

Healthy food

Since a few years ago, there has been an increase in the demand for healthy food by a large sector of society. Words like healthy, super food, high nutritional value and others of the same order have appeared on our menu.

One of these foods is Kale, it is a type of cabbage (kale) that is also known as Portuguese cabbage (*Brassica oleracea*). It can reach 40cm in height and is characterized by curly leaves.

It is typical of North America, but is widely cultivated in Northern Europe. The cultivation is very simple, and a cold climate is required. The culture density can be about 7 plants per square meter, and it has a cultivation time of about 100 days. It is usually consumed in December or January. In some cases it is also used as an ornamental plant.

It is considered a super food, because it contains a lot of vitamin C (100 mg / 100g), it is high in vitamin A, calcium and beta carotene. It is also high in fiber.

Business

Our proposal is to bring the Kale to the largest sector of society that we can. For this we will investigate:

- the best place to place a plantation: taking into account adequate climatology for its growth, roads to transport the product from the plantation to the consumer.
- The best place to create a product marketing (and distribution) office: we will take into account nearby locations (restaurants and food stores), and the population density of the neighborhood.
- Nearby restaurants to offer the product: we will have direct contact with restaurants obtaining lists of all possible customers.



The data

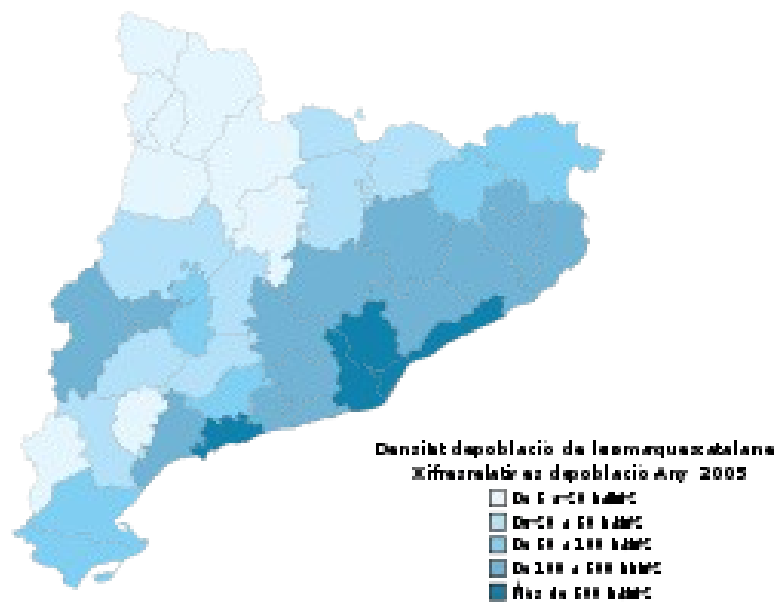
Weather

Climate data will be used to find the best site within Catalonia, Spain for growing Kale.

Mes	Ene.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Ago.	Sep.	Oct.	Nov.	Dic.	Anual
Temp. máx. abs. (°C)	23.8	25.5	29.0	29.1	33.6	43.9	39.0	41.2	37.0	32.3	30.0	22.5	43.9
Temp. máx. media (°C)	13.1	14.1	16.7	18.8	22.4	26.6	30.1	29.8	26.1	21.8	16.6	13.6	20.8
Temp. media (°C)	7.1	7.9	10.4	12.5	16.3	20.4	23.6	23.4	20.1	16.2	10.9	7.8	14.7
Temp. mín. media (°C)	1.1	1.7	4.1	6.2	10.1	14.3	17.1	17.0	14.1	10.5	5.2	2.0	8.6
Temp. mín. abs. (°C)	-13.0	-8.2	-5.5	-1.8	0.6	5.1	10.2	8.6	5.8	-0.8	-6.0	-9.4	-13.0
Precipitación total (mm)	62.0	51.3	50.2	66.6	71.1	59.6	32.3	45.7	69.9	87.9	69.7	56.1	727.5
Días de precipitaciones (≥ 1 mm)	4.9	4.9	5.1	7.1	7.3	5.1	3.2	5.1	6.5	6.4	5.2	4.7	65.8
Días de nevadas (≥)	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7
Horas de sol	147	156	179	194	224	247	285	261	195	167	143	132	2330

