

# Crop pollination services



**bc<sup>3</sup>**  
BASQUE CENTRE  
FOR CLIMATE CHANGE  
Klima Aldaketa Ikergai



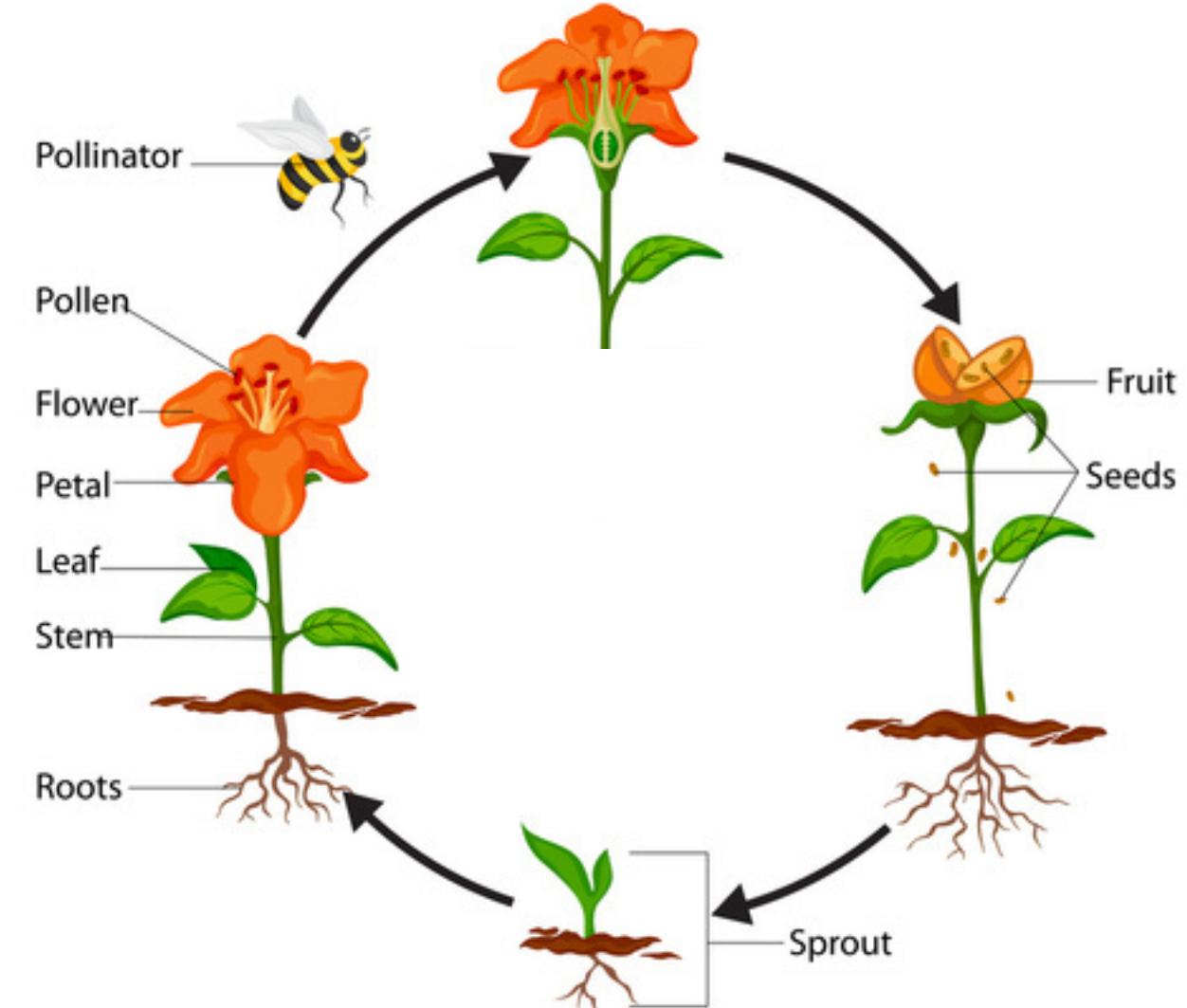
- 87.5% of angiosperms are pollinated by animals

