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International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Manejo de datos espaciales

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CGIAR

Contenido

- Datos espaciales
- Operaciones básicas entre datos espaciales
- Práctica con R

Datos espaciales

Es información que describe objetos, eventos o cualquier otro atributo, con una ubicación. Este combina, la información de la locación y características del objeto.

- **Locación (Sistemas de coordenadas)**
  - Sistemas globales o esféricas de coordenadas
  - Sistemas de coordenadas proyectas

- **Características (Tipos de datos)**
  - Vector
  - Raster

Manipulación datos espaciales

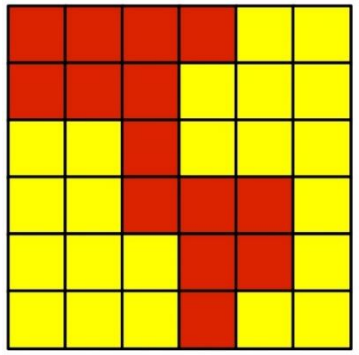
Softwares usados en GIS

QGIS® trademark

ArcGIS

GRASS GIS

OSGeo Project



Diva GIS

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Nociones de GIS

GIS en R y Python

Spatial manipulation with sf: : CHEAT SHEET

The sf package provides a set of tools for working with geospatial vectors, i.e. points, lines, polygons, etc.

Geometric confirmation

st_contains(x, y, ...) Identifies if x is within y (i.e. point within polygon)

st_covered_by(x, y, ...) Identifies if x is completely within y (i.e. polygon completely within polygon)

st_covers(x, y, ...) Identifies if any point from x is outside of y (i.e. polygon outside polygon)

Geometric operations

st_boundary(x) Creates a polygon that encompasses the full extent of the geometry

st_buffer(x, dist, nQuadSegs) Creates a polygon covering all points of the geometry within a given distance

st_centroid(x, ..., of_largest_polygon) Creates a point at the geometric centre of the geometry

Geometry creation

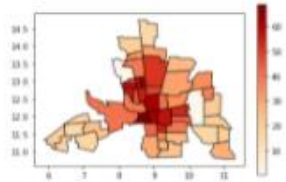
st_triangulate(x, dTolerance, bOnlyEdges) Creates polygon geometry as triangles from point geometry

st_voronoi(x, envelope, dTolerance, bOnlyEdges) Creates polygon geometry covering the envolope of x, with x at the centre of the geometry

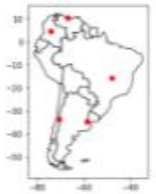
st_point(x, c(numeric vector), dim = "XYZ") Creating point geometry from numeric values

Plotting with CartoPy and GeoPandas

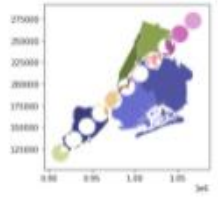
Choro legends



Choropleth classification schemes from PySAL for use with GeoPandas



Creating a GeoDataFrame from a DataFrame with coordinates



Overlays

Clip Vector Data with GeoPandas

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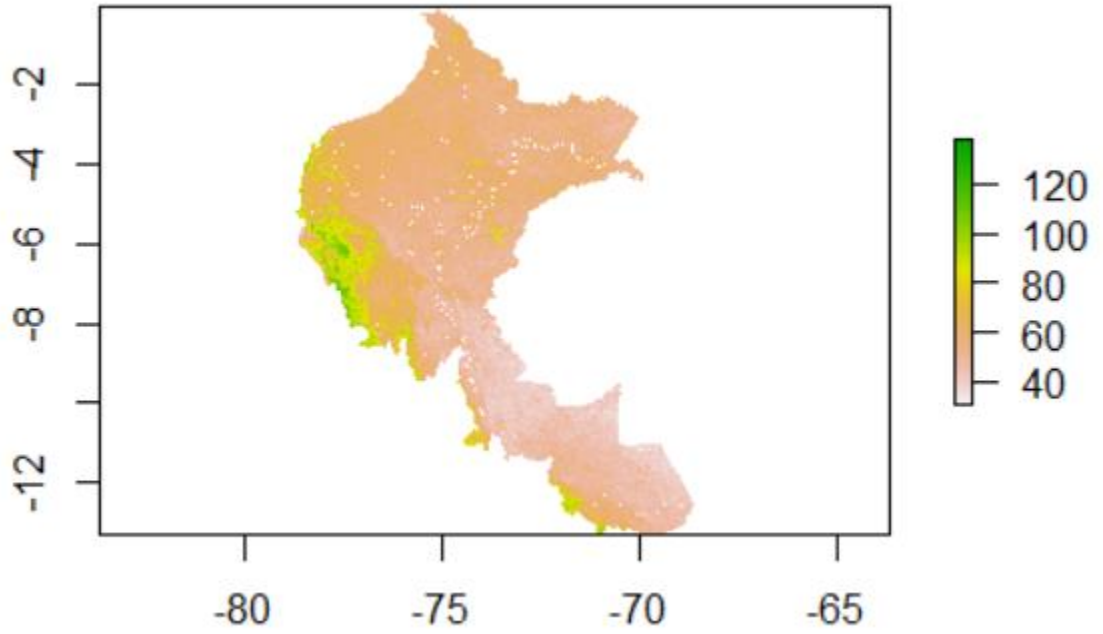
Datos espaciales

