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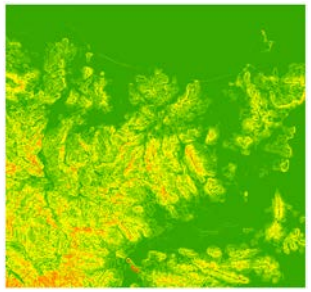
Siting Three Farms in Fajardo, Puerto Rico

In the below report, I create an automated Model-Builder tool which sites a 3 farms in Fajardo based on high aggregate suitability scores, and lengthy distance from one another across the landscape. Each farm is at least 10-acres (400 pixels).

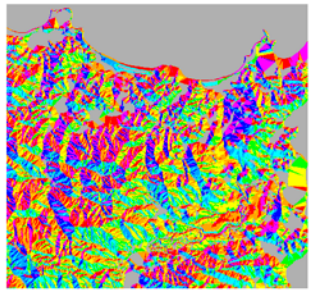
Initial Suitability Grid

The below grid presents a pixel-by-pixel site suitability map for farmland in Fajardo. Criteria I used to make this map include current land use, slope of land (3-5% ideal for drainage), aspect (south facing aspects preferred), flooding potential (discovered via flow accumulation), proximity to population centers, and access to population centers (proximity to roads).

Slope

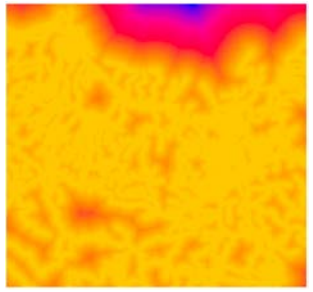


Aspect



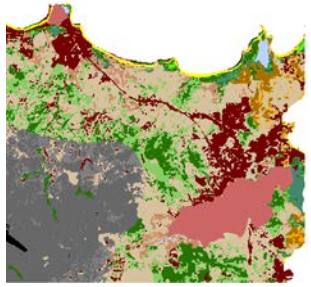
Flow Accumulation

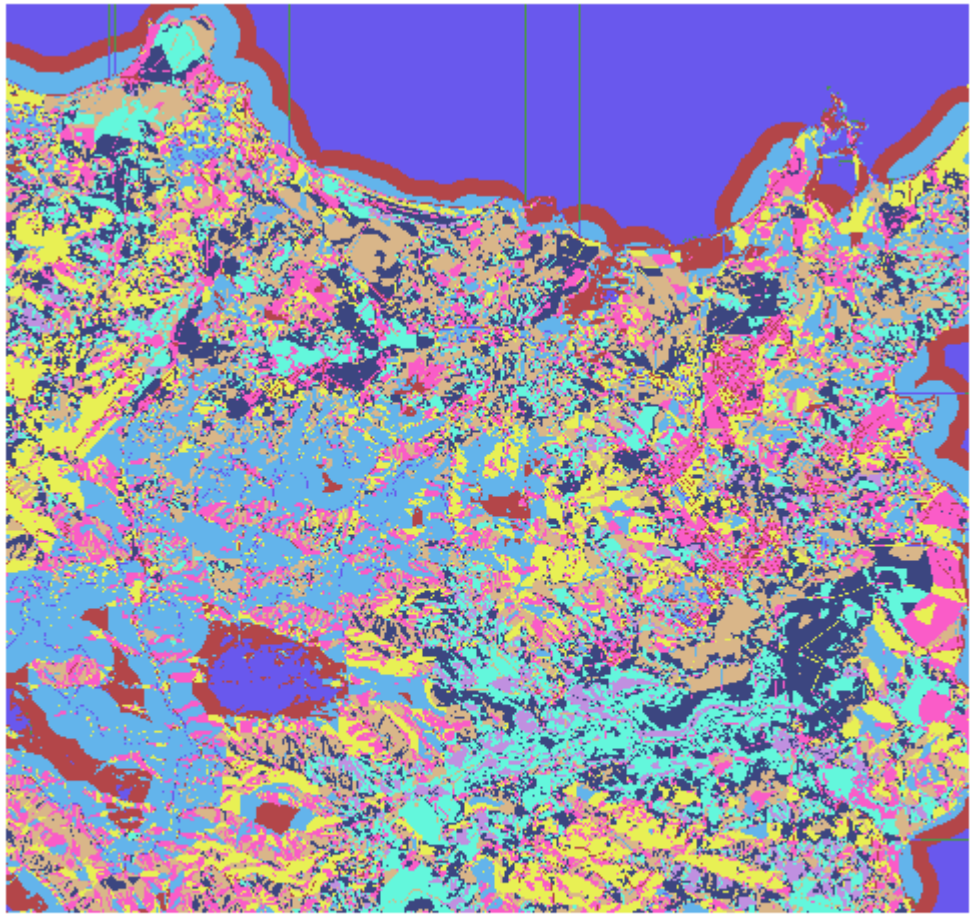
Distance to Roads



Census Populations

Land Use

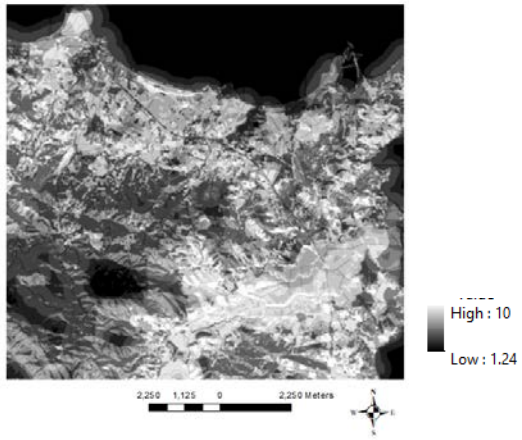




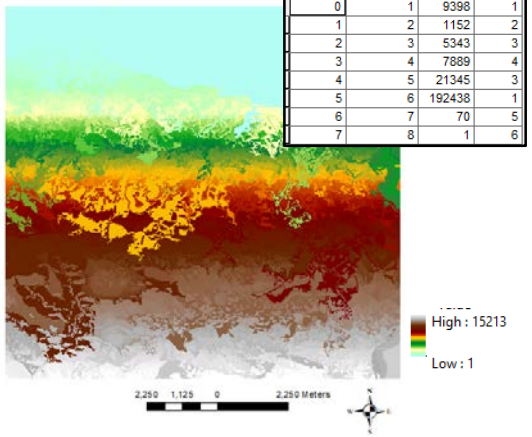
Step 1: Locating the First Farm

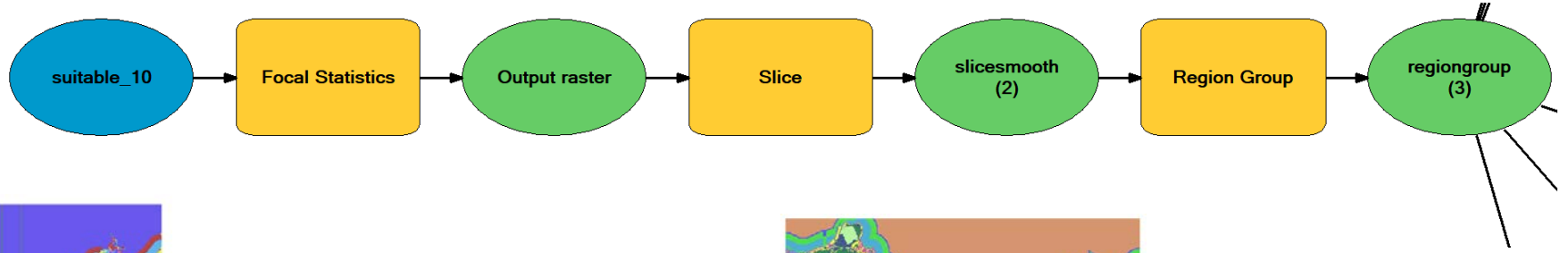
Locating the First Farm

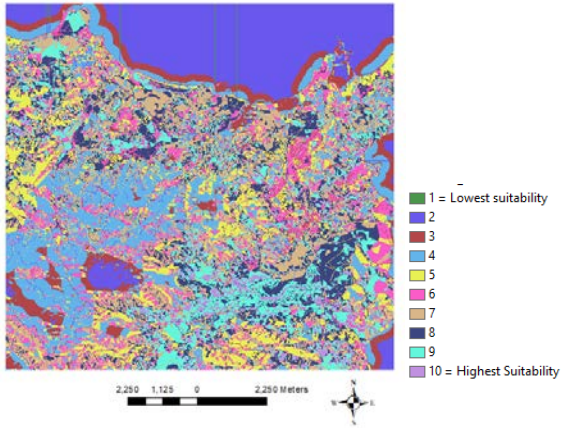
To locate the first farm, I (1) used focal mean to smooth over individual pictures in my suitability grid; (2) used slice to reclassify those smoothed over pixels from 1-10; (3) and extracted each coterminous pixel group.