Population

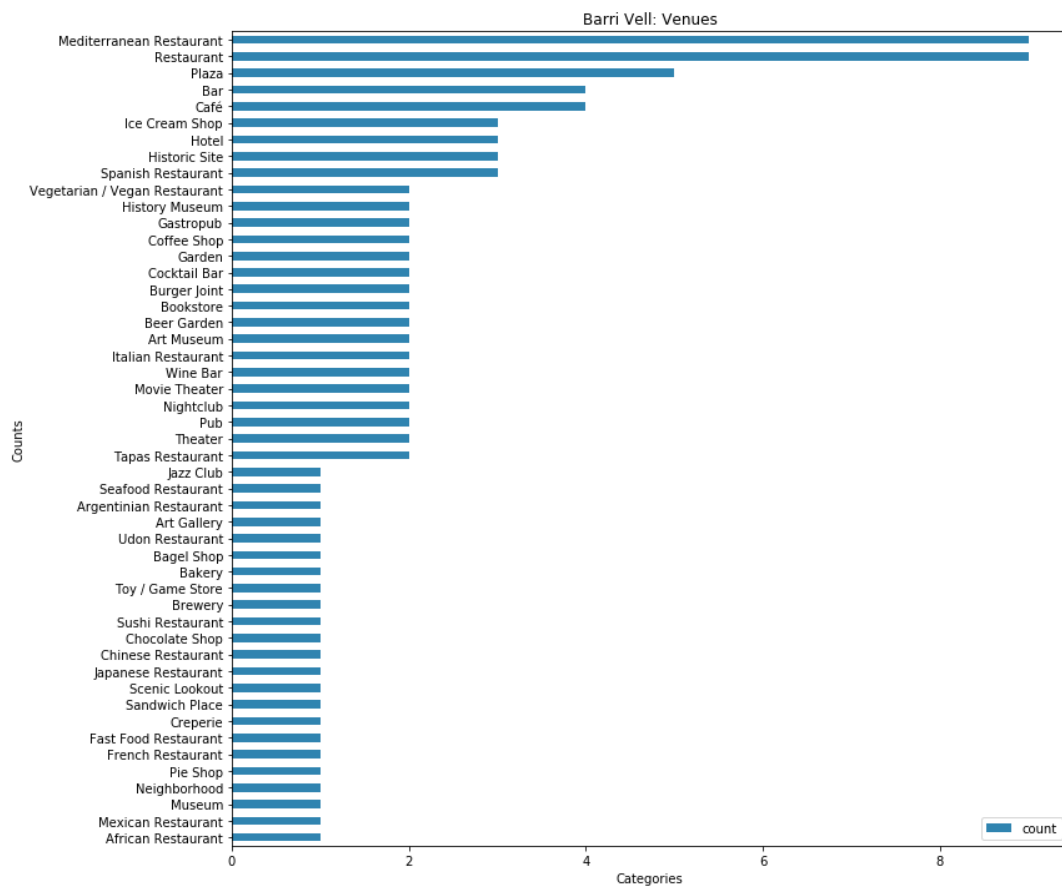
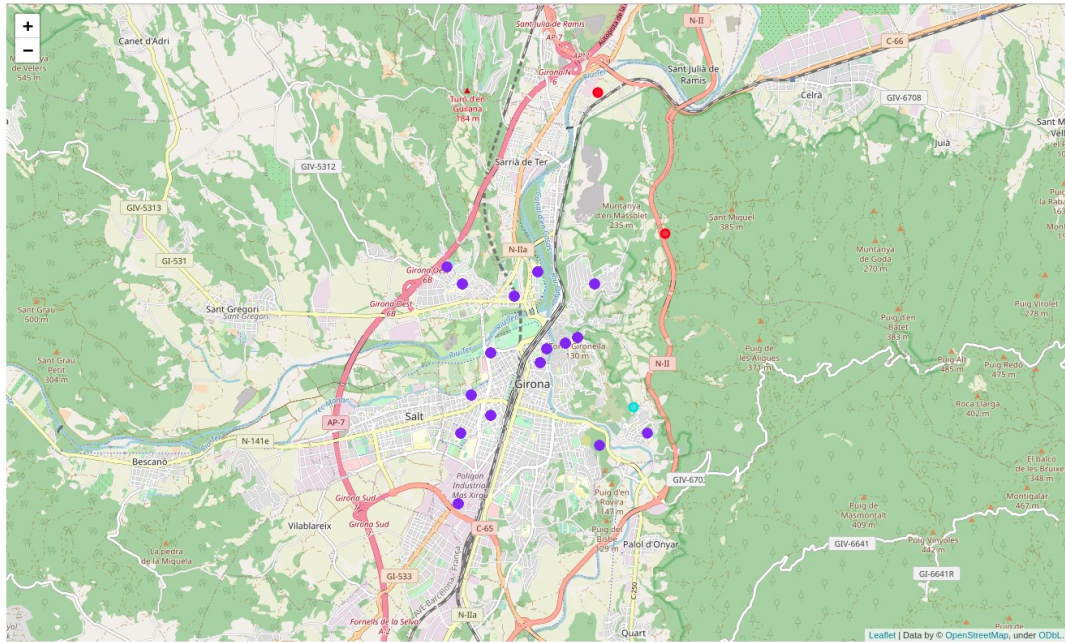
The populations near the cultivation site will be searched to see those with the most population / clients.