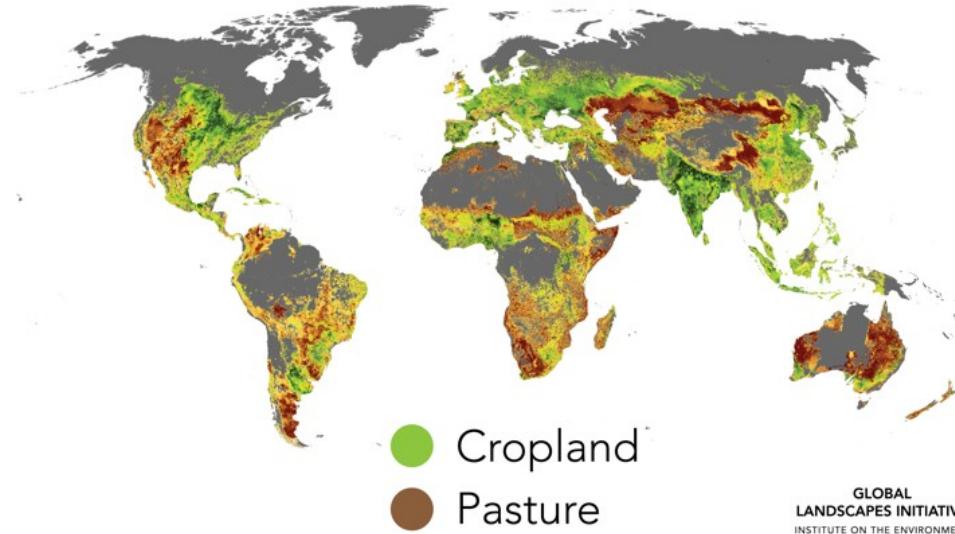


- 70% of crops depend on pollinators to some extent



**Without bees they'll  
all be off the menu**



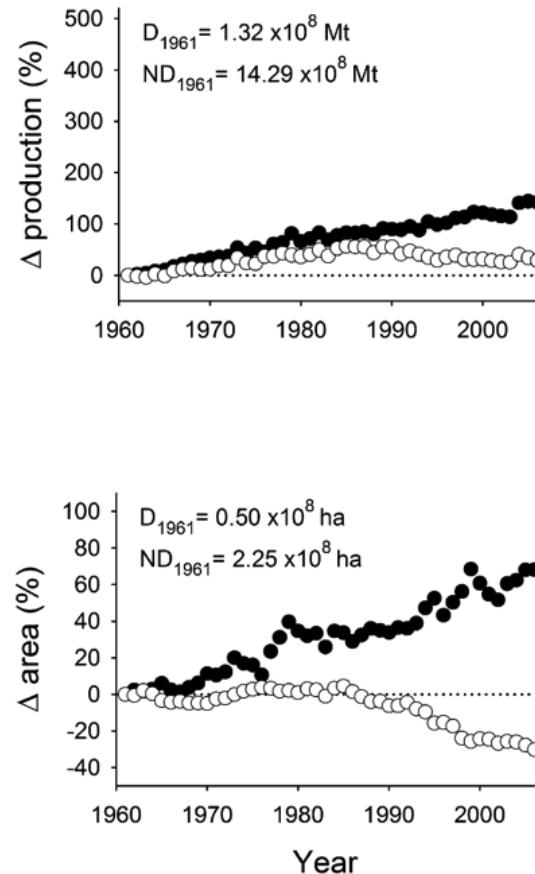


1 in 3 bites  
  
 of food you eat is the result of  
 insect pollination

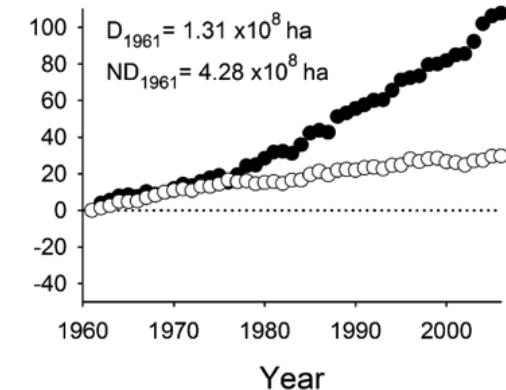
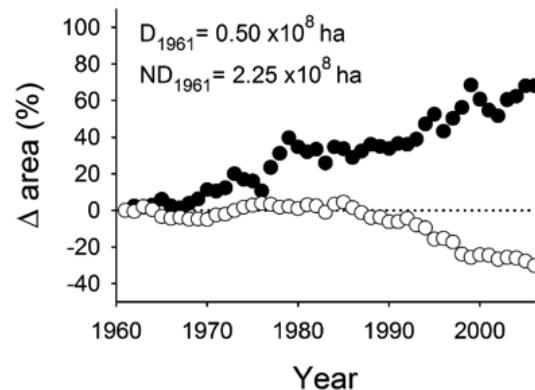
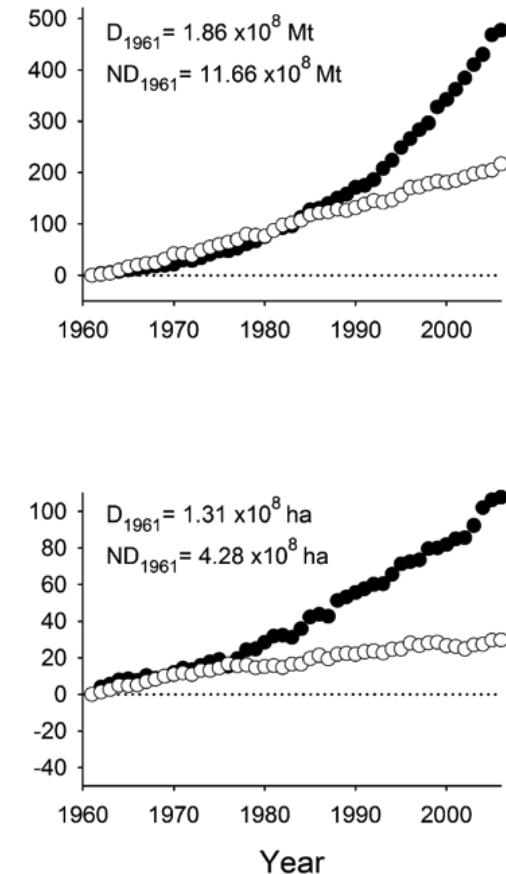
There are roughly  
**3,600**  
 species of bees native to  
 North America



**Developed world**



**Developing world**



- Dependent (D)
- Nondependent (ND)



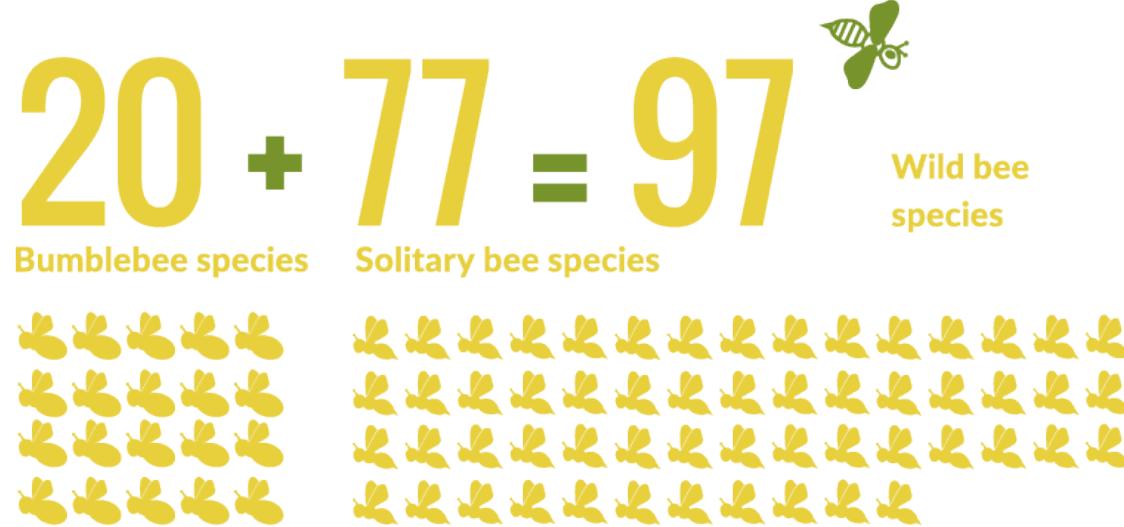
[springuniversity.bc3research.org](http://springuniversity.bc3research.org)



