Aninda Retno Utami Wibowo
S2106876

The Breadfruit (*Artocarpus altilis*) Habitat Suitability Under Present and Future Climate Conditions

I. Introduction

The Breadfruit (*Artocarpus altilis*) is one of the stale fruit in tropical country. The breadfruit is a tree with up to 26 m height and the fruit is oval – oblong shape, up to 6 kg weight. This species belongs to the Moraceae family and has a pantropical distribution (Zerega et. al. 2010). The distribution also supported by GBIF data that collected from every tropical country.

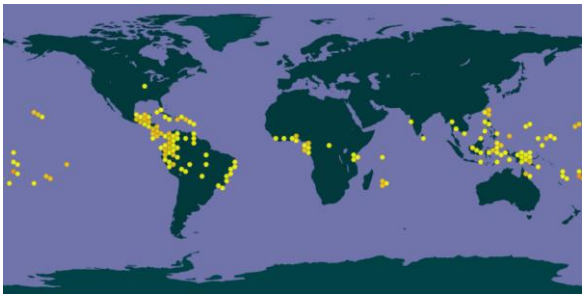


Figure 1. Present species distribution in the world based on data collected.

II. Methodology

Species occurrence data from GBIF was converted into cvs file format and then run it in R programme. MaxEnt application is used to make species distribution models with setting modes as follows: Linear features, Quadratic features, create response curves, and make picture of predictions. Linear and Quadratic features were used to models the closer prediction in ecological niche theory. During the variable selection from BioClim, there were 11 variables that are highly correlated. Out of that 11 variables, 8 variables were selected: Bio2, Bio5, Bio7, Bio8, Bio9, Bio15, Bio18, Bio19. Those 8 variables are independently affected the models, represent the temperature and precipitation range in each region.

III. Model Output

The output model response to the present and future distribution map according to the selected variable are shown below.

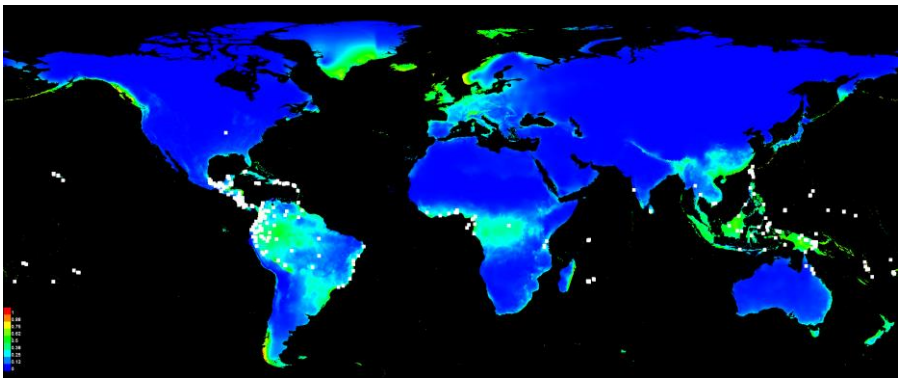


Figure 2. Present distribution area by model, the suitable area shown in warmer colour

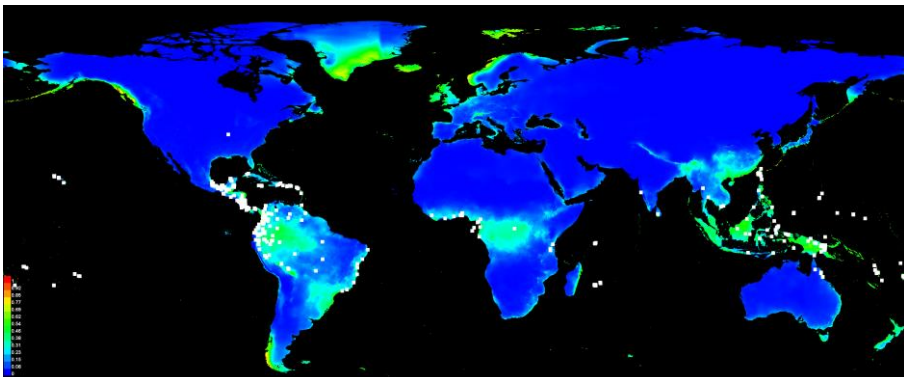
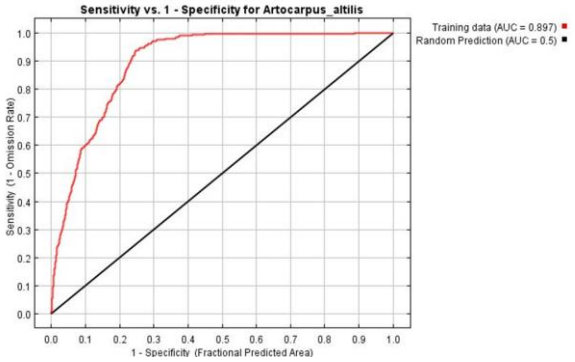


Figure 3. Future distribution area by model, the suitable area shown in warmer colour

The maximum achievable AUC is 0.897 which is considered to be the maximum value. This model has high probability as a good model but need more consideration to use as it shown from figure 2 and 3 that this model may overfitted.