Local

Within the city with the most (or best) population, the right place will be found, taking into account neighboring businesses where to sell (such as restaurants and food stores), to open a distribution and advertising agency for the product.

Barrio	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0 Centre, Girona	Plaza	Train Station	Japanese Restaurant	Burger Joint	Bakery	Ice Cream Shop	Wine Bar	Mediterranean Restaurant	Market	Hotel
1 Mas Xirgu, Girona	Auto Dealership	Burger Joint	Supermarket	Shopping Mall	Electronics Store	Restaurant	Café	Cafeteria	Garden	Fried Chicken Joint
2 Montilivi, Girona	Bar	Wine Bar	Café	Gift Shop	Gastropub	Garden	Fried Chicken Joint	Food Truck	Electronics Store	Dog Run
3 Montjuïc, Girona	Garden	Soccer Field	Snack Place	Bed & Breakfast	Playground	Wine Bar	Cafeteria	Fried Chicken Joint	Food Truck	Electronics Store
4 Pla de Campdorà, Girona	Dog Run	Restaurant	Wine Bar	Cafeteria	Gastropub	Garden	Fried Chicken Joint	Food Truck	Electronics Store	Dessert Shop
5 Sant Daniel, Girona	Restaurant	Wine Bar	Cafeteria	Gastropub	Garden	Fried Chicken Joint	Food Truck	Electronics Store	Dog Run	Dessert Shop
6 Sant Narcís, Girona	Gym	Supermarket	Café	Plaza	Athletics & Sports	Record Shop	Hotel	Department Store	Cafeteria	Gift Shop
7 Sant Ponç, Girona	Hotel	Gym Pool	Sandwich Place	Fried Chicken Joint	Mediterranean Restaurant	Plaza	Restaurant	Burger Joint	Supermarket	Beer Garden
8 Santa Eugènia, Girona	Supermarket	Café	Cafeteria	Shoe Store	Food Truck	Mediterranean Restaurant	Park	Pizza Place	Gift Shop	Bar



Methodology

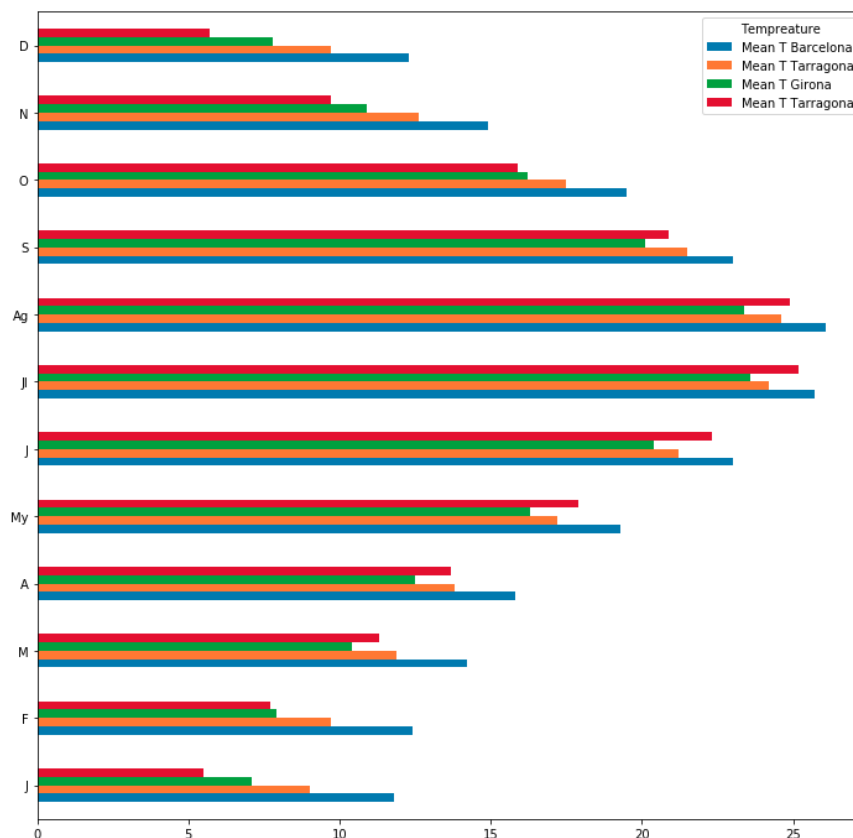
We scrap the climate data from different web pages, to choose the best place to grow up the Kale plants according to they requirements. To do this we use Python (Beautiful soup).

We did the same, once the area is selected, to choose the best place according to the population.

To conclude, we use Fousquare API to get geographical data, and venues of all businesses in the selected area. We did a k-mean clustering to select the best cluster of neighborhoods (grouped by venues) to open a marketing/distribution office.

