



NAME: MICHAEL PURUGGANAN

Project: Theme III: Bioinformatic analysis of RAV gene family in rice: mining systems genetic datasets.

Host Institution: Centre for Research in Agricultural Genomics, Barcelona, Spain

Host Scientist: Dr. Soraya Pelaz

Fellowship Dates: July 1-August 2, 2019 and November 25-29, 2019

Consent: I consent to post this report.

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

The objective of this project was to examine a variety of functional genomic and systems biology databases developed primarily by the Fellow's laboratory to understand the function of the OsRAV9 and related genes in rice. A particular focus is to examine the relationship of expression of this gene with OsMADS18 and examine their possible roles in drought stress response. This project could provide insight into drought-escape responses of rice in response to drought, specifically by accelerating flowering time.

2. Were the objectives of the fellowship achieved?

Much of our objectives were achieved, including examining selection on gene expression for these study genes, their heritability of expression and relationship to various traits in the field.

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

(a) We found that while OsMADS18 expression had high association with rice wet field and dry field flowering time ($p < 2 \times 10^{-5}$ and 6×10^{-6} , respectively), OsRAV9 – which partially regulates OsMADS18 expression is not significantly associated. This may mean that OsRAV9 function is stably important across different rice landraces.

(b) We find, however, that there is significant genotype, environment (wet vs. dry field) and G x E interaction in expression variation for OsRAV9 and OsRAV11. The heritabilities in gene expression are also fairly high for OsRAV9 ($H^2 = 0.333$) and OsRAV11 ($H^2 = 0.35$)

(c) In the course of the fellowship, I gave 3 seminars at the host institution and established collaborations for the future.

4. Will there be any follow-up work?

The Purugganan and Pelaz laboratories will continue to collaborate on examining the regulatory interaction between OsRAV9 and OsMADS18, and will continue to study this in future experiments with transgenic OsMADS18 lines being developed in the Fellow's laboratory. Moreover, in a side project, we have developed a collaboration with the Casacuberta laboratory in the host institute to conduct transposon-GWAS mapping for gene expression in rice.

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?

Understanding the regulatory framework of cereal crop flowering time, specifically under drought conditions, can help in the development of new varieties of climate-ready crops. By providing insights into how flowering time is regulated, particularly under drought, we can use this to breed new drought-escape mechanisms into cereal crops, and help mitigate possible effects of drought stress conditions.

6. How was this research relevant to:

The fellowship provided an avenue for stronger collaborations between the Fellow's laboratory at the New York University Centre for Genomics and Systems biology (USA) and the Centre for Research on Agricultural





Genomics (Spain) to help address issues in crop biology. This is particularly relevant to the OECD Cooperative Research Programme: Biological Resource Management for Sustainable Agricultural Systems, Theme III: Transformational Technologies and Innovation. Specifically, this helps advance the use of genomic science for agricultural improvement.

7. Satisfaction

The Fellowship did meet expectations, particularly in helping establish and/or strengthening international research collaborations. This provides opportunities to continue joint research activities in the future between the Fellow's laboratory and research groups in the host institution.

8. Advertising the Co-operative Research Programme

I learned about the programme through hosting a previous OECD CRP Fellow. Wider dissemination of the fellowship may help through mass emailing of scientists.

