Reproducible Global N

Reproducible Spatial Analysis for Charting Nitrogen Dynamics in Global Wheat Production

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  - "Combine various datasets to generate indictors of nitrogen loss to the environment associated with wheat production at various spatial scales"
  - "Provide graphical representations and conduct simple comparisons across a few countries"
  - "Provide a reproducible code associated to these tasks."

Task 1

- Using SPAM raster data [Wood-Sichra et al., 2016], a new raster at the same resolution, containing wheat production volume (in million tons Mt) is produced.

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- Using SPAM raster data [Wood-Sichra et al., 2016], a new raster at the same resolution, containing wheat production volume (in million tons Mt) is produced.
- Global scale in a raster format (5 arcminute spatial resolution) estimates of yield (r_y) in Kg/Ha, physical area (r_a) in Ha and harvested area (r_h) in Ha for the year 2005 are available.

Reading SPAM data

```
spam_data = list("yield" = rast("data/SPAM_2005_v3.2/SPAM2005V3r2_global_Y_TA_WHEA_A.tif"),
                 "harvested_area" = rast("data/SPAM_2005_v3.2/SPAM2005V3r2_global_H_TA_WHEA_A.tif"),
                 "physical_area" = rast("data/SPAM_2005_v3.2/SPAM2005V3r2_global_A_TA_WHEA_A.tif"))
```

```
str(spam_data)
```

```
List of 3
 $ yield         :S4 class 'SpatRaster' [package "terra"]
 $ harvested_area:S4 class 'SpatRaster' [package "terra"]
 $ physical_area :S4 class 'SpatRaster' [package "terra"]
```

```
spam_data[['yield']]
```

```
class       : SpatRaster
dimensions  : 1853, 4320, 1  (nrow, ncol, nlyr)
resolution  : 0.08333333, 0.08333333  (x, y)
extent      : -180, 180, -64.41667, 90  (xmin, xmax, ymin, ymax)
coord. ref. : lon/lat WGS 84 (EPSG:4326)
source      : SPAM2005V3r2_global_Y_TA_WHEA_A.tif
name        : SPAM2005V3r2_global_Y_TA_WHEA_A
min value   :                             0
max value   :                         19429
```

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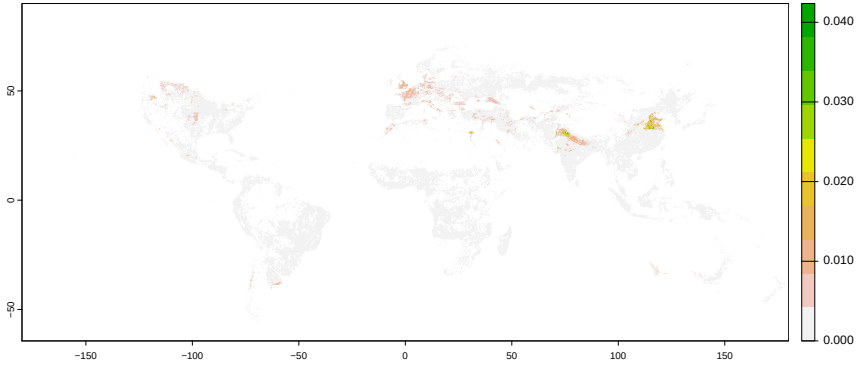
  - wheat_production_Mt = wheat_production / (1e3 * 1e6)

Calculate Wheat Production

- A global map is created and the raster is exported in a geotif format:

```
wheat_production = spam_data[["yield"]] * spam_data[["harvested_area"]]
wheat_production_Mt <- wheat_production / (1e9)
```

```
plot(wheat_production_Mt, col = terrain.colors(10, rev=TRUE))
```




```
writeRaster(wheat_production_Mt, filename = "./output/wheat_production_Mt.tif",
            overwrite=TRUE, gdal = c("COMPRESS=DEFLATE", "TFW=YES"))
```

Task 2

- Using the newly created raster and the GAUL shapefile of administrative borders, the production is aggregated to country level and exported to a csv file.

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Issues

References

Ulrike Wood-Sichra, Alison B Joglekar, and Liangzhi You. Spatial Production Allocation Model (SPAM) 2005: Technical Documentation. 2016.