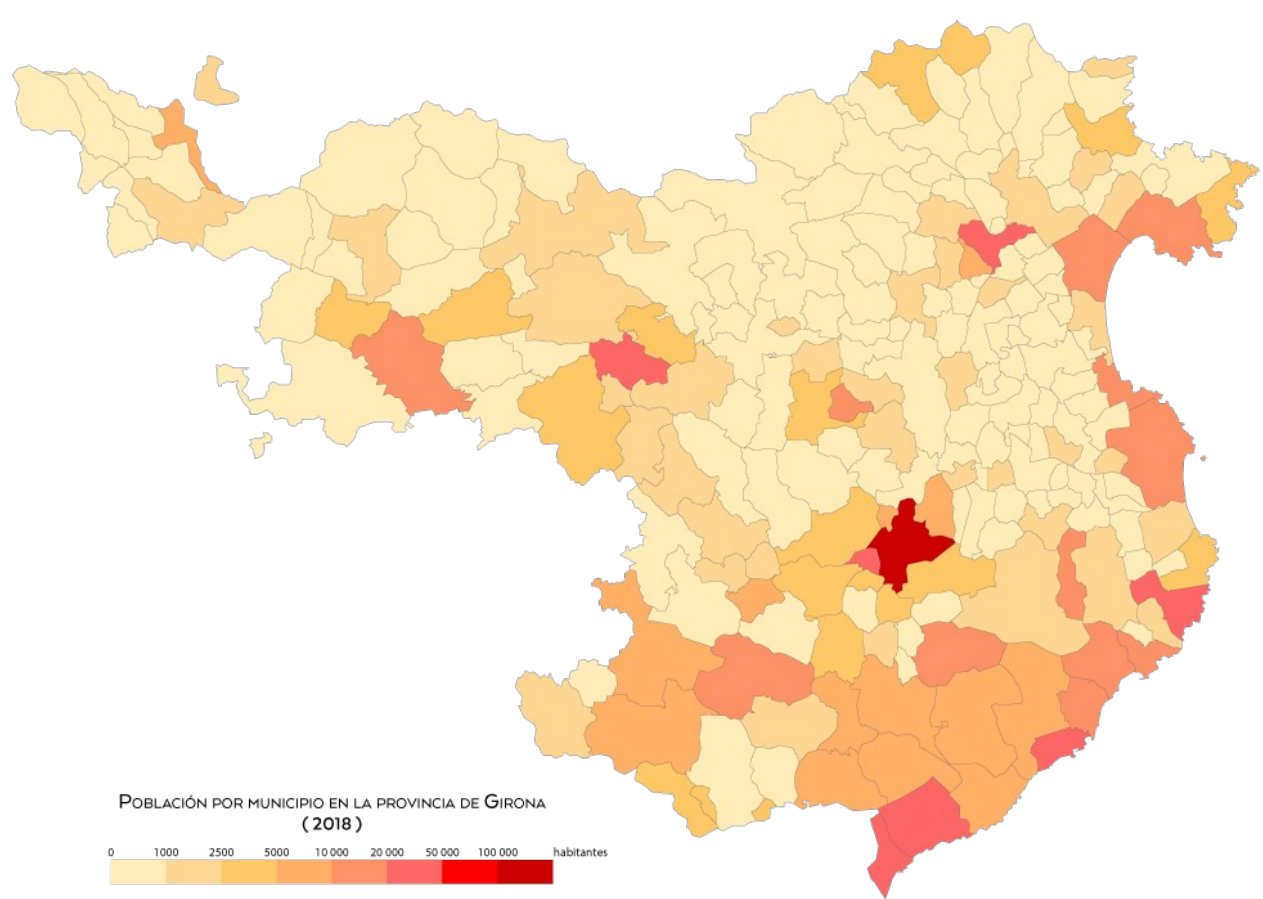
Results

First we can compare the different temperatures between regions.



We can see that the best place is Girona, cold temperatures, but not extreme, during October and March.

In order to decide where, in Girona (province), we can place the marketing and distribution office, and the plantation, we can check on the web for the population of different parts in Girona we can see that the work is done. Here we can see the data of population in 2018.



Most populated area is Girona (city), the best place to place the plantation.

Now we can divide the neighborhoods in Girona to see how different they are, and selected the best neighborhood for our office. To do this we scrap the information of the neighborhoods names and sectors of the Girona city, after we extract the venues of each neighborhood and we clustered in 4 different groups. Here we can see the results. For the extraction of geographical data, and venues metadata we use Geopy and Foursquare API.

