogen (NO_x).

“We had no issues whatsoever with 85 to 90 percent of the Valley dairy operations where we scheduled site visits, reviewed the BMP checklist and discussed how best to proceed at each farm,” said Yakima Clean Air Agency Director Gary Pruitt. “Our crew presents the facts, explains with dairy farmers what we are up to, and we get buy-in, with several dairy farmers demonstrating innovative practices to improve air quality and reduce odor.”

“What I know for certain is when one molecule of ammonia reacts with one molecule of nitrate, while two molecules of ammonia are needed for one molecule of sulfate,” Ndgwa concluded, “meaning that even the amount of particulate matter that would be formed in the air from that ammonia would be in similar proportions.”