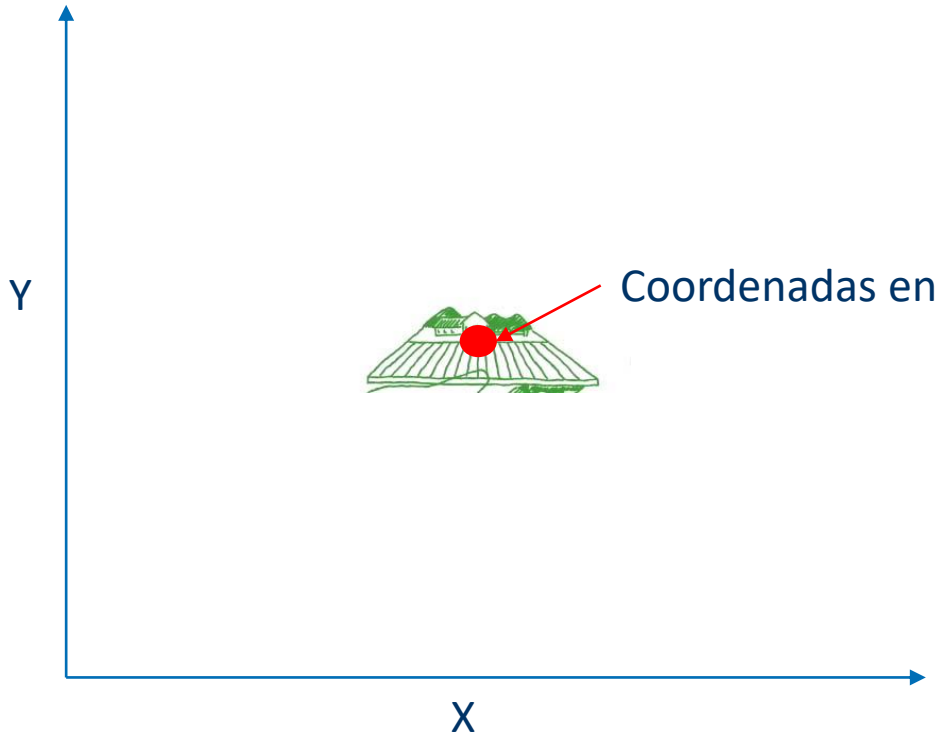
- **Locación**

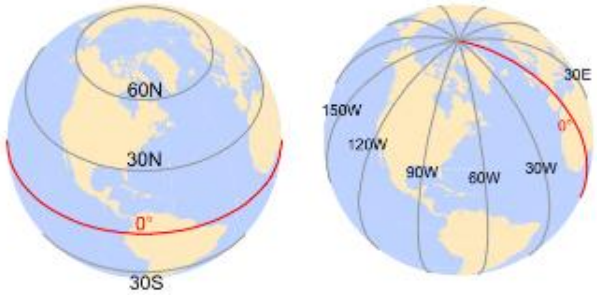


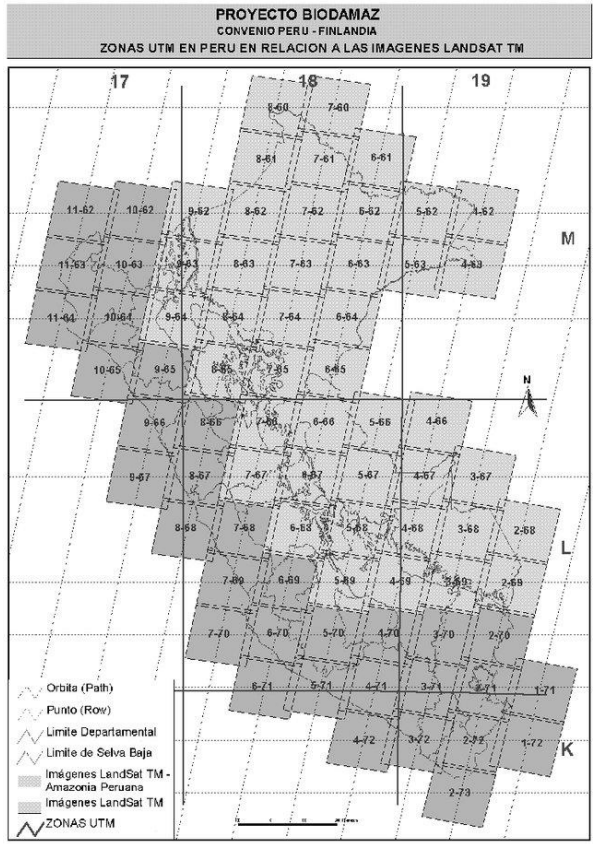
cómo es posible saber el contenido de materia orgánica de la finca?

Datos espaciales

Sistema de coordenadas







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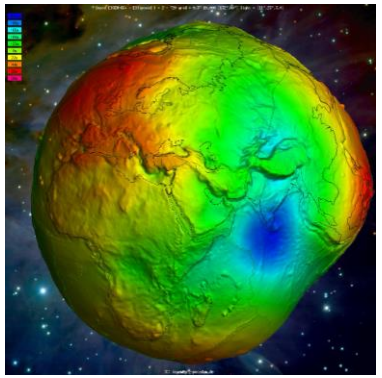
Datos espaciales