We obtain the following table scrapping from the we page ("https://es.wikipedia.org/wiki/Girona")

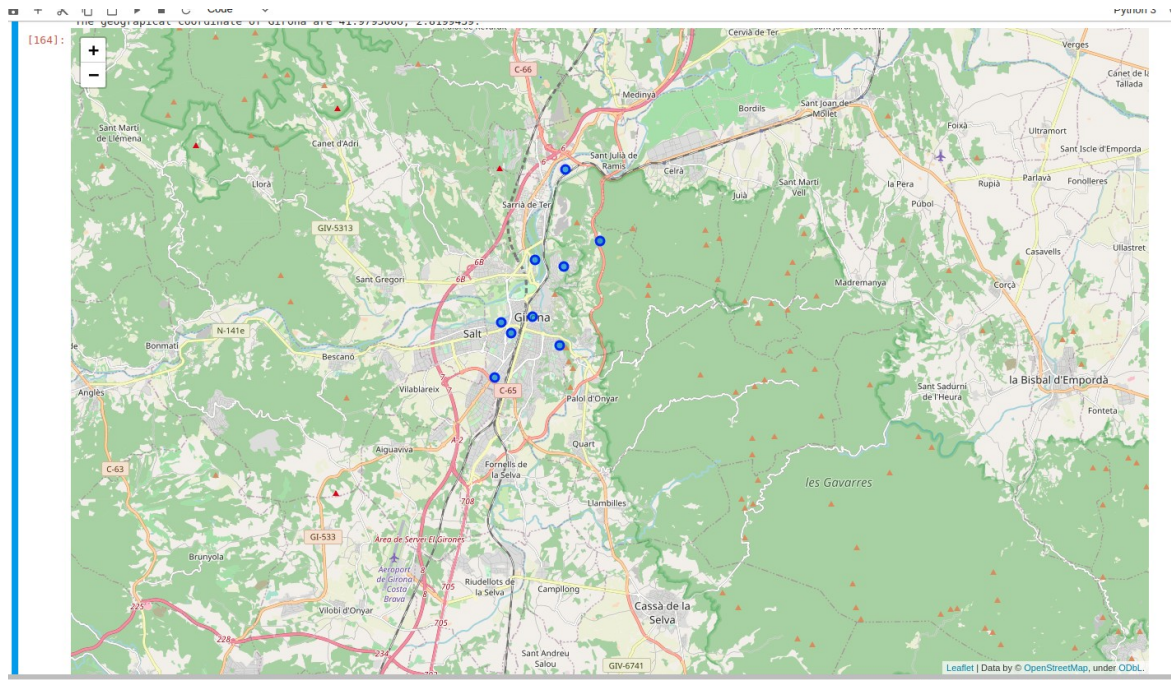
[160]:	Barrio	Sectores
50	Centre, Girona	Barri Vell, Mercadal , Carm
51	Sant Narcís, Girona	Sant Narcís, Eixample Nord , Eixample Sud
52	Sant Daniel, Girona	Sant Daniel, Torre Gironella, Pedreres, Fon...
53	Mas Xirgu, Girona	Mas Xirgu
54	Montjuïc, Girona	Montjuïc
55	Pla de Campdorà, Girona	Pedret, Pont Major, Muntanya de Campdorà , P...
56	Sant Ponç, Girona	Sant Ponç, Fontajau, Taialà, Germans Sàbat,...
57	Santa Eugènia, Girona	Hortes, Santa Eugènia , Can Gibert
58	Montilivi, Girona	Palau, l'Avellaneda, Montilivi , la Creueta

After we used Geopy to get the latitude and longitude points.

[276]:

	Barrio	Sectores	latitude	longitude
50	Centre, Girona	Barri Vell, Mercadal , Carm	41.979301	2.819944
51	Sant Narcis, Girona	Sant Narcis, Eixample Nord , Eixample Sud	41.974247	2.811085
52	Sant Daniel, Girona	Sant Daniel, Torre Gironella, Pedreres, Fon...	42.002908	2.848043
53	Mas Xirgu, Girona	Mas Xirgu	41.960412	2.804262
54	Montjuïc, Girona	Montjuïc	41.994913	2.833146
55	Pla de Campdorà, Girona	Pedret, Pont Major, Muntanya de Campdorà , P...	42.025089	2.833761
56	Sant Ponç, Girona	Sant Ponç, Fontajau, Talalà, Germans Sabat,...	41.996909	2.821115
57	Santa Eugènia, Girona	Hortes, Santa Eugènia , Can Gibert	41.977527	2.807016
58	Montilivi, Girona	Palau, l'Avellaneda, Montilivi , la Creueta	41.970379	2.831247

We can plot this table with folium



And then we can extract the information of the venues for each point with Foursquare