Only **1**  
Honeybee species



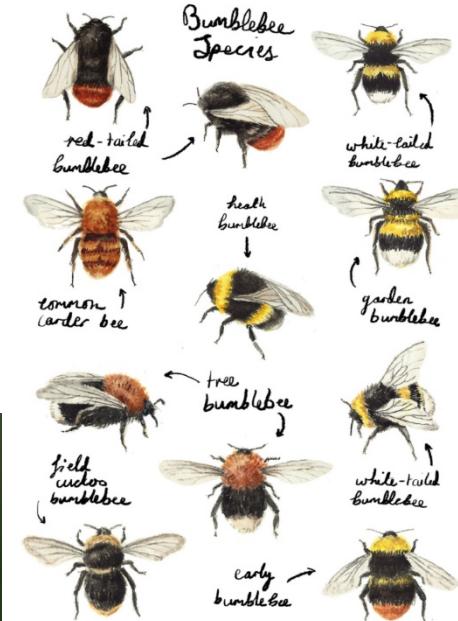
There are roughly  
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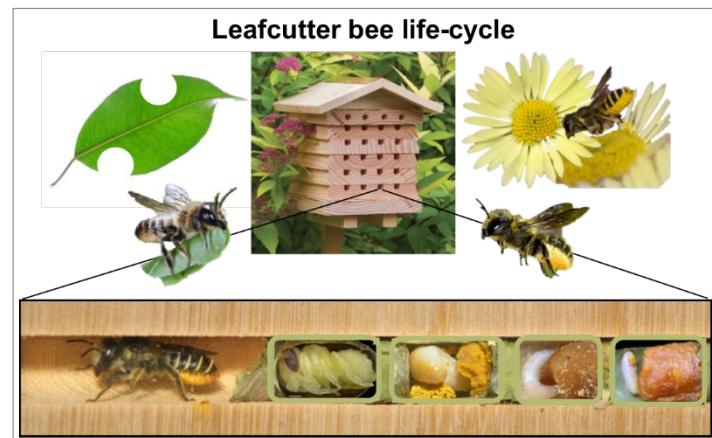
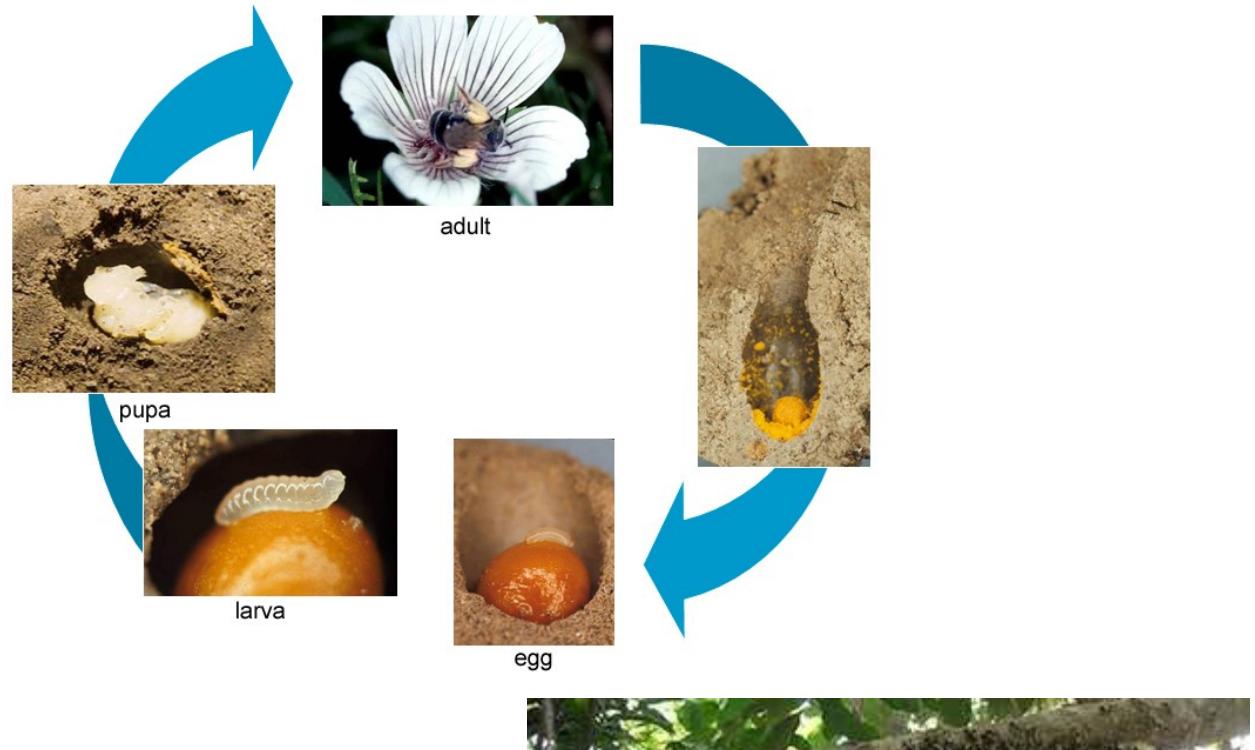
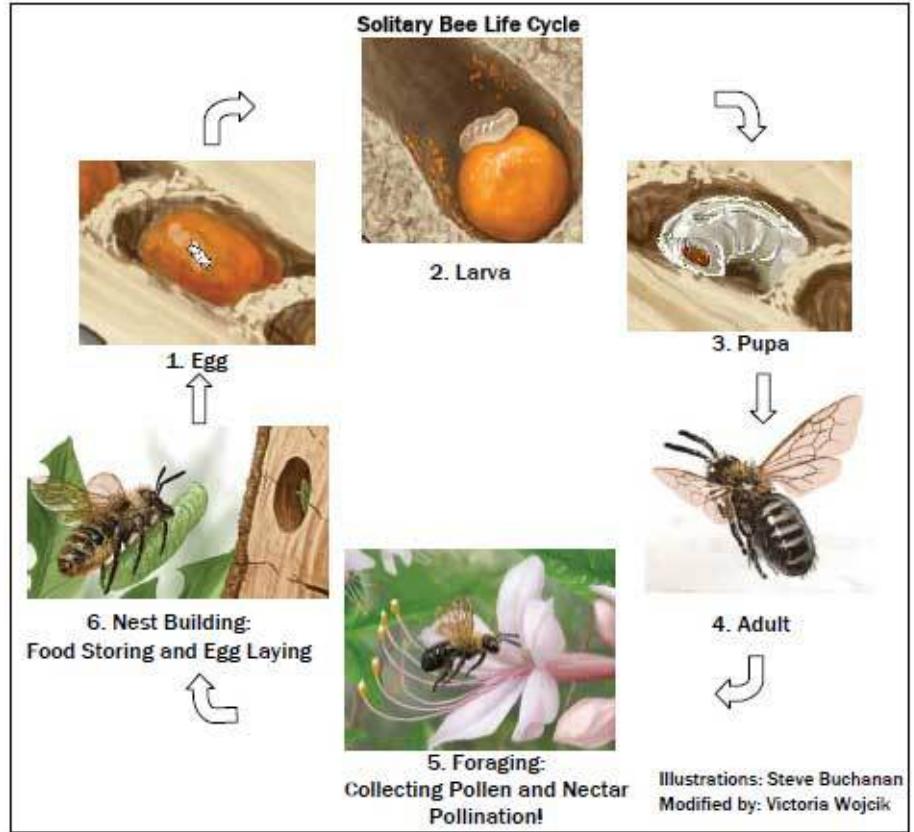


**28%**

of North American  
bumble bee species in decline





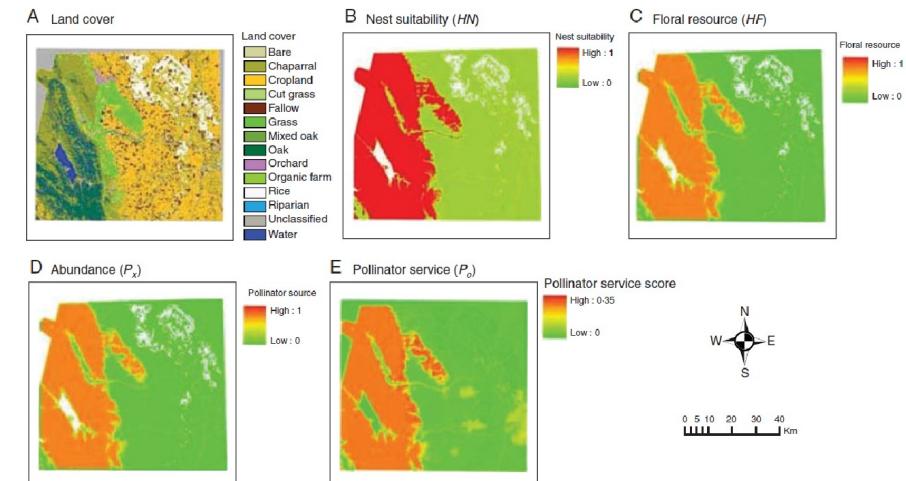


## Modelling pollination services across agricultural landscapes

Eric Lonsdorf<sup>1,\*</sup>, Claire Kremen<sup>2</sup>, Taylor Ricketts<sup>3</sup>, Rachael Winfree<sup>4</sup>, Neal Williams<sup>5</sup> and Sarah Greenleaf<sup>6</sup>