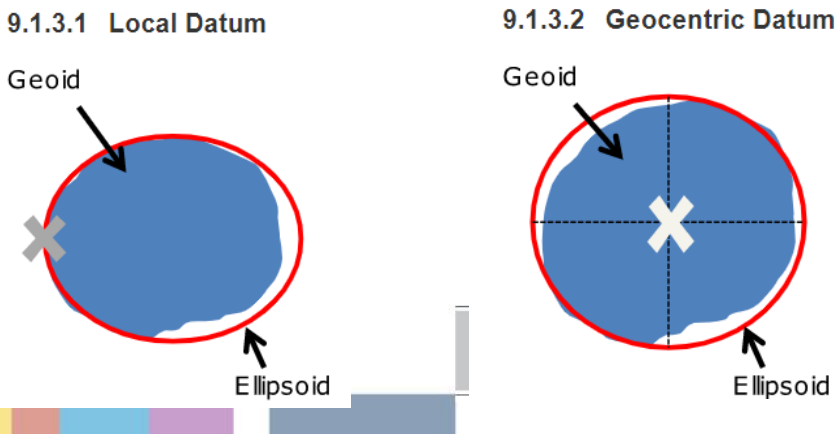
Sistema geográfico de coordenadas

La tierra como vista como una esfera o elipsoide



Sin embargo, la tierra esta sometida a distintas fuerzas gravitacionales y de rotación afectan su superficie. Geoide

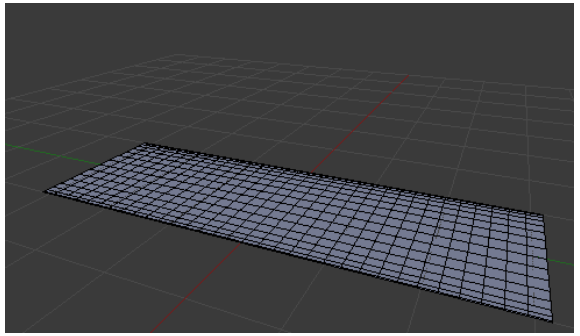
Se necesita alinear la esfera con el geoide - Datum



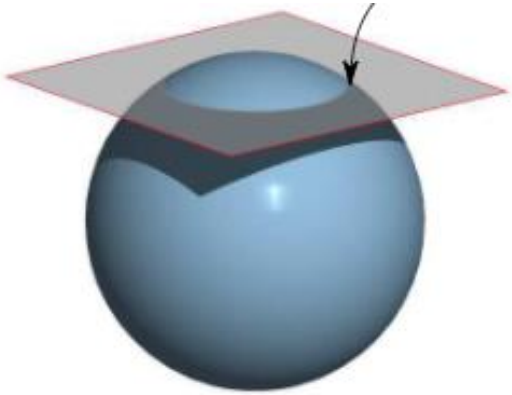
Datos espaciales

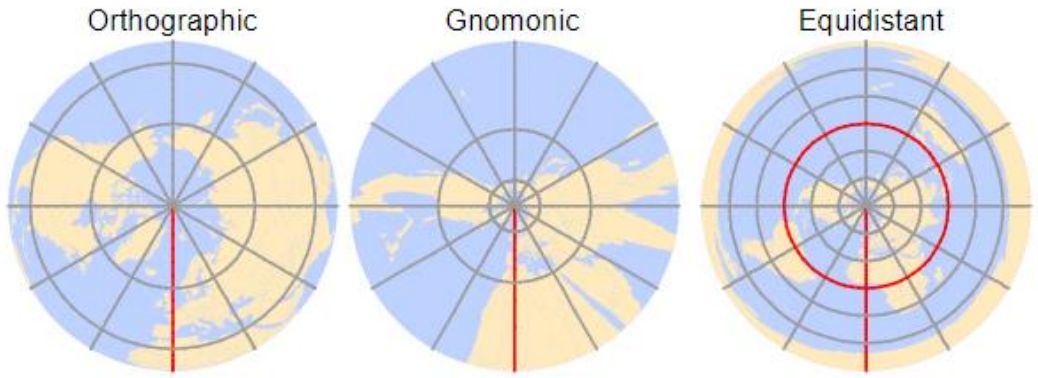
Sistema de Coordenadas proyectadas

Un Sistema de coordenadas proyectadas es un sistema de referencia en dos dimensiones, para localizar y medir geometrías en una superficie plana. Hay 3 prioridades generales: Área, Dirección y Forma.



