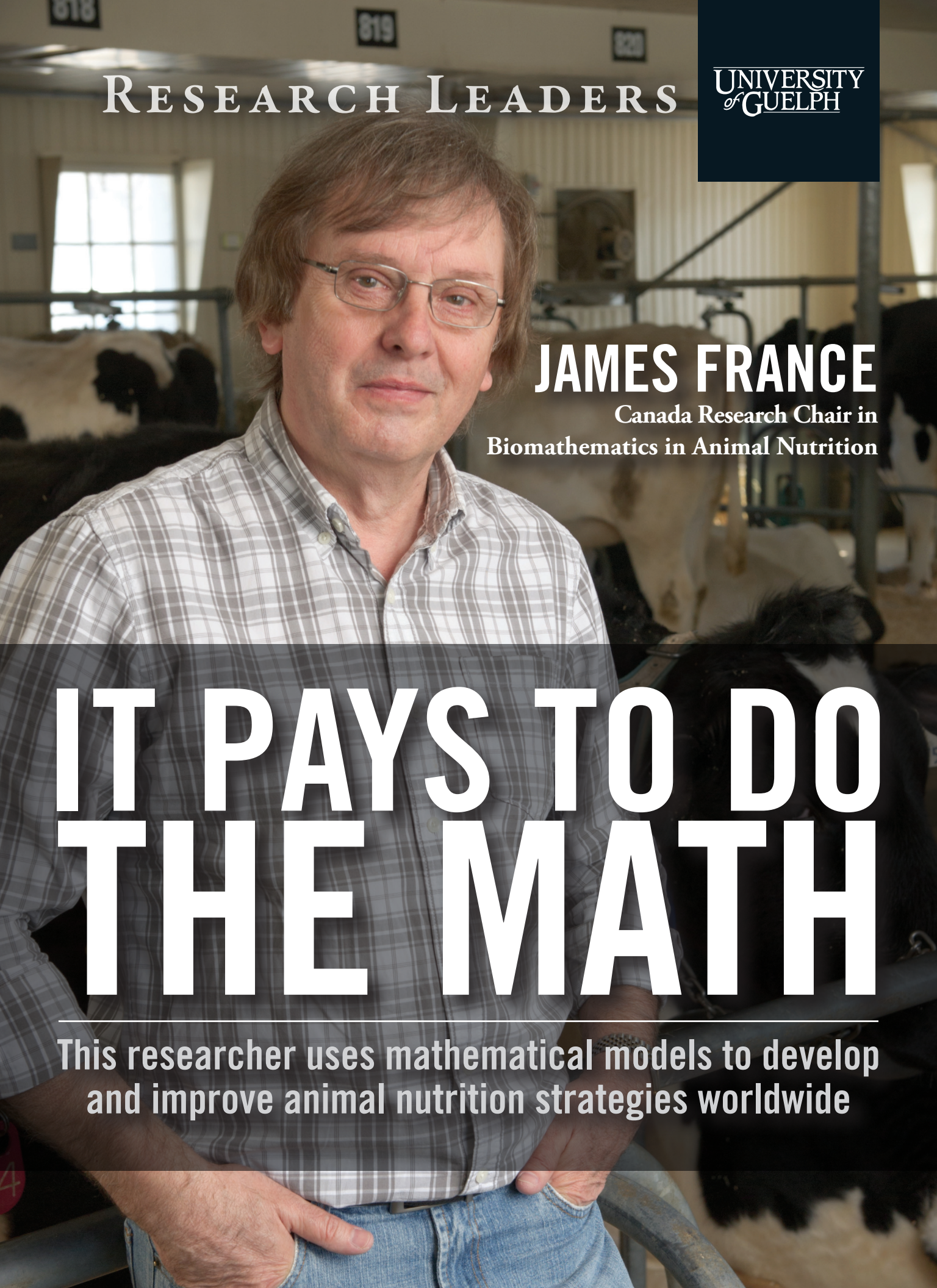

RESEARCH LEADERS

UNIVERSITY of GUELPH

JAMES FRANCE

Canada Research Chair in
Biomathematics in Animal Nutrition

IT PAYS TO DO THE MATH

This researcher uses mathematical models to develop and improve animal nutrition strategies worldwide

Advanced mathematical models help optimize animal health

It's tricky to find optimal animal nutrition strategies in agriculture. Farmers need to uphold animal and human health standards and minimize environmental pollutants, while maintaining cost-effectiveness.

