Name: Jose Alberto Oliveira Prendes

Subject: Evaluation and calibration of CERES-maize (DSSAT) for maize silage production in northern Spain: Seasonal analysis and modeling climate change impacts

Theme 2: Strengthening resilience in the face of multiple risks in a connected world

Host institution:

Institute of Food and Agricultural Sciences

Agriculture and Biological Engineering Department

University of Florida

Frazier Rogers Hall

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Name of my host collaborators:

Dr. Kenneth J. Boote, Adjunct Professor

Dr. Gerrit Hoogenboom, Professor

Dates of the fellowship: 19 April 2022 to 31 May 2022.

I give my consent to my report being posted on the Co-operative Research Programme's website

1. **What were the objectives of the research project? Why is the research project important?**

The objectives of the research project were: 1) to adapt the CERES-Maize model to simulate and output silage production (fresh weight, dry weight, ear:total plant ratio, crude protein, dry matter concentrations of total, ear, and grain as well as quality aspects such as starch, organic matter digestibility, and feed units for milk) and for responses to climate and crop maturity, 2) to calibrate the adapted model with data collected on three maize cultivars (FAO 200, FAO 300 and FAO 400) evaluated at four sites in Asturias (northern Spain) during the years 2012, 2013 and 2014, 3) to initiate the publication of a paper in a scientific journal.

The research project is important because the adaptation of the CERES-Maize model to simulate and output silage production and the calibration of the adapted model with data collected in Asturias will help farmers decide which maize cycle cultivars to plant for a given site and to better evaluate potential biomass productivity and quality for chosen maize cycle cultivar/site combination.

2. **Were the objectives of the fellowship achieved?**

The CERES-Maize model in DSSAT was adapted to simulate and output silage production and responses to weather and cultivar maturity were accounted for.

The adapted model was calibrated with data collected on three maize cultivars (FAO 200, FAO 300 and FAO 400) evaluated at four sites in Asturias (northern Spain) during the years 2012, 2013 and 2014.

A draft of a publishable paper was initiated.

3. **What were the major achievements of the fellowship? (up to three)**

   a) To adapt the CERES-Maize (DSSAT) model for ability to simulate maize silage production.
   b) To calibrate the adapted model with data collected on three maize cultivars evaluated at four sites in Asturias for three years.
   c) To initiate a draft of a publishable paper.

4. **Will there be any follow-up work?**

Is a publication envisaged? A draft of a publishable paper on the subject was initiated.

Will this be in a journal or a publication? In a scientific journal.

When will it appear? Probably in 2023

Is your fellowship likely to be the start of collaboration between your home institution and your host?

Dr. Boote and Dr. Oliveira are already good collaborators in prior research activities, starting when Dr. Oliveira took the DSSAT training course in the USA (May 2019), followed up by "long-distance" virtual collaboration research targeted toward adapting the CROPGRO-Perennial-Forage model for simulating ryegrass production.

Is your research likely to result in protected intellectual property, novel products or processes?

The CERES-Maize model adapted for silage production will be part of the DSSAT software, which is public domain, and thus will not be protected intellectual property. The advantage is that DSSAT software will be available worldwide to multiple users with no fee, thus being available to the public.

5. **How might the results of your research project be important for helping develop regional, national or international agro-food, fisheries or forestry policies and, or practices, or be beneficial for society?**

The results of this research project have a potential impact to fill a vacuum in the modeling of maize silage in northern Spain (and for a worldwide group of DSSAT CERES-Maize modelers and users). The new capabilities for predicting maize silage production and quality will be added to the DSSAT's CERES-Maize model, thus providing a new tool for a worldwide modeling community of DSSAT modelers and users.

6. **How was this research relevant to:**

The objectives of the CRP? To ensure the sustainable use of natural resources in the areas of food and agriculture, the DSSAT crop modeling system can provide alternative management options to increase crop yield and quality, optimize resource use, and minimize environmental impact for long term sustainable agricultural production**.**

The CRP research theme? This research aligns with theme 2: Strengthening resilience in the face of multiple risks in a connected world. Topic: climatic risks to production. Adding new capabilities to the CERES-Maize model, of simulating silage production is a significant contribution to the DSSAT crop modeling community and its sensitivity to rainfall, temperature and solar radiation, thus providing a valuable tool to evaluate climate risks to silage production.

7. **Satisfaction**

Did your fellowship conform to your expectations? Yes

Will the OECD Co-operative Research Programme fellowship increase directly or indirectly your career opportunities? No

Did you encounter any practical problems? No

8. **Advertising the Co-operative Research Programme**

How did you learn about the Co-operative Research Programme? Through the National Correspondent