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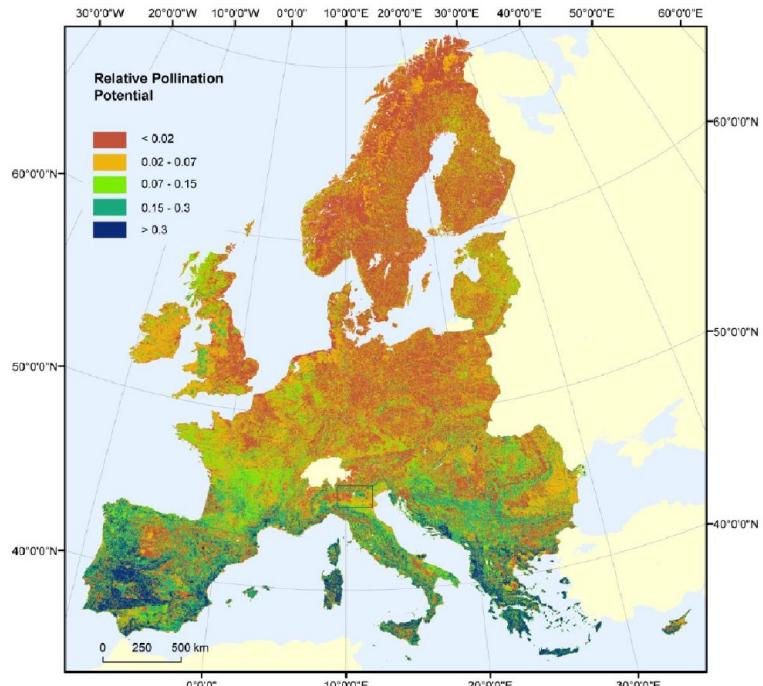
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Article

## Linking Land Cover Data and Crop Yields for Mapping and Assessment of Pollination Services in Europe

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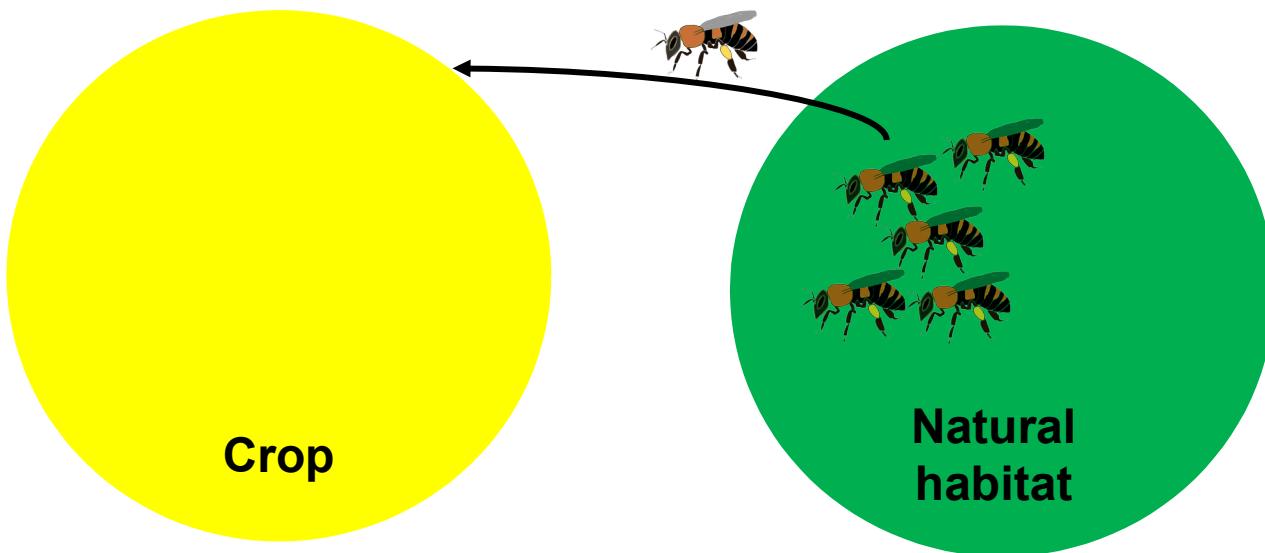


# Main concepts for supply

1. Flower availability
2. Nesting suitability
3. Presence of water (streams, lakes or waterbodies)
4. Temperature
5. Solar radiation

Landscape  
suitability

Insect activity



# Main concepts for demand

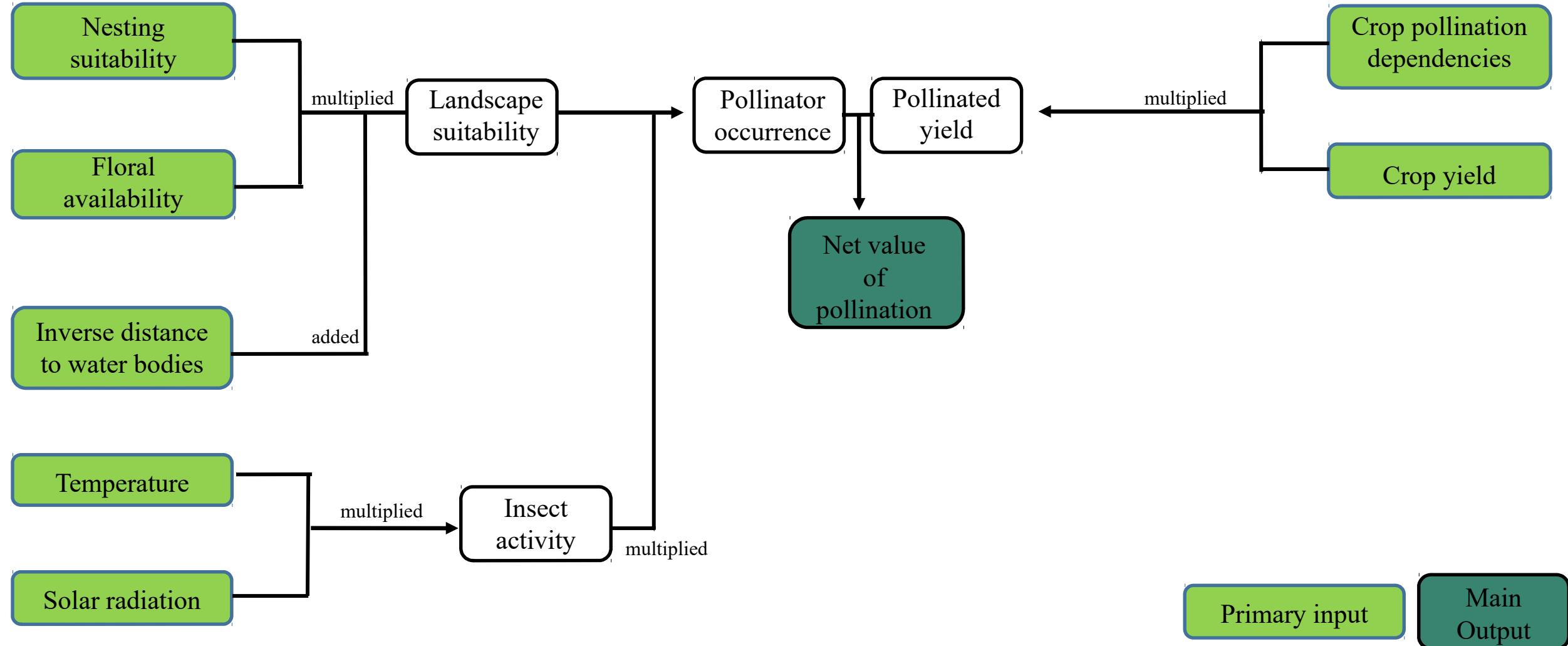
1. Crop yield
2. Crop dependence on pollination

Pollinated yield



Fonte: United States Department of Agriculture - Roger A. Morse and Nicholas W. Calderone, Cornell University.