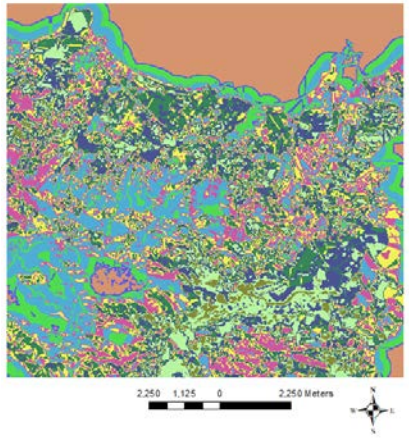


Rowid	VALUE *	COUNT	LINK
0	1	9398	1
1	2	1152	2
2	3	5343	3
3	4	7889	4
4	5	21345	3
5	6	192438	1
6	7	70	5
7	8	1	6



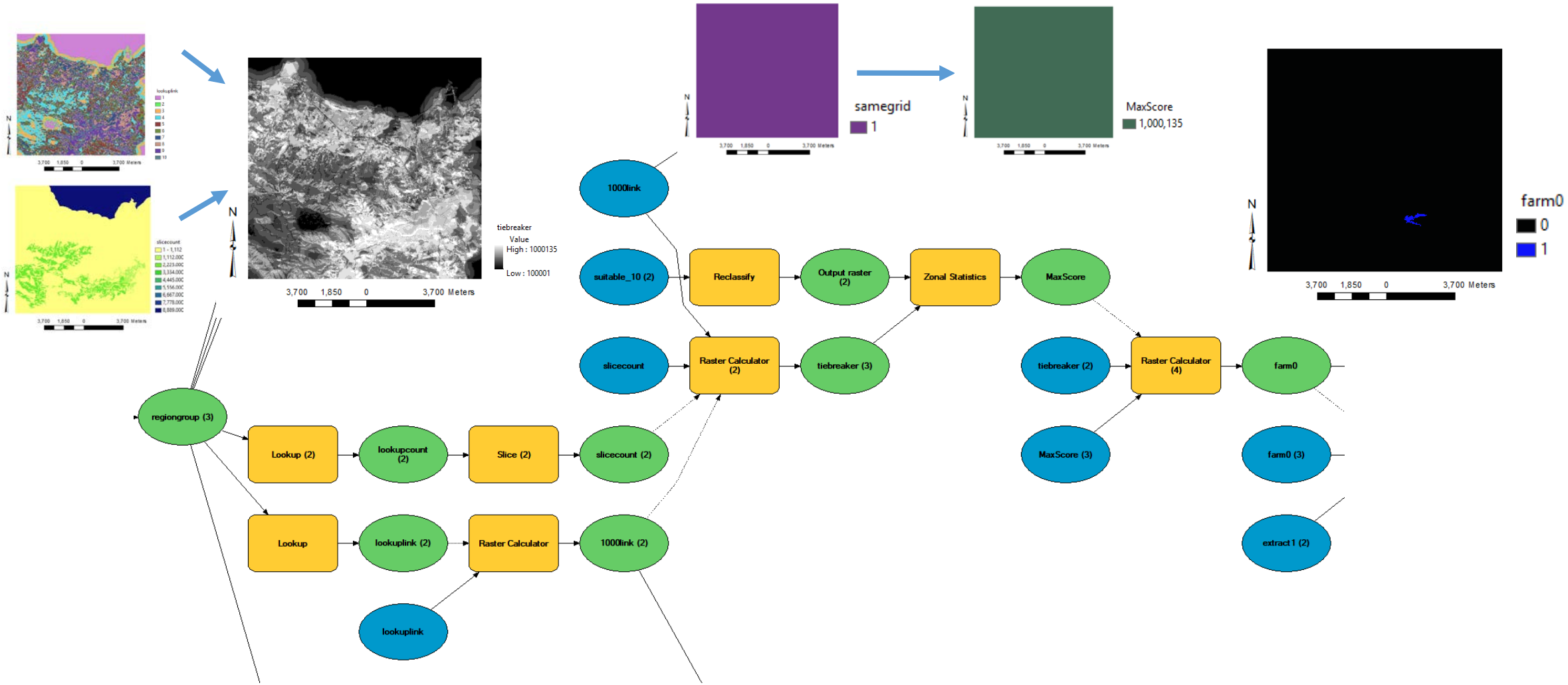






Locating the First Farm (Continued)

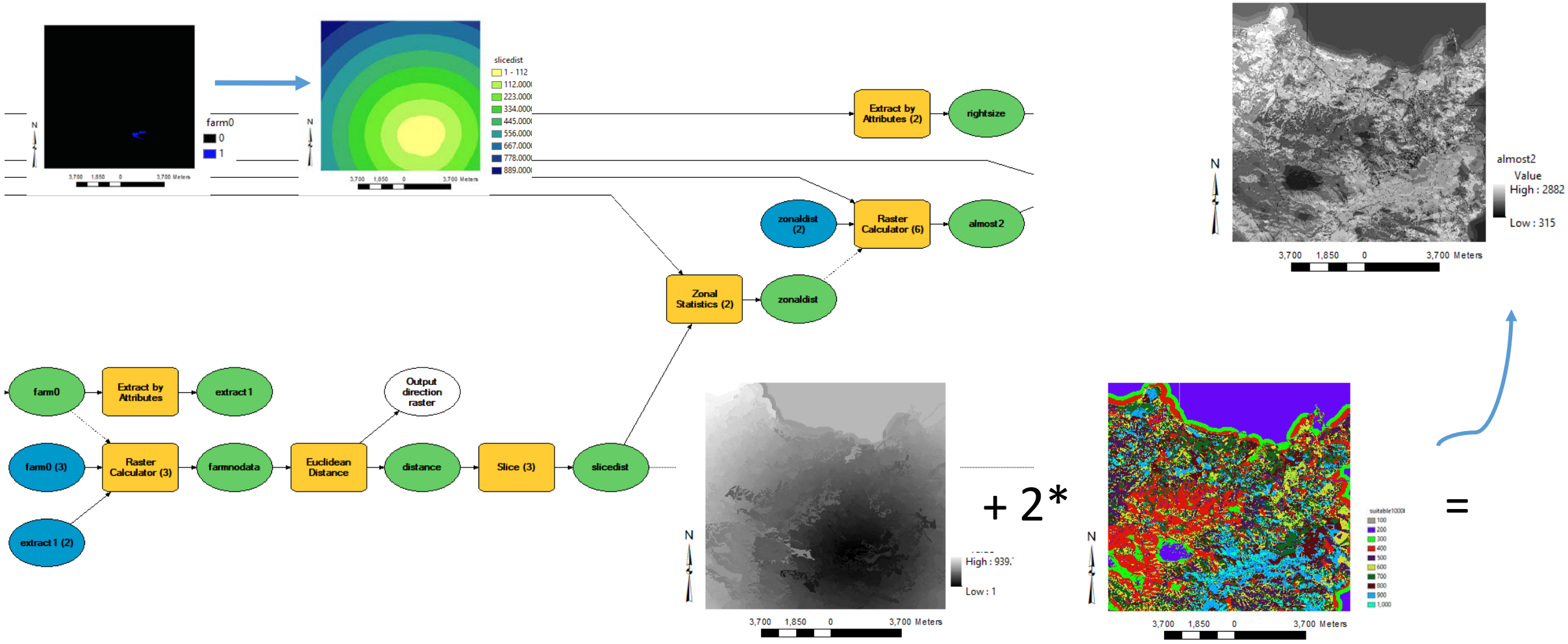
Because there were more than one coterminous pixel group with the highest smoothed suitability score (10 out of 10), I used the total area of each coterminous pixel region as a second criterion for which to base selection of the first farm. To do this, I (4) manipulated the regiongroup grid through various "lookup" and "slice" operations, and (5) ranked the coterminous pixel groups according to a combination of their suitability scores and pixel number. Lastly, I automated the selection of the highest ranking group through zonal maximum (on a grid of all 1s) and raster calculator operations. The final output gives a grid where my first farm is set to a value of 1 and all other pixels are set to a value of 0.



Step 2: Locating the Second Farm

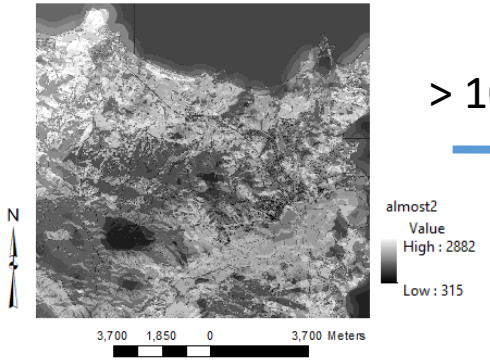
Locating the Second Farm

The location of the second farm is a function of both suitability and distance from the first farm. To locate the second farm, I (1) generated a grid of distances from my initial farm placement, (2) standardized the Euclidean distance score using the slice operation so that I could more easily weigh the relative importance of distance to mean suitability score, (3) used zonal mean so that each coterminous pixel group takes on the mean distance value of all pixels from the first farm, (4) used raster calculator to identify the next best farm placements, where suitability is weighed twice as much as distance from farm 1.

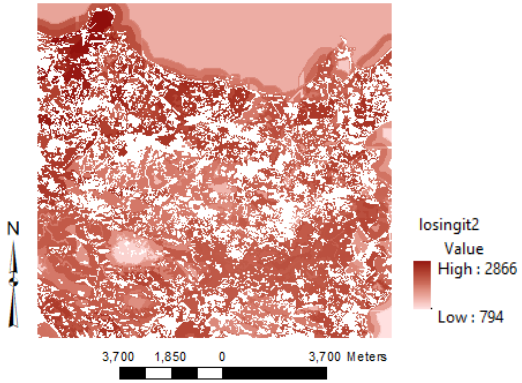


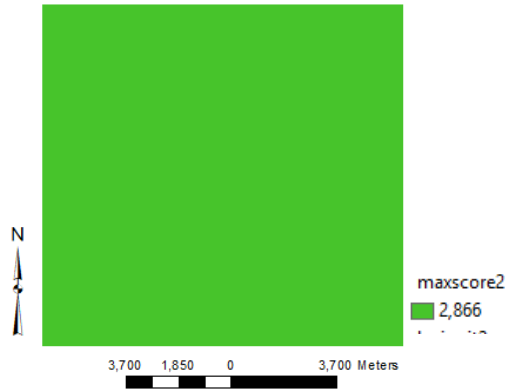
Locating the Second Farm (Continued)

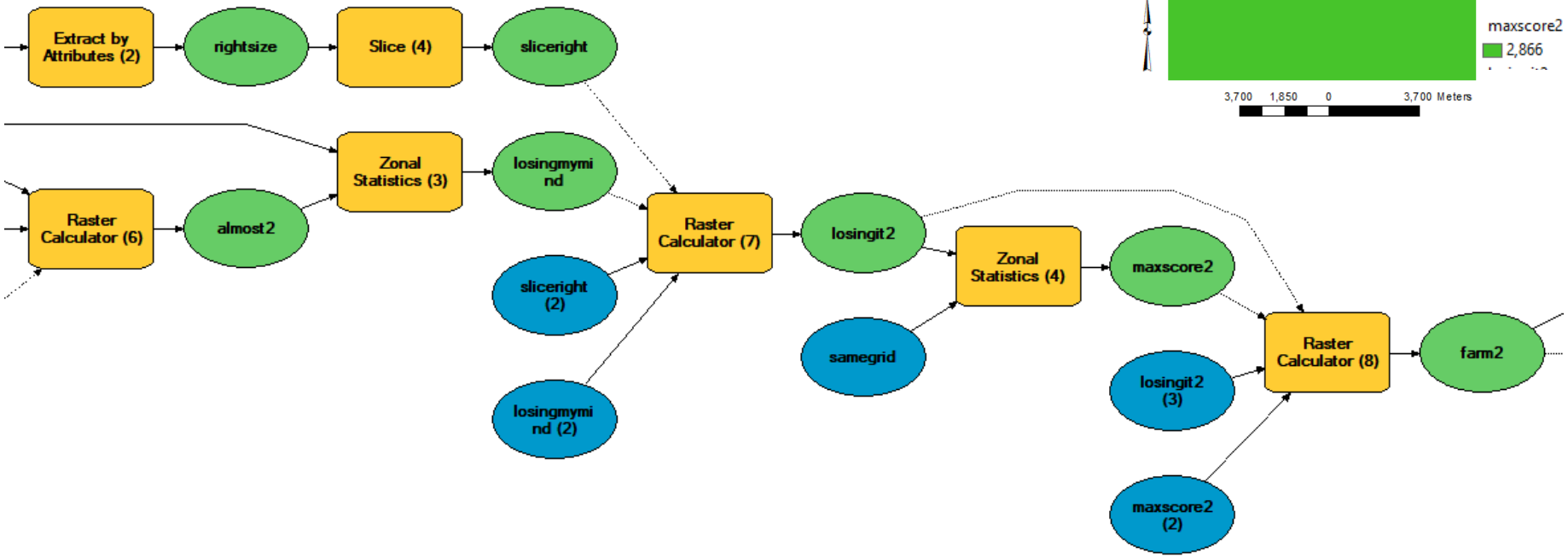
Next, I (5) extract only the region groups that are coterminous above 400 pixels, (6) extract the highest scoring region group using the zonal maximum automation technique with a grid of all 1s.

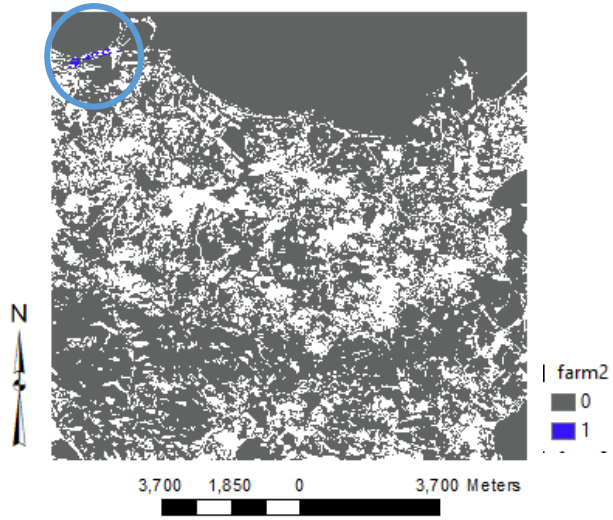


> 10 acres





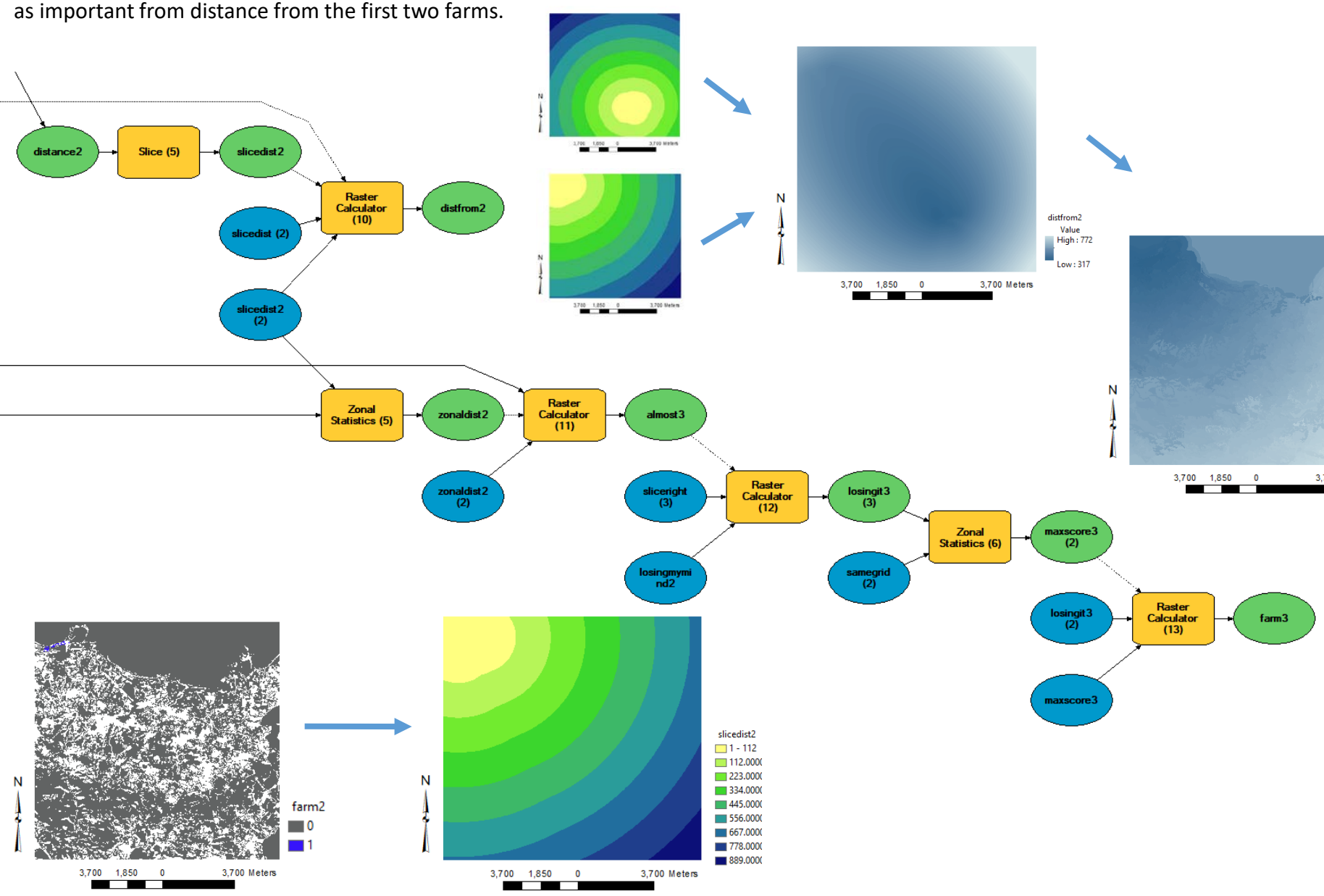


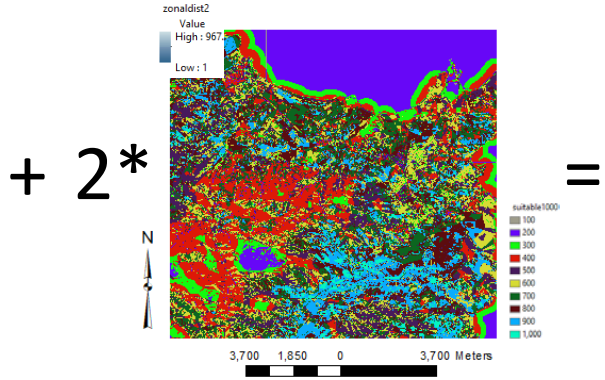


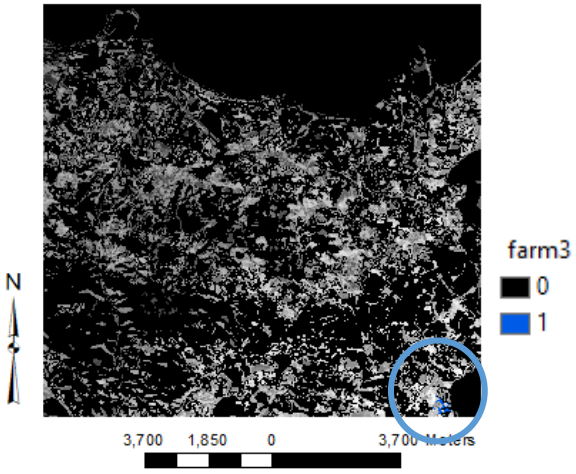
Step 3: Locating the Third Farm

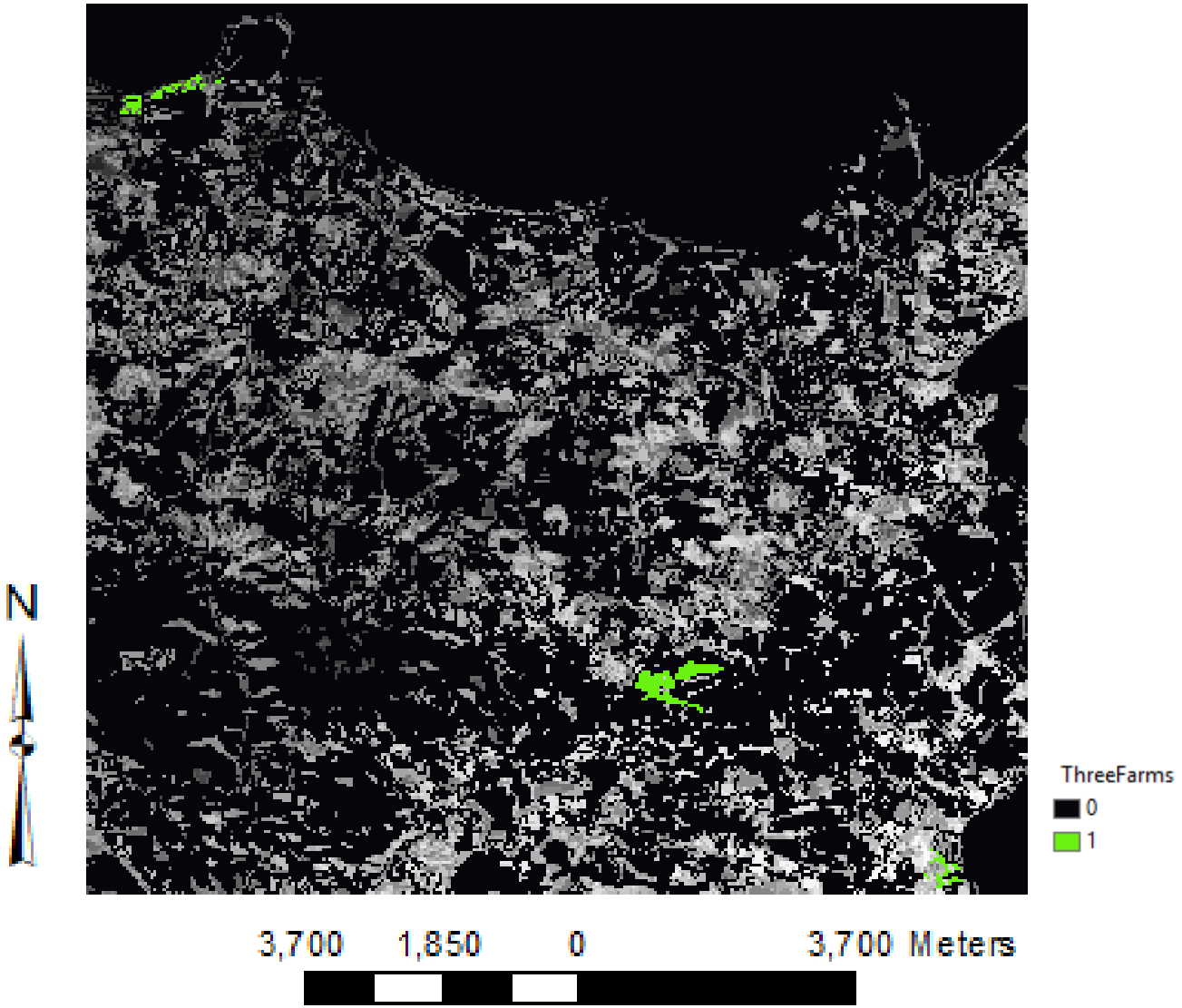
Locating the Third Farm

The location of the third farm is a function of both suitability and distance from the first two farms. To locate the third farm, I (1) generated a grid of distances from my second farm placement, (2) averaged this distance grid with the distance grid away from farm 1. (3) repeated the same process by which I located farm 2, weighting suitability twice as important from distance from the first two farms.








N
3,700
1,850
0
3,700 Meters
ThreeFarms
0
1