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**Report Name:** The Fertilize 4 Life Initiative - Combating Food Insecurity and Climate Change

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**Report Highlights:**

Dr. Jose Dubeux from the University of Florida gave a series of presentations in Brazil on the Fertilize 4 Life (F4L) Initiative at the end of September. The State Department's U.S. Speaker's Program sponsored his visit. His message was that the world needs to produce more food using fewer resources and reducing environmental problems. Dr. Dubeux pointed out that Brazil and the United States are major global producers with a long history of collaboration in agricultural research. He emphasized that the United States and Brazil need to supercharge this relationship to meet the challenges of global food insecurity and climate change and that the F4L Initiative is an ideal first step.

## Introduction



Dr. Dubeux during his presentation in Bagé.

From September 18-26, 2023, the University of Florida's professor Dr. José Dubeux gave a series of presentations in Brazil on the Fertilize 4 Life Initiative. Dr. Dubeux's visit to Brazil was sponsored by the State Department's U.S. Speaker's Program, which collaborates with U.S. embassies and consulates around the world to connect professional foreign audiences with American citizen experts on topics of strategic importance to the United States.

Dr. Dubeux is an internationally recognized authority on nutrient use in agricultural systems, with an emphasis on climate change mitigation and adaptation, methane emissions from livestock, and integrated crop livestock systems. Dr. Dubeux gave presentations to a broad and receptive audience in Bage, Brasilia, and Recife. He met scientists from Embrapa (The Brazilian Agricultural Research Corporation), agricultural industry representatives, academics, and the Brazilian media. Because of Dr. Dubeux's visit, there were 36 articles in the Brazilian press on F4L along with several television segments.

## The Existential Threats of Food Insecurity Security and Climate Change

Dr. Dubeux's message during his trip to Brazil was clear, compelling, and a call to action. By 2050, the world needs to produce 60 percent more food to feed an estimated 2.5 billion additional people that reduces environmental problems but uses less resources because of climate change. Improving fertilizer-use efficiency will be critical to achieve these results.

Improving fertilizer-use efficiency, unfortunately, will not be easy. There have been very limited advances in fertilizer technology since the 1950s. Current fertilizer production methods also add to the world's carbon footprint. Moreover, fertilizers produce greenhouse gases after farmers apply them to their fields. Much of the applied fertilizer runs off into waterways are broken down by microbes in the soil, releasing greenhouse gas nitrous oxide into the atmosphere. Pound per pound, nitrous oxide warms the planet 300 times as much as carbon dioxide. In recent years, Brazilian agriculture has also been using more and more fertilizers to maintain current yields.

## Research Collaboration Between the United States and Brazil Could be Part of the Solution

The United States and Brazil together feed 25 percent of the world. In addition, U.S. and Brazilian agricultural researchers are world-class with close historical ties in research. However, the United States and Brazil need to significantly increase their research collaboration to meet food insecurity and climate change challenges. Thus, F4L could help supercharge this collaboration that positively impacts the world's battle against food insecurity and climate change. For example, Africa could directly benefit from this research as soils in Africa are very similar to Brazil.

## The Fertilize 4 Life Initiative



Dr. Dubeux during his presentation in Brasilia

F4L began shortly after the Russian invasion of Ukraine and the shock it caused to global fertilizer and food supplies. The U.S. embassy in Brasilia reached out the Brazil's Ministry of Agriculture to see if we could undertake research on fertilizer-use efficiency that could benefit both our countries. Four world-class research institutions were recruited to participate in this Initiative.

