Raster Exercise

Objective: Use IPUMS Terra to obtain customized datasets that can be used to answer research questions. This exercise uses raster datasets to explore education and agriculture in two economically different countries.
RESEARCH QUESTIONS

Question 1
Examine relationships between education and agriculture in Zambia and Switzerland. Is there a correlation between educational attainment levels and crop/pasture land use in each country? Is the relationship similar across the two countries?

Question 2
Examine the tree cover present in Zambia and Switzerland. How does population relate to the presence of broadleaved trees? Compare relationships in both countries, for evergreen and deciduous broadleaved trees where applicable.

OBJECTIVES

- Create an IPUMS Terra account
- Create and download an IPUMS Terra raster data extract
- Use IPUMS Terra to rasterize area-level data

IPUMS TERRA VARIABLES

Area-level variables

- POPTOTAL: Total population for tabulated census areas
- EDATTAIN: Percent of population with a specific level of educational attainment in each census area

Raster variables

- CROPLAND2000: Area used as cropland
- PASTURE2000: Area used as pasture
- LCBRDEVGRN: Tree Cover, Broadleaved, Evergreen
- LCDECIDCL: Tree Cover, Broadleaved, Deciduous, Closed
- LCDECIDOP: Tree Cover, Broadleaved, Deciduous, Open
IPUMS Terra: Raster Data Extract Overview

Data Type Descriptions

Raster
Raster data describe how the value of a variable varies over space. The data are structured as a grid of cells. Each cell is connected to a location, and contains the value of the variable at that location. For example, in a land cover raster, each cell indicates the type of land cover found at that location.

Area-level
Area-level data describe geographic units defined by boundaries. Units are grouped in sets, such as the counties of the United States or the states of Brazil. In IPUMS Terra, these sets of units are referred to as geographic levels. The data are structured as tables, with a row for each unit and a column for each variable. For example, you may have a table with a row for each county in the United States and columns containing the number of males and the number of females in each county.
IPUMS uses a common user management system covering all IPUMS products. If you have an existing account with any IPUMS product, you will use the same account for IPUMS Terra.

- Go to https://data.terrapop.org/
- If you have an existing IPUMS account, click Login. After logging in, you will be directed to the registration page for IPUMS Terra.
- If you do not have an IPUMS account, click on Sign up to register for access.

Note: Microdata access is NOT required for this exercise. Access to international microdata requires application and approval by the

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**Step 1**
Sign up

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**Step 2**
Email confirmation and log in

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After you have registered with IPUMS Terra, an e-mail will be sent to your account notifying you of approval.

Note: Please be sure to check your trash/spam folders

- Open the e-mail and click on the confirmation link. You will then be logged into IPUMS Terra.
The extract builder website guides researchers through the workflows for building data extracts. Choose the type of data structure you would like to receive as output for further analysis. In this tutorial, we will get raster data output.

- Click on the \textit{Start Extract} button for Raster Data Output
Step 4
Examine the IPUMS Terra interface

The IPUMS Terra interface for the first step of the workflow consists of the following elements:

**Navigation Bar:** Shows the major steps in the workflow, the sub-steps of the current