Variable	Percent contribution	Permutation importance
bio7	79.7	73.5
bio2	12.4	12.3
bio18	4.3	3.7
bio15	2.7	9.7
bio19	0.5	0.2
bio9	0.4	0.5
bio8	0	0.1
bio5	0	0

Figure 4. The AUC value for model correction and the variable importance table

From the variable importance table, the main driver in the distribution patterns model is the temperature changes. The temperature changes are shown by Bio7 and Bio2.

IV. Response to Future Scenario

The response in the future scenario 2050 shows that the suitable habitat for *Artocarpus altilis* is wider than the actual occurrence. This result probably happens because we just give the attention to the climate change. Another response is that the suitability in the present habitat is decline.

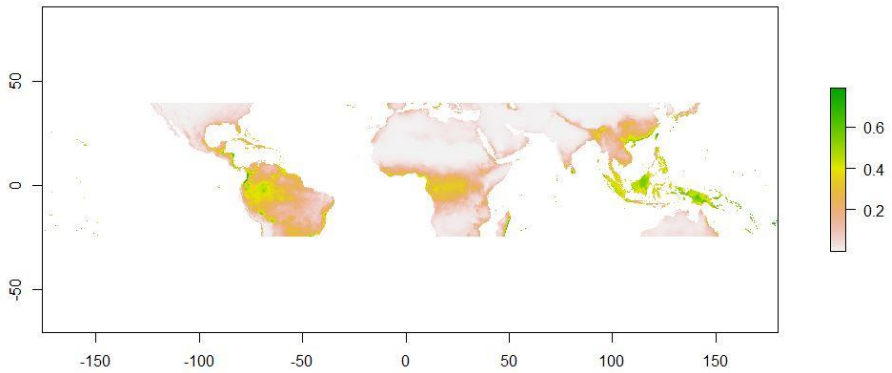


Figure 5. The future response based on global climate change, the suitable area shown with yellow and green colour

V. Biological Interpretation

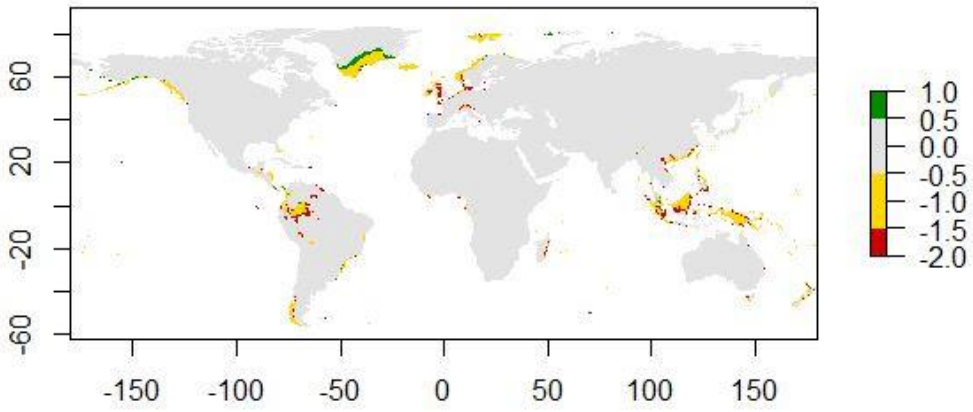


Figure 6. Future plot prediction in suitable area

The distribution change expected to be extrapolating to the temperate area with the warm effect from the climate change. And present distribution area is no longer suitable. This will affect the species to be more vulnerable since the suitable areas are more scattered. The species probably forced to adapt the new suitable area or genetic drift in small population will force them to decline.

The model is useful in predicted the new suitable area and under the constant population assumption. While new area in the pole should be not considered, the new prediction area there might because of the Bio15 variable. The limitation of this model is that we only predict by the climate change and the climate trends that come from past decades. This model does not give us prediction from the land use change and the biotic interaction.

References

GBIF Occurrence Download doi:10.15468/dl.i9zaa5 accessed via GBIF.org on 06 Dec 2017

Zerega, N. J. C., M. N. N. Supardi, and T. J. Motley. 2010. Phylogeny and Recircumscription of Artocarpeae (Moraceae) with a Focus on Artocarpus. *Systematic Botany* 35(4): 766–782.