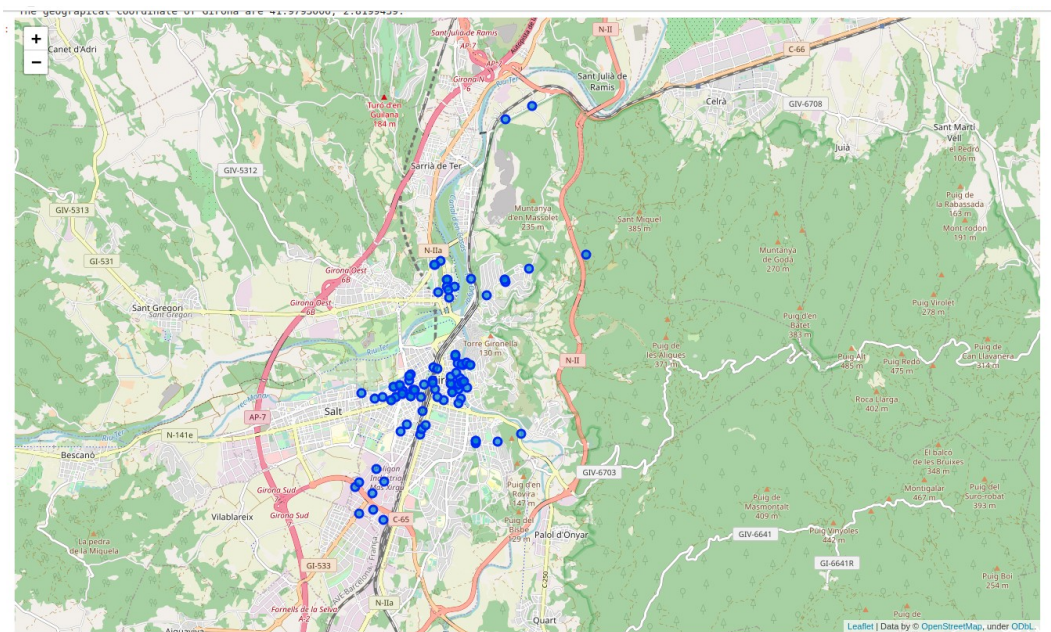
(95, 7)

69]:

	Barrio	Neighborhood	Latitude	Neighborhood	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Centre, Girona		41.979301		2.819944	Pizzeria La Pulcinella	41.978223	2.821999	Pizza Place
1	Centre, Girona		41.979301		2.819944	Mercat del Lleó	41.979580	2.822816	Market
2	Centre, Girona		41.979301		2.819944	Llagurt	41.977369	2.821059	Ice Cream Shop
3	Centre, Girona		41.979301		2.819944	Indigo	41.978604	2.820871	Paella Restaurant
4	Centre, Girona		41.979301		2.819944	Plaça de Catalunya	41.981658	2.823331	Plaza
...
90	Montilivi, Girona		41.970379		2.831247	A 1/2 Cami	41.968896	2.826156	Bar
91	Montilivi, Girona		41.970379		2.831247	Can merla (santa coloma farmers)	41.969233	2.831031	Restaurant
92	Montilivi, Girona		41.970379		2.831247	Can Mascort	41.970450	2.836230	Restaurant
93	Montilivi, Girona		41.970379		2.831247	Solar	41.969338	2.826191	Dog Run
94	Montilivi, Girona		41.970379		2.831247	Tokio	41.969335	2.826196	Japanese Restaurant

95 rows x 7 columns

And we can plot it with folium again.

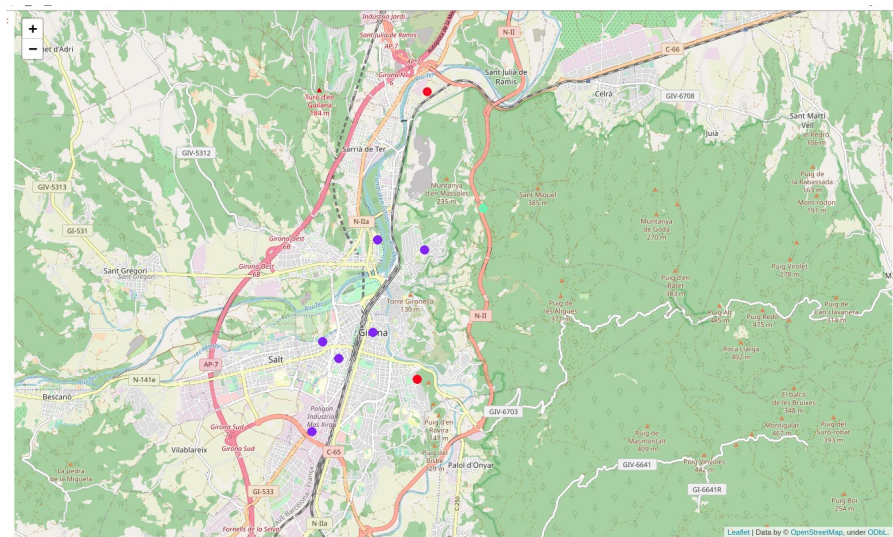


For our interest is good to know the most common venues of each neighborhood, the following table shows this information.

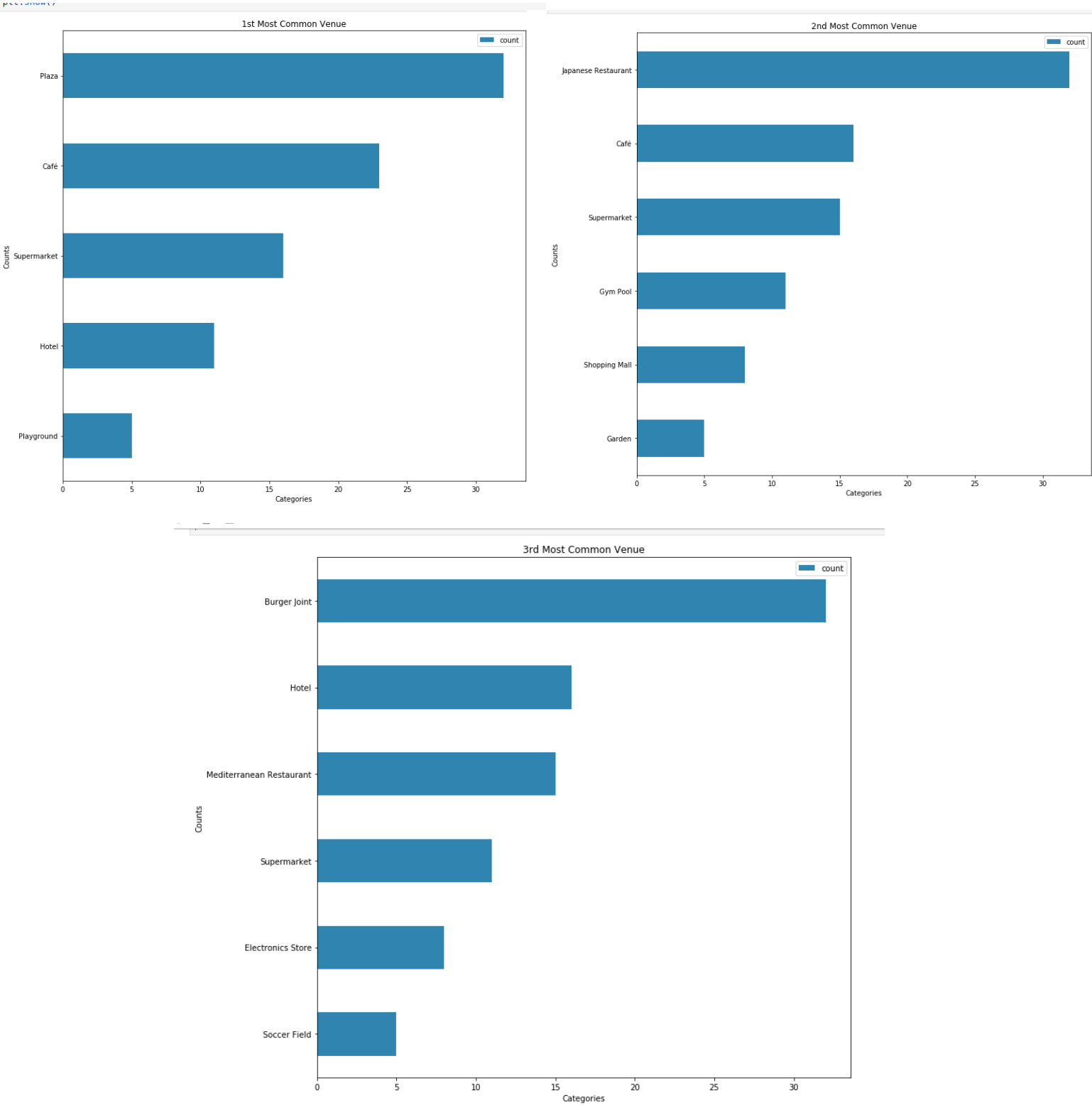
711:

	Barrio	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Centre, Girona	Plaza	Japanese Restaurant	Burger Joint	Ice Cream Shop	Train Station	Wine Bar	Gym	Market	Italian Restaurant	Gastropub
1	Mas Xirgu, Girona	Café	Shopping Mall	Electronics Store	Burger Joint	Restaurant	Grocery Store	Supermarket	Auto Dealership	Basketball Court	Dog Run
2	Montilivi, Girona	Restaurant	Bar	Japanese Restaurant	Dog Run	Wine Bar	Dessert Shop	Gift Shop	Gastropub	Garden	Fried Chicken Joint
3	Montjuic, Girona	Playground	Garden	Soccer Field	Snack Place	Bed & Breakfast	Department Store	Gift Shop	Gastropub	Fried Chicken Joint	Food
4	Pla de Campdorà, Girona	Restaurant	Dog Run	Wine Bar	Department Store	Grocery Store	Gift Shop	Gastropub	Garden	Fried Chicken Joint	Food
5	Sant Daniel, Girona	Restaurant	Wine Bar	Department Store	Grocery Store	Gift Shop	Gastropub	Garden	Fried Chicken Joint	Food	Farmers Market
6	Sant Narcís, Girona	Supermarket	Café	Hotel	Plaza	Basketball Court	Cafeteria	Department Store	Farmers Market	Food	Gift Shop
7	Sant Ponç, Girona	Hotel	Gym Pool	Supermarket	Fried Chicken Joint	Sandwich Place	Restaurant	Burger Joint	Plaza	Mediterranean Restaurant	Department Store
8	Santa Eugènia, Girona	Café	Supermarket	Mediterranean Restaurant	Bar	Basketball Court	Smoke Shop	Cafeteria	Plaza	Gift Shop	Pizza Place

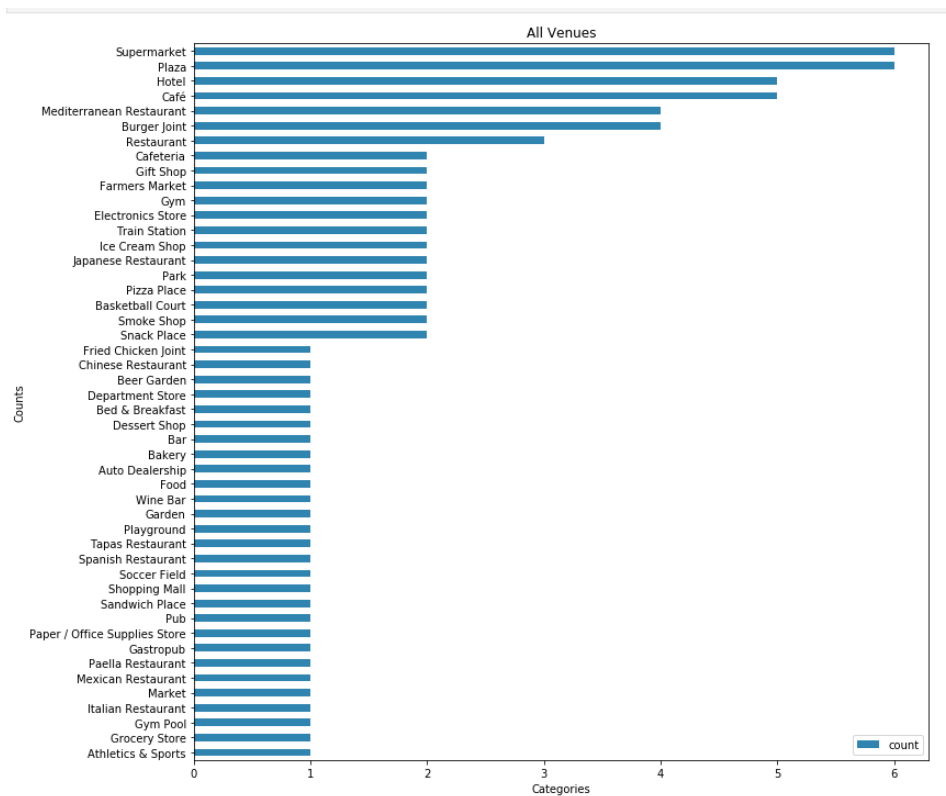
Here the clustered map of the neighborhoods



All the neighborhoods near the center of Girona are grouped in the same cluster, we can see how this cluster is defined looking the following graphs.



To conclude we can take a look at the count of all the venues defined in the cluser 1.



Discussion and conclusion

We have been able to see that the best region for the cultivation of Kale is Girona, since it manages to maintain a low thermal regime, between 7 and 13 degrees the months necessary for the Kale to grow in the ideal conditions. Tarragona was also a good option, but if we take into account the population, much larger in Girona (province) we ended up opting for Girona.

Regarding the population where to do the plantation and the marketing and distribution office, we have based ourselves on the population, the more density we believe, the more beneficial it will be for the business. So looking at the density maps by municipality we end up opting for Girona City.

The plantation will be on the surroundings of Girona city, everything is well connected so we have not focused on this point, but where we will put the marketing and distribution office. For this we have segmented the neighborhoods and we have chosen the group that most closely meets our expectations, which is the one with the largest number of businesses that is related to restaurants and food stores such as supermarkets. So the best placement of the office would be within the red circle that we see in the following figure.