That's why Prof. James France, Tier 1 Canada Research Chair in Biomathematics in Animal Nutrition, has teamed up with biologists from around the world to develop mathematical models of animal digestion and feeding systems. The models are improving nutrient efficiency on farms in a cost-effective, environmentally friendly way.

France regularly employs what he calls "bread and butter mathematics" – in particular, differential equations, statistics, optimization and basic algebra – that allows him to solve problems with many varying factors.

For France, the beauty of his research is that it is problem-oriented rather than technique-driven. His work allows him to pursue the real-life applications of mathematics in the field of biology, where factors like environmental impact, disease risk and production all need to be considered.

"Mathematics has a lot of applications to think about," he says. "When you start throwing it around, the possibilities are tremendous."

France's Canada Research Chair enables him to collaborate with biologists around the world. In the last five years, he has worked in India, South America, much of Western Europe and throughout the United States and Canada, especially on the system about which he is most passionate: the digestive system of dairy cows.

> **"Mathematics has a lot of applications...the possibilities are tremendous."**

The dairy cow's rumen is a massive ecosystem that houses up to 300 bacterial species, dozens of protozoan species and several fungal species.

"The dairy cow is the most interesting and complex organism on the planet," says France. "It has a phenomenal digestive system, which presents tremendous opportunities for mathematical problems."

Recently, France and his collaborators used mathematical models to study the effects of a high-sugar grass diet on cattle methane emissions and nitrogen excretion. Their findings will lead to feeding strategies that reduce environmental pollutants – but maintain milk production and animal nutrition – on dairy farms.

Most of France's research is centred on livestock, but he devotes some of his time to companion animals – namely dogs and cats – as well. For instance, up to one-quarter of North American dogs are clinically obese, and France's team is looking for a way to feed the animals so that they are healthy but not hungry.

One solution they are investigating is providing dogs with foods that mimic the benefits of caloric restriction without reducing total food intake. For example, they are looking into incorporating mannoheptulose, a sugar found in avocado, into dogs' diets.

He has also studied mad cow disease and phosphorus pollution in poultry.

Why is France so interested in animals?

"Animals have not been studied to the extent of the human being, so there's a lot to do. There is so much interesting math to be done," he says.

France hopes that his research will continue helping farmers around the world develop economical feeding systems that contain the spread of animal diseases – such as bird flu and hoof and mouth disease – and reduce the effects of environmental pollution in agriculture.

France receives funding for his projects primarily through the Canada Research Chairs program and NSERC.

UNIVERSITY of GUELPH

Office of the Vice-President (Research)
University of Guelph
Guelph, ON Canada N1G 2W1
519-824-4120, Ext. 53081

This profile was written by Megan Cowie, Students Promoting Awareness of Research Knowledge (SPARK)

The Canada Research Chairs program aims to boost the country's capacity as a global research leader by supporting outstanding and emerging scholars and scientists. The program, administered by the federal government, invests approximately $265 million per year in universities across Canada to attract and retain some of the world's most accomplished and promising minds. Chairholders aim to achieve research excellence in engineering and the natural sciences, health sciences, humanities and social sciences. The program has established almost 30 research chairs at the University of Guelph.

Visit the Canada Research Chairs program website at www.chairs-chaires.gc.ca and see Guelph's Canada Research Chairs at www.uoguelph.ca/research/discover-our-research/research-chairs/crc.