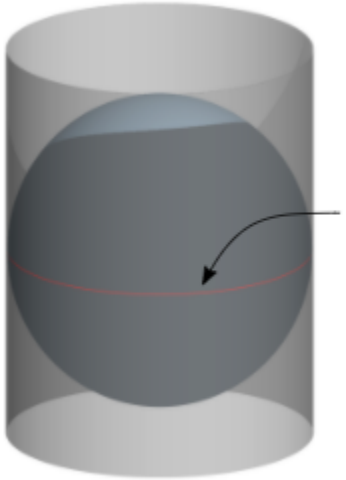
Proyección plana

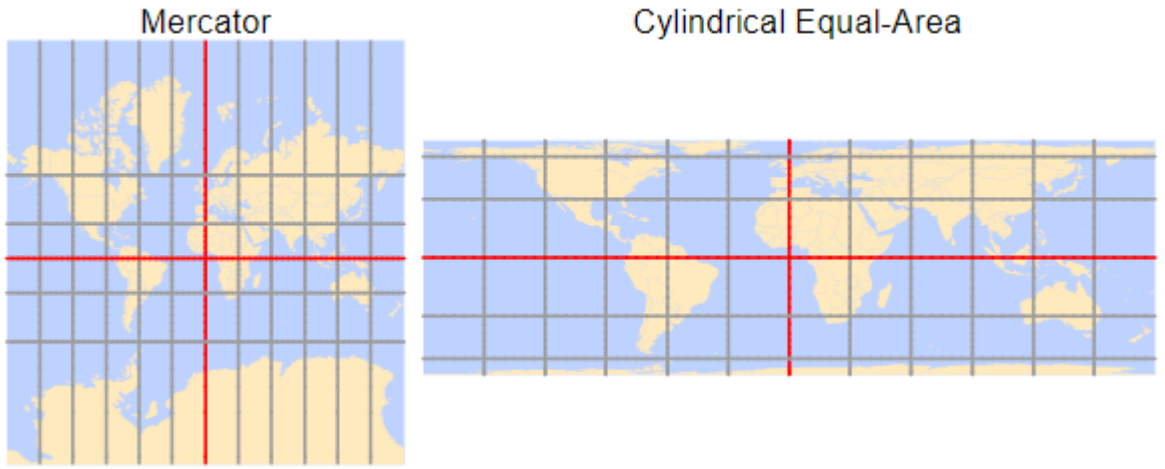




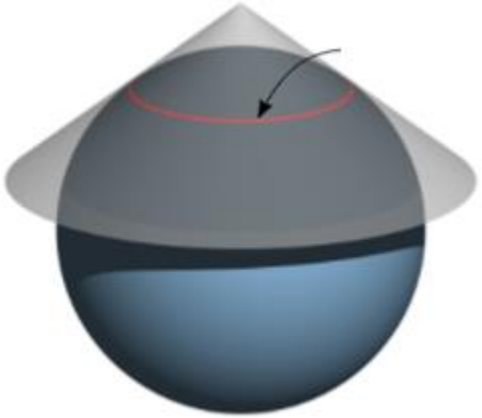
https://mgimond.github.io/Spatial/chp09-0.html

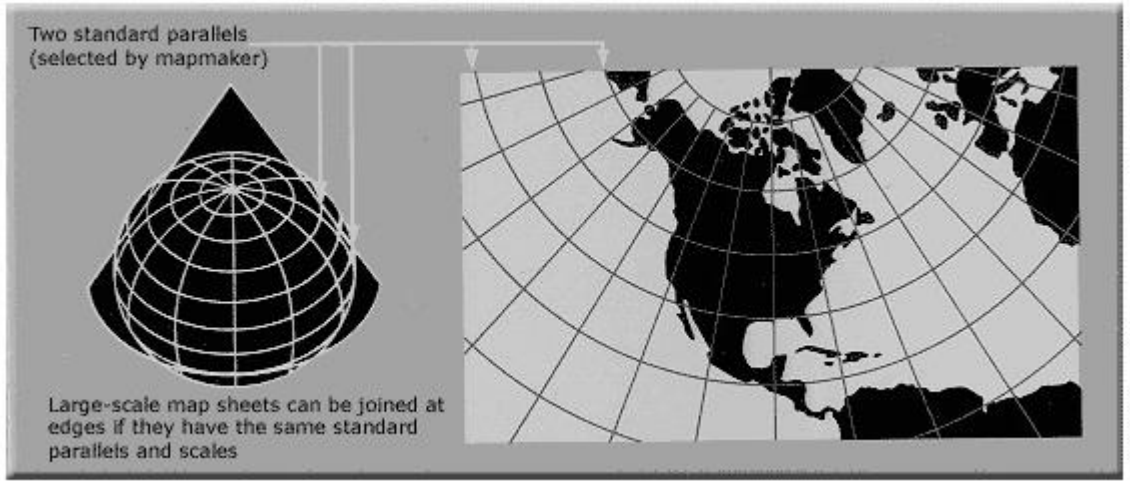
Proyección cilíndrica





Proyección plana



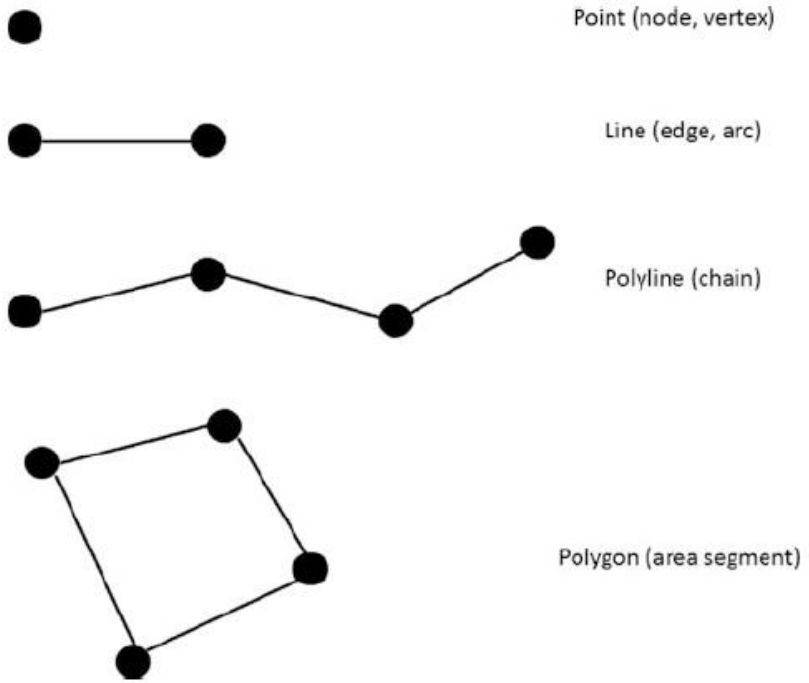


Tomado en : https://regi.tankonyvtar.hu/hu/tartalom/tamop425/0027_DAI1/ch01s05.html