Nesting suitability  
(LC reclassification)

Floral availability  
(LC reclassification)

Inverse distance to  
water bodies

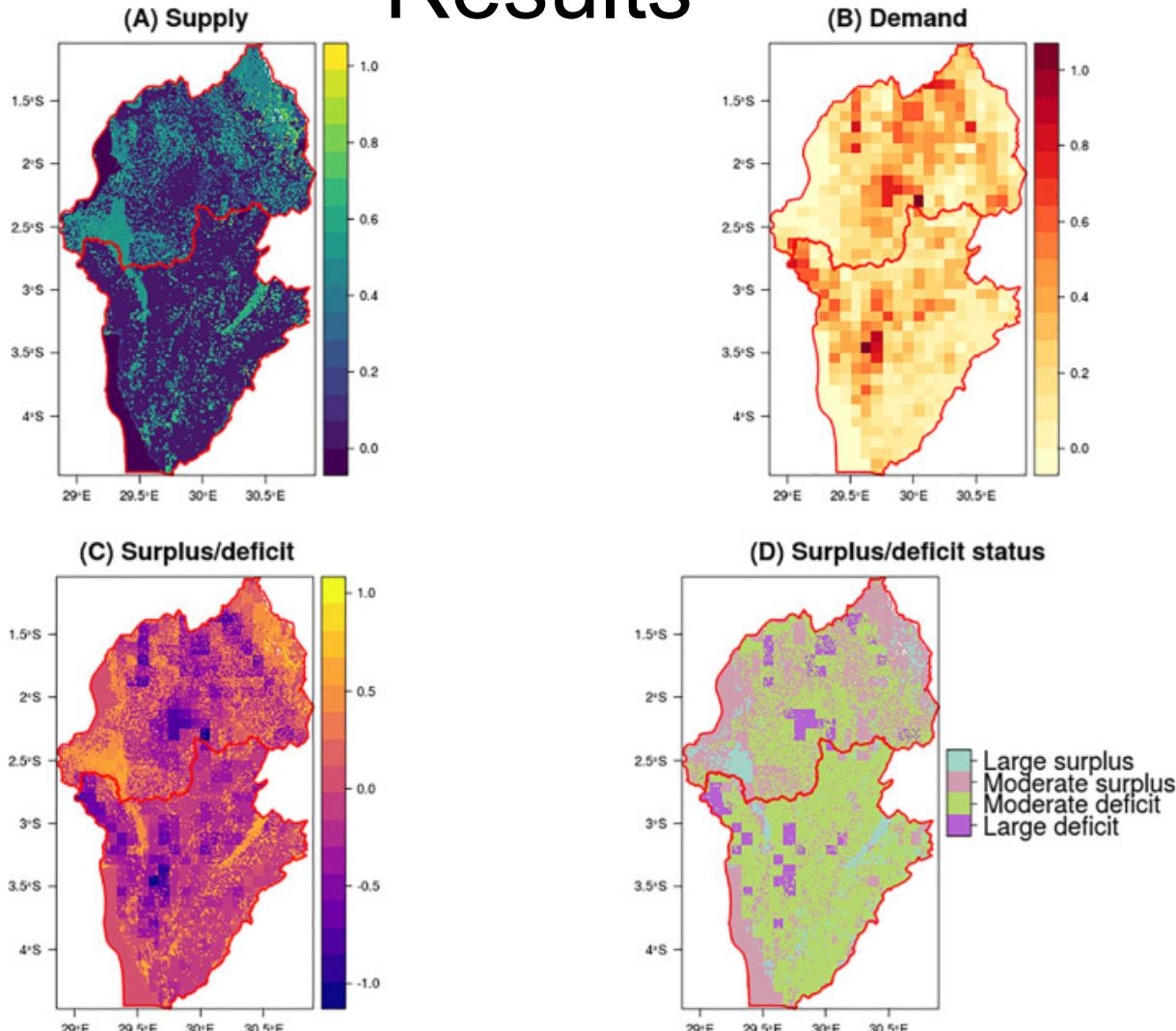
multipled

added

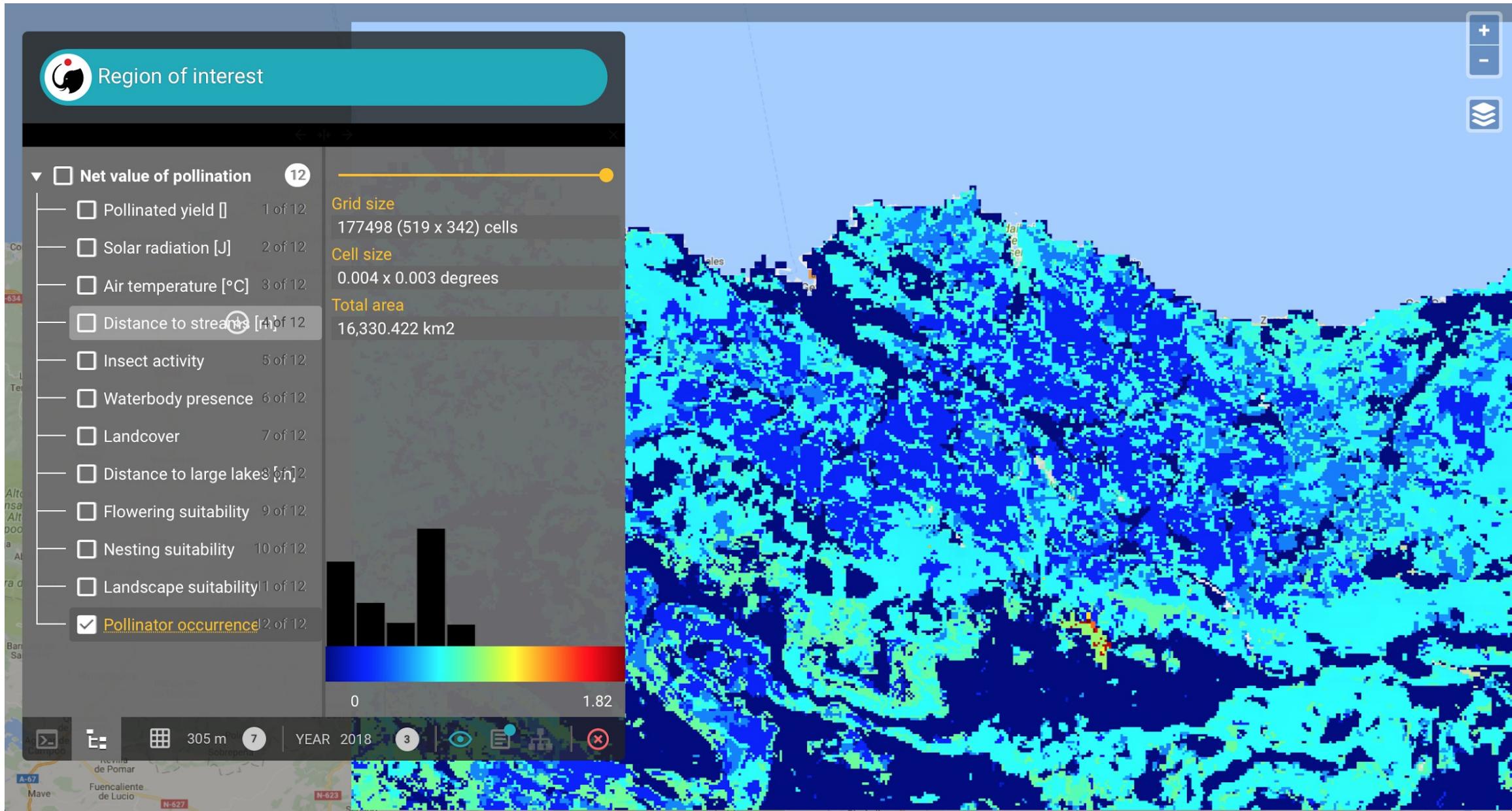
```
1 @documented(pollination)
2 namespace aries.global.pollination
3     using (FLOWERING_PROBABILITY_TABLE, NESTING_PROBABILITY_TABLE)
4         from aries.global.pollination.tables;
5
6 @documented(pollination.nesting-suitability)
7 model occurrence of agriculture:Pollinator ecology:Nesting
8     observing landcover:LandCoverType named landcover
9         lookup (landcover) into NESTING_PROBABILITY_TABLE;
10
11 @documented(pollination.flower-availability)
12 model probability of ecology:Flowering
13     observing landcover:LandCoverType named landcover
14         lookup (landcover) into FLOWERING_PROBABILITY_TABLE;
15
16 @documented(pollination.insectoccurrence.landscape)
17 model occurrence of agriculture:Pollinator biology:Insect caused by ecology:Landscape
18     observing
19         distance to earth:Waterway in m named distance_to_streams,
20         distance to earth:WaterBody in m named distance_to_large_lakes,
21         probability of ecology:Flowering named flowering_suitability,
22         occurrence of agriculture:Pollinator ecology:Nesting named nesting_suitability
23     set to [
24         def lake_effect = nodata(distance_to_large_lakes) ? 0 : Math.exp(-distance_to_large_lakes/0.5)
25         def stream_effect = nodata(distance_to_streams) ? 0 : Math.exp(-distance_to_streams/0.5)
26         return stream_effect + lake_effect + (nesting_suitability * flowering_suitability)
27     ];
28
```