- **USDA's Agricultural Research Service (ARS)** is the research arm of USDA. The agency's main focus is on research to develop solutions to agricultural problems and provide access to information for U.S. agriculture. ARS supports more than 2,000 scientists and post docs working on approximately 690 research projects in 90 research locations.
- **Embrapa** was founded by the Brazilian government in 1973. Since its inception, Embrapa has developed technologies aimed at improving Brazilian agriculture, including livestock. Today, Embrapa is the world's leading institution in tropical agriculture. Embrapa has 43 research centers throughout the country and employs over 2,000 researchers.
- **The University of Florida Institute of Food and Agricultural Sciences (UF/IFAS)** is a teaching, research, and extension scientific organization focused on agriculture and natural resources. IFAS is a leader in the United States in R&D expenditures in agricultural sciences and natural resources conservation.
- **The International Fertilizer Development Center (IFDC)** is a science-based public international organization working to alleviate global hunger by introducing improved agricultural practices and fertilizer technologies. Headquartered in Muscle Shoals, Alabama, IFDC has projects in over 25 countries.

Over the last year, over 60 researchers from USDA, ARS, IFDC and UF/IFAS developed four projects that are key to improving fertilizer-use efficiency. Each project is scheduled to last four to five years.

The research will be initiatively funded with a grant from the U.S. government. F4L was officially launched at a ceremony in Brasilia on April 26, 2023, marking the 50<sup>th</sup> anniversary of Embrapa. UF/IFAS, ARS and Embrapa also signed an MOU on research cooperation.

## The Four Projects that Make up the Fertilize 4 Life Initiative

Below are the four projects and their key objects.

- Precision management, big data, and artificial intelligence. This project has three main objectives:
  - Develop a platform that will integrate existing soil chemical, physical, and biological properties data and methodologies to develop nutrient management recommendations.
  - Develop site-specific nutrient management recommendations based on soil property maps and nutrient removal measurements.
  - Evaluate the utility of the tools developed in Objective 2 to ensure they match the needs of farmers, agronomists, and other stakeholders.
- Biological products, soil biology, and soil health. This project has two main objectives:
  - To advance soil health assessments in the United States and Brazil.
  - Develop better fertilizer-use efficiency (FUE) strategies based on bioproducts.
- New products, including fertilizer and bio-stimulants. This project has five main objectives.
  - Conduct a comprehensive review of the literature which will (a) identify agronomic, environmental, and economic limitations of currently available nutrient sources and (b) provide a framework for designing and evaluating new nutrient formulations.
  - Develop standardized protocols for evaluation of new fertilizer products to evaluate their effects on crop nutrient use efficiency, production costs, and environmental and human health impacts; these protocols will be designed to proceed from the laboratory to greenhouse to field scales.
  - Increase the transportation and application characteristics of different organomineral formulations by addition of nutrients and additives (e.g. polymers, clay, organic substances) during the granulation process.
  - Enhance the agronomic crop productivity and environmental impact characteristics of different organomineral formulations by addition of biostimulants and/or microbial inhibitors.
  - Carry out a socioeconomic and environmental assessment of the technology using the standardized protocol develop under Objective 2 to determine economic feasibility, agronomic potential, and environmental impacts of new fertilizer products.
- More efficient use of existing nutrient sources. This project has three main objectives:
  - Evaluate the ability of cover crops to recycle N, P, and K and increase mineral fertilizer use efficiency in annual crop rotations, integrated crop livestock systems (ICLS), or integrated crop livestock forestry systems (ICLFS).
  - Assess legume species and genotypes as forage sources and annual cover crops, then quantify how much these legumes can reduce fertilizer use when used in rotation.
  - Measure the performance of grass-legume mixed pastures or legume only pastures in integrated crop-livestock systems to increase nutrient efficiency and reduce mineral N fertilizers.

## **The Way Forward**

Dr. Dubeux's visit was well received by his Brazilian audience. He emphasized that we have a worldwide crisis to significantly increase food production in the next 25 years that reduces environmental problems, with fewer resources because of climate change. Dr. Dubeux emphasized that the combined efforts of U.S. and Brazilian agricultural research scientists are up to meeting this challenge. Therefore, the outcomes of the Fertilize 4 Life Initiative could increase fertilizer-use efficiency, reduce dependency on imports, mitigate the amount of greenhouse gas emissions from agriculture, and provide lasting solutions to advance sustainable agricultural systems in Brazil, the United States, and worldwide.

**Attachments:**

No Attachments.