Datos espaciales

Tipos de datos

Vector



Datos espaciales

Vector


```
> print(limites_dep)
Simple feature collection with 25 features and 4 fields
geometry type:  MULTIPOLYGON
dimension:      XY
bbox:           xmin: -203260.8 ymin: 7964769 xmax: 1190991 ymax: 9995733
CRS:            32718
# A tibble: 25 x 5
   NOMBDEP    COUNT FIRST_IDDP                                        geometry areakm2
 * <chr>      <dbl> <chr>                                    <MULTIPOLYGON [m]>   <dbl>
 1 AMAZONAS      84 01          (((212372.3 9332652, 212473.3 9332544, 212~  39306.
 2 ANCASH       166 02          (((150666.9 9058817, 150667.2 9058817, 150~  35962.
 3 APURIMAC      80 03          (((781311 8490377, 781314.4 8490263, 78133~  21114.
 4 AREQUIPA     109 04          (((518459.3 8278798, 518429.8 8278813, 518~  63256.
 5 AYACUCHO     111 05          (((571155.3 8654149, 571057.7 8654097, 571~  43504.
 6 CAJAMARCA    127 06          (((25179.07 9209710, 25130.78 9209771, 250~  33045.
 7 CALLAO         6 07          (((265262.1 8665012, 265257.4 8664993, 265~    141.
 8 CUSCO        108 08          (((875377.1 8338199, 875434.6 8338092, 875~  72076.
 9 HUANCAVE~     94 09          (((577364.1 8587853, 577430.1 8587786, 577~  22065.
10 HUANUCO       76 10          (((290289.5 8963833, 290399 8963902, 29048~  37201.
```

Operaciones geométricas

- Relacionar una tablo archivo plano a una geometría

Cuadro N° 42
PERÚ: PRODUCCIÓN DEL MAÍZ AMARILLO DURO, SEGÚN ZONA GEOGRÁFICA
(Toneladas)

Zonas de producción	2007	2018	Crecimiento promedio anual 2007 - 2018	Estructura % 2007	Estructura % 2018
COSTA	**753 778**	**804 693**	**0,6**	**67,1**	**63,6**
TUMBES	1 431	1 149	-2,0	0,1	0,1
PIURA	63 777	46 845	-2,8	5,7	3,7
LAMBAYEQUE	92 381	98 649	0,6	8,2	7,8
LA LIBERTAD	232 596	106 491	-6,9	20,7	8,4
ANCASH	82 205	214 096	9,1	7,3	16,9
LIMA	213 803	130 719	-4,4	19,0	10,3
ICA	63 165	204 901	11,3	5,6	16,2
AREQUIPA	4 139	1 554	-8,5	0,4	0,1
MOQUEGUA	146	211	3,4	0,0	0,0
TACNA	136	78	-4,9	0,0	0,0
SELVA	**235 122**	**305 825**	**2,4**	**20,9**	**24,2**
LORETO	55 086	118 336	7,2	4,9	9,4
SAN MARTÍN	127 372	110 450	-1,3	11,3	8,7
AMAZONAS	22 014	31 260	3,2	2,0	2,5
UCAYALI	22 103	26 553	1,7	2,0	2,1
MADRE DE DIOS	8 548	19 226	7,6	0,8	1,5
SIERRA (Selva alta)	**134 017**	**154 554**	**1,3**	**11,9**	**12,2**
CAJAMARCA	74 571	65 852	-1,1	6,6	5,2
HUÁNUCO	25 422	42 962	4,9	2,3	3,4
PASCO	5 541	6 465	1,4	0,5	0,5
JUNÍN	8 804	22 895	9,1	0,8	1,8
HUANCAVELICA	264	615	8,0	0,0	0,0
AYACUCHO	1 865	1 792	-0,4	0,2	0,1
APURÍMAC	2 113	4 331	6,7	0,2	0,3
CUSCO	10 451	5 402	-5,8	0,9	0,4
PUNO	4 987	4 240	-1,5	0,4	0,3
TOTAL NACIONAL	**1 122 918**	**1 265 072**	**1,1**	**100,0**	**100,0**

Fuente: MINAGRI-DGESEP-DEA Elaboración: MINAGRI-DGPA-DEEIA

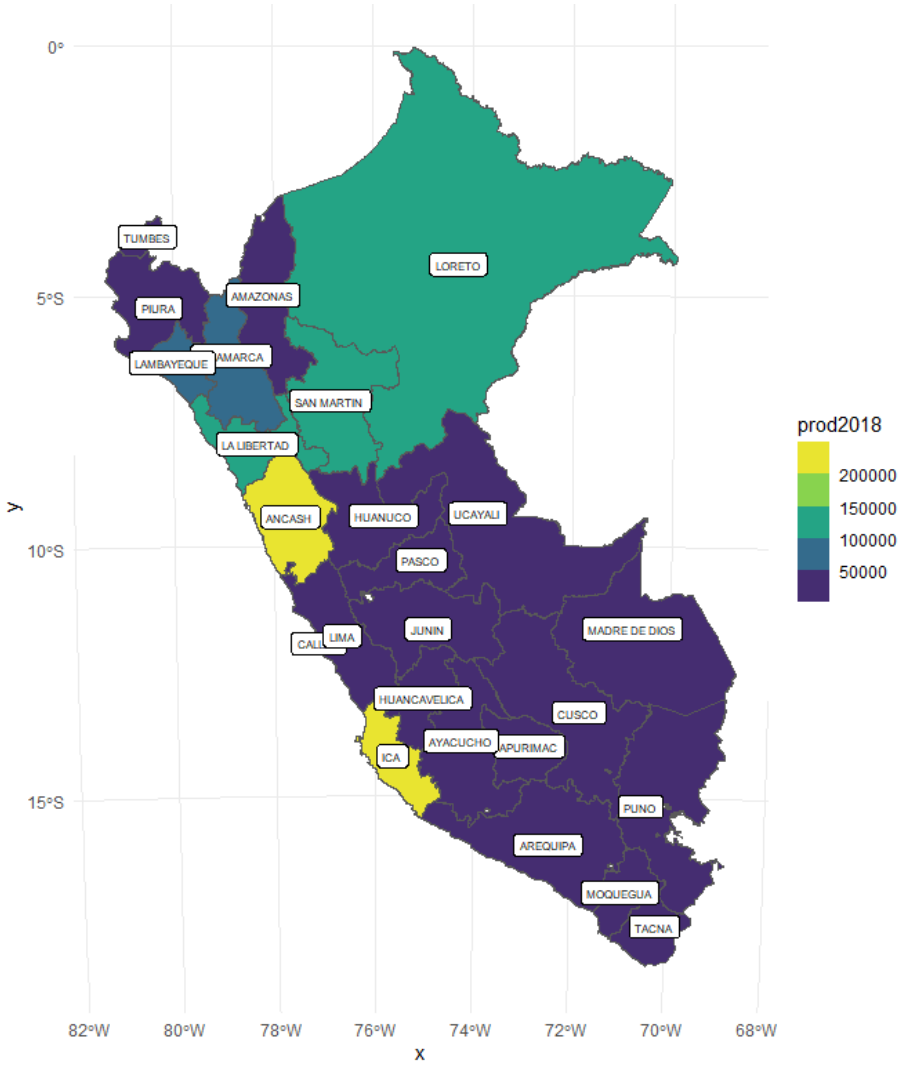
https://cdn.www.gob.pe/uploads/document/file/471867/Plan_Nacional_de_Cultivos_2019_2020b.pdf

Operaciones geométricas

Dissolve: st_cast

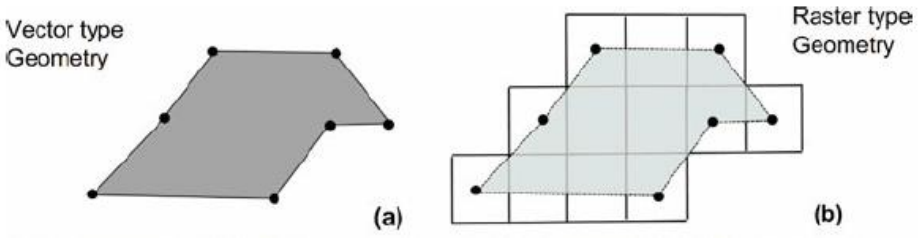
Merge: merge

Plot: ggplot



Datos espaciales

Raster



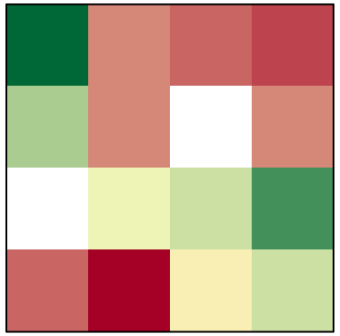
A. Cell IDs

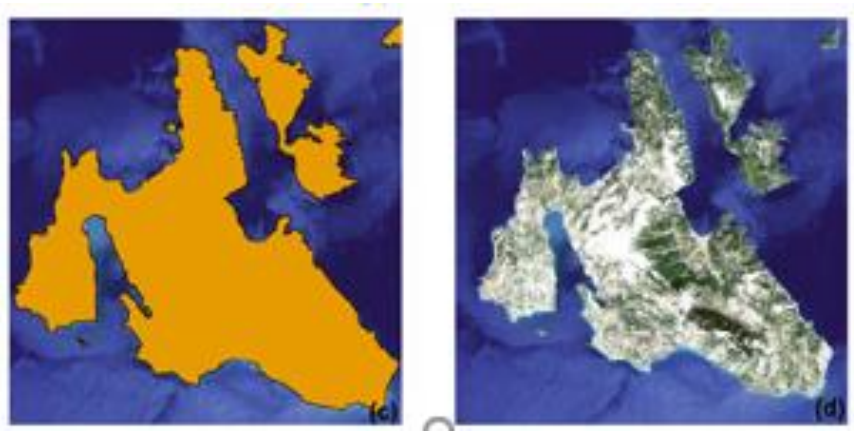
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

B. Cell values

100	28	22	15
73	31	NA	30
NA	59	62	91
25	6	53	66

C. Colored values

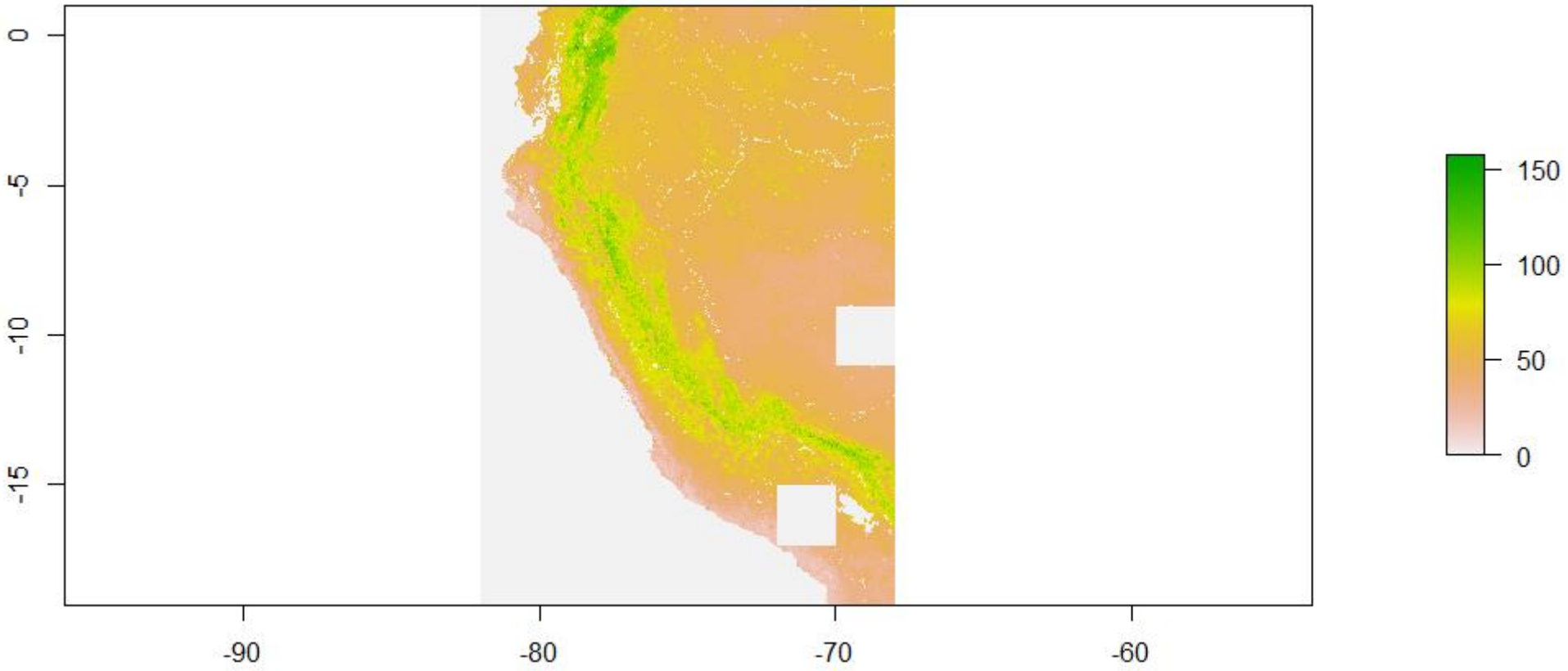




https://geocompr.robinlovelace.net/spatial-class.html#raster-data

Datos espaciales

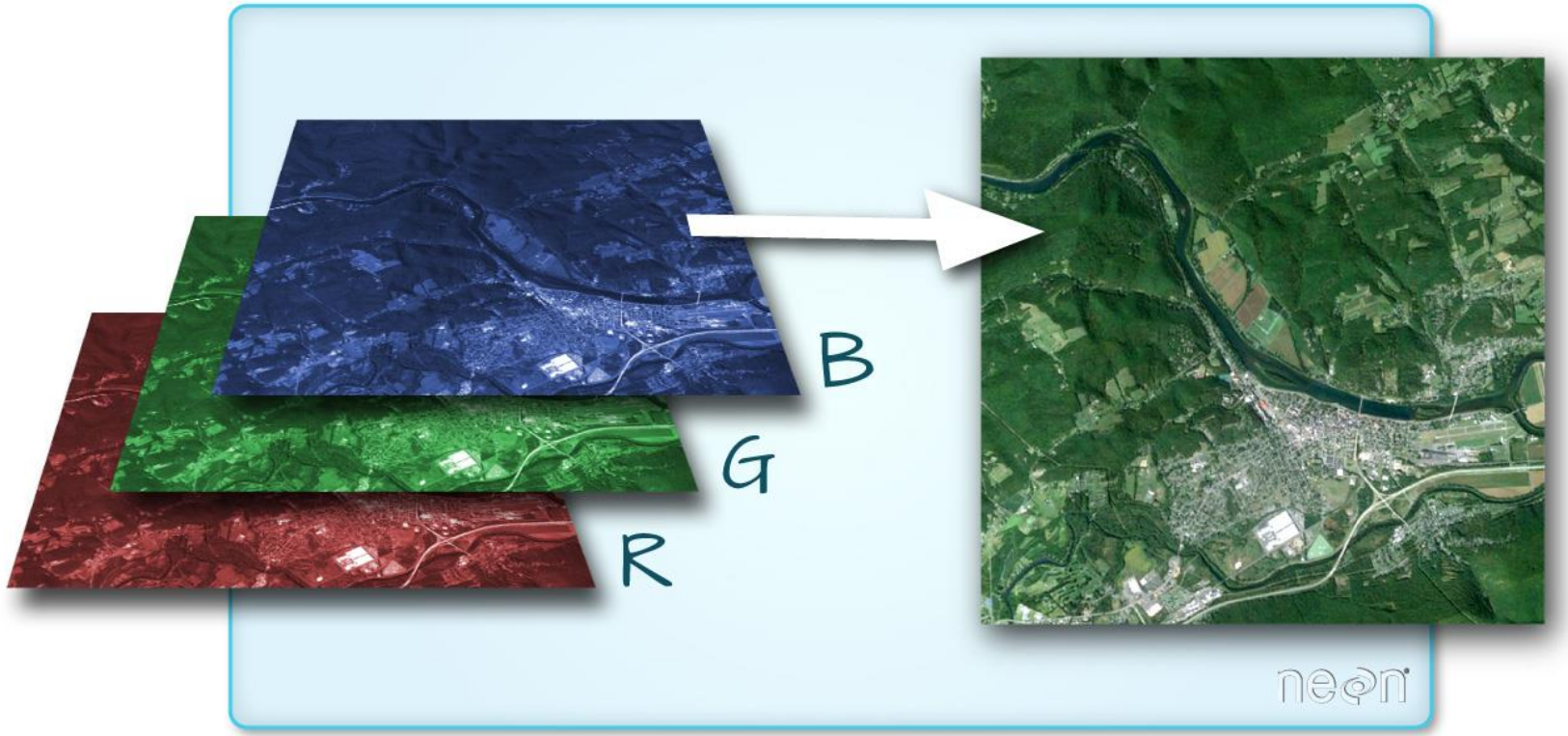
Raster



Datos espaciales

Datos espaciales

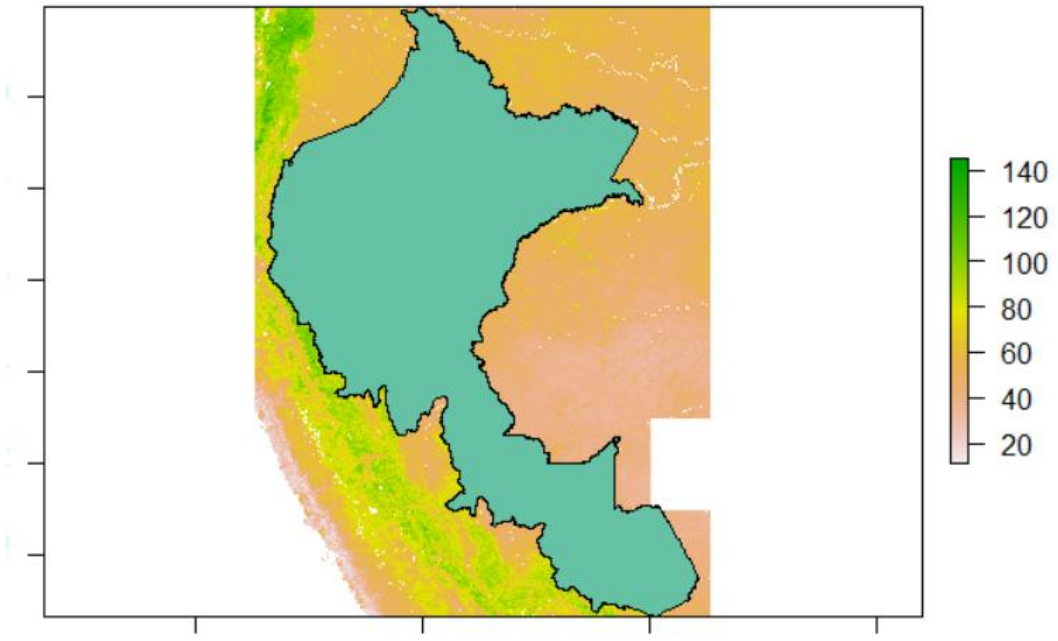
Raster

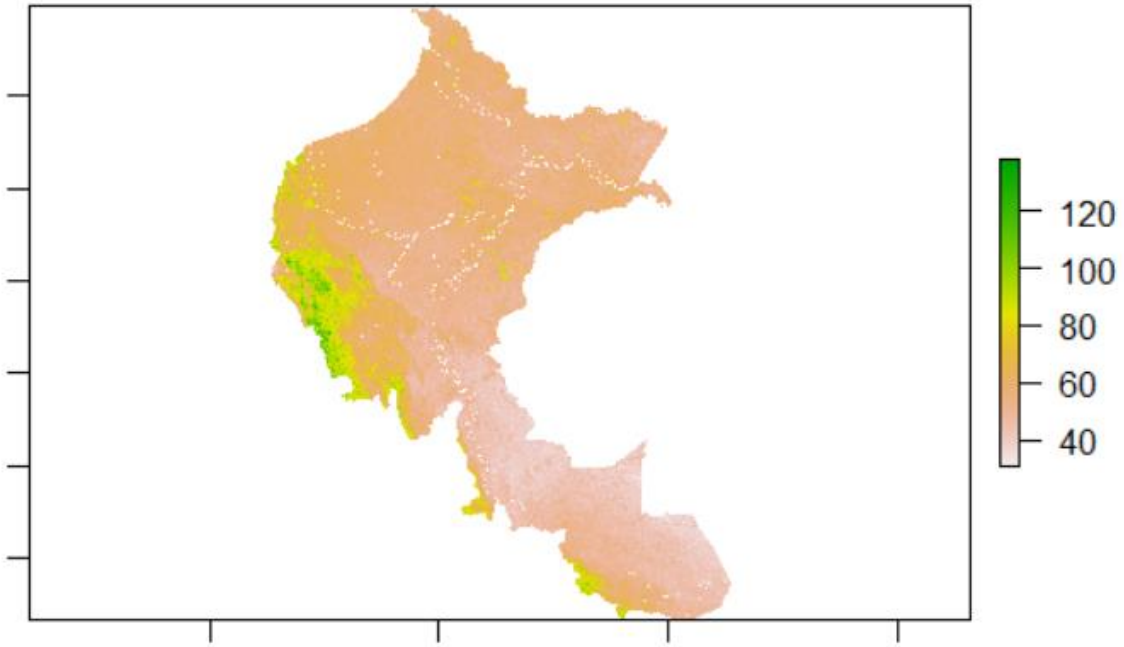


https://erinbecker.github.io/r-raster-vector-geospatial/05-raster-multi-band-in-r/index.html

Operaciones espaciales

- Mask
- Crop
- Extract





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