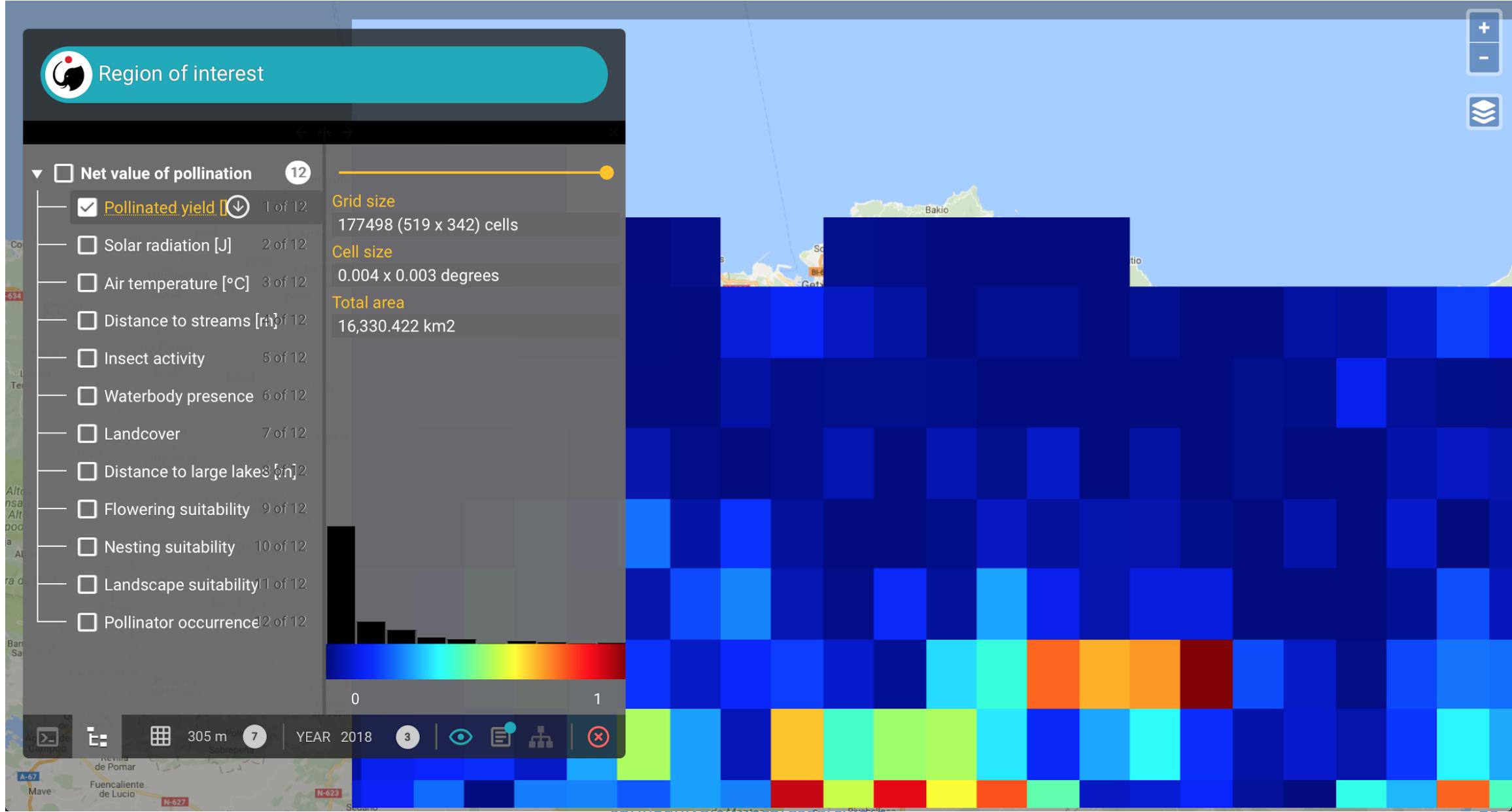
# Results



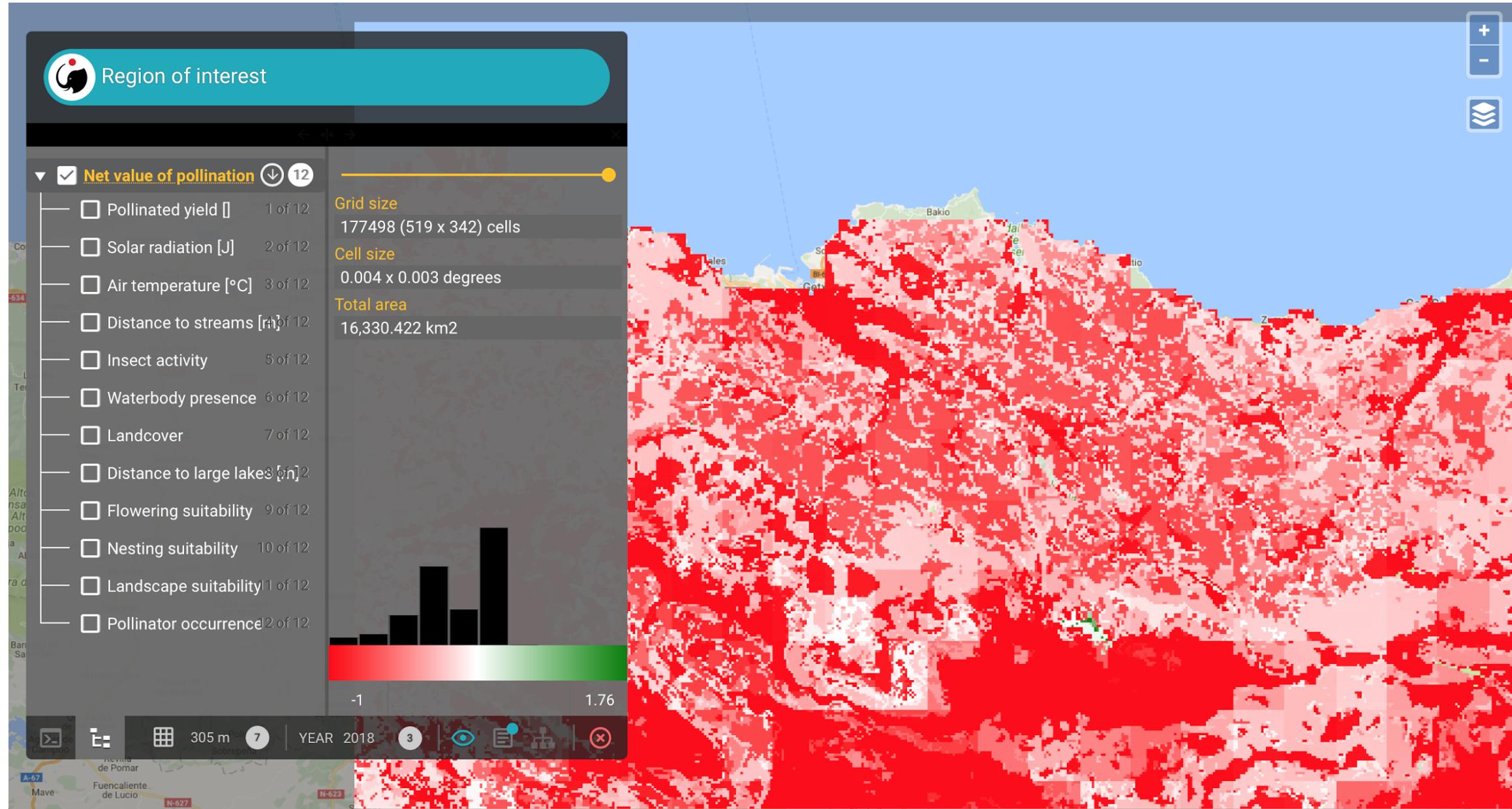
# Results Supply



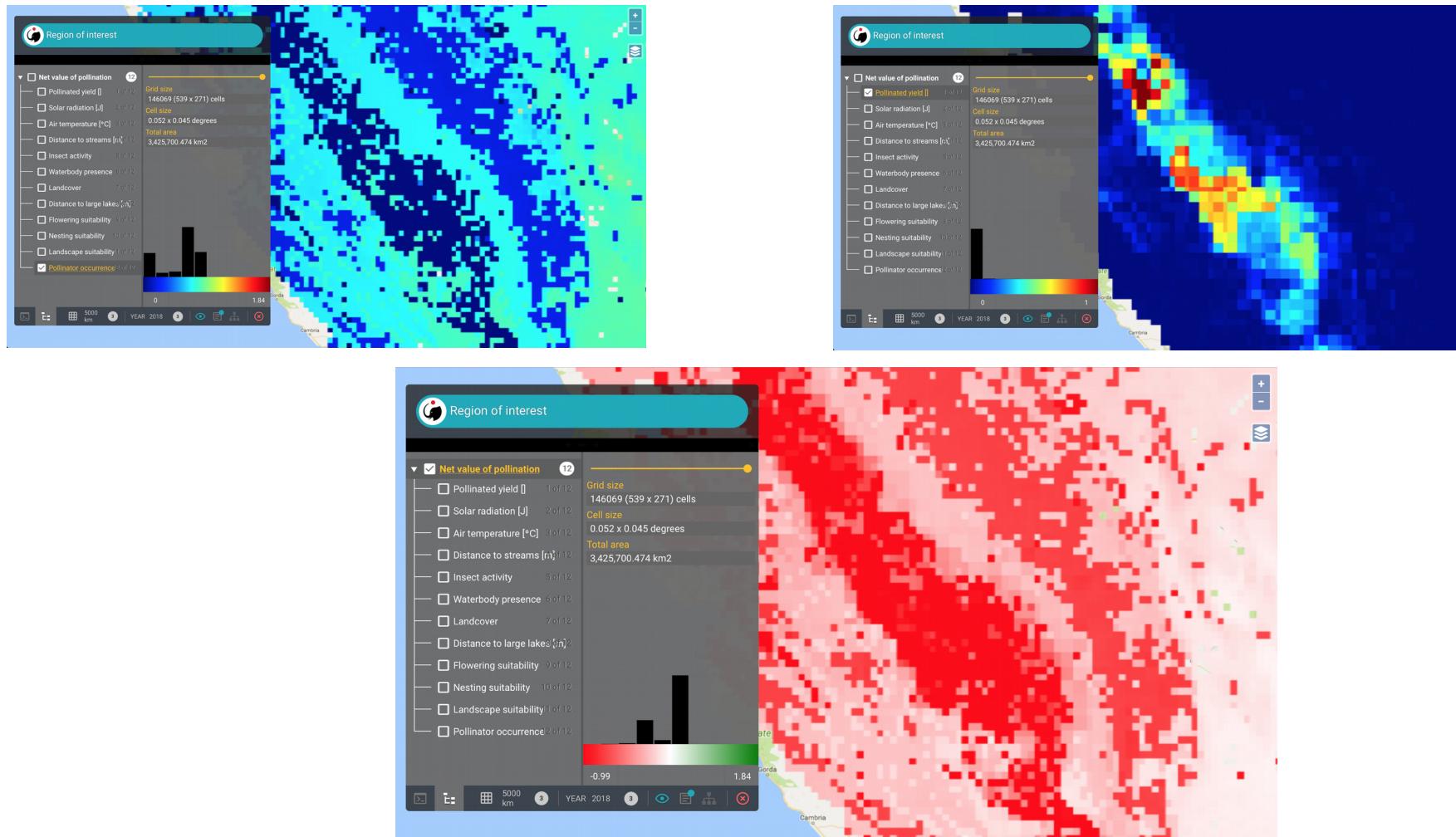
# Results Demand



# Results Surplus/Deficit



# Results

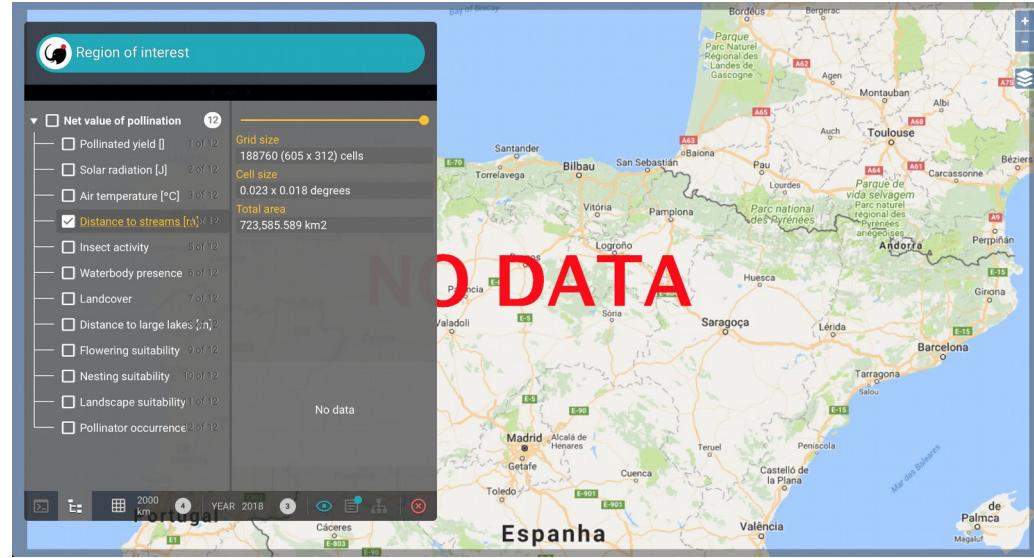
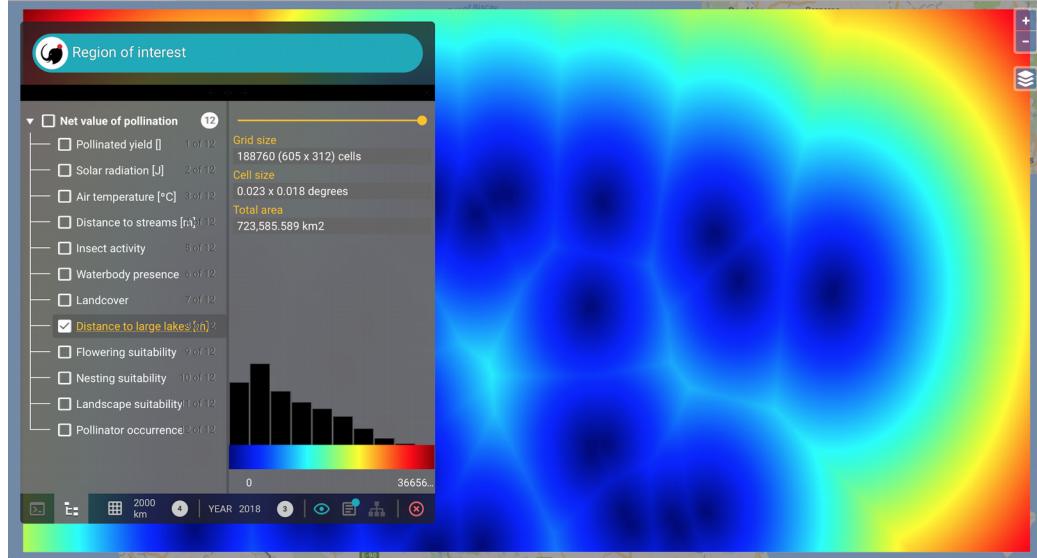


# Examples of model customization

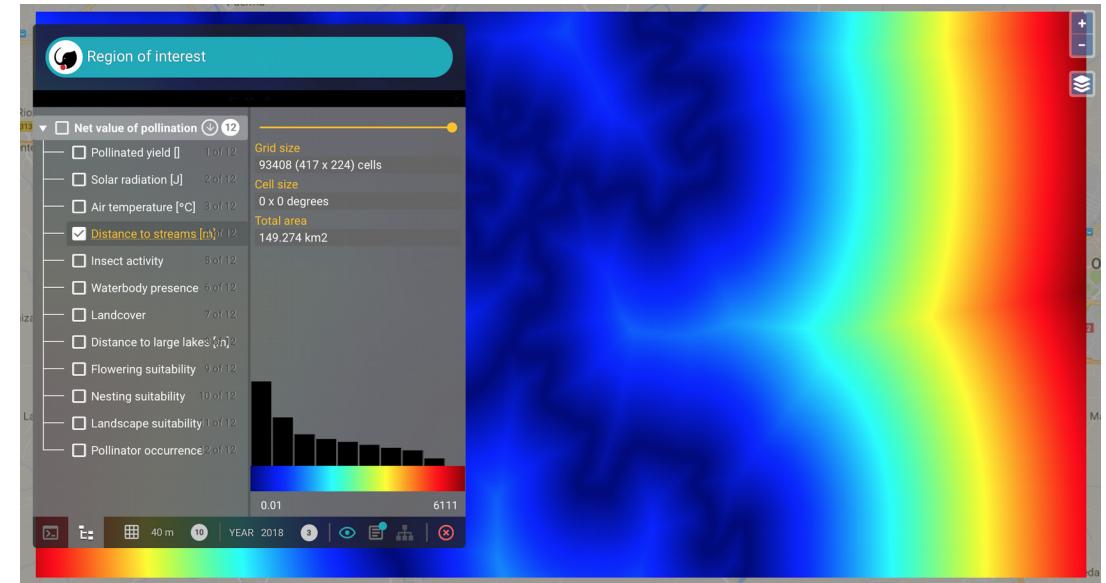
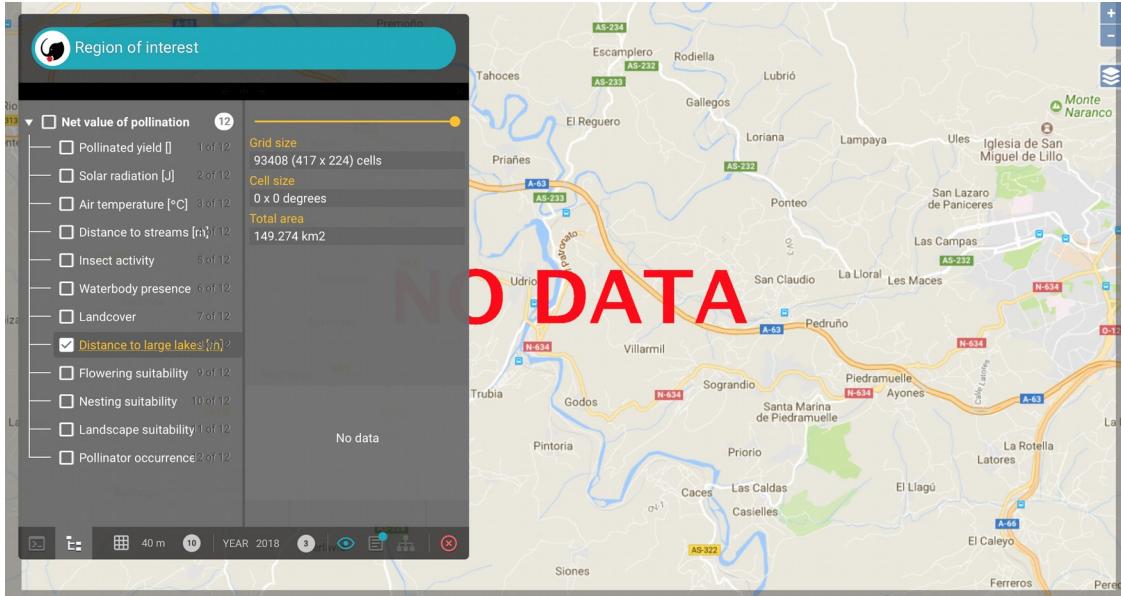
- Local data for land cover, climate, etc.
- Local nesting suitability and flower availability lookup tables based on data or expert opinion
- Knowledge on biology of local pollinators (e.g., flight distance)



# Examples of model customization



# Examples of model customization



# Examples of model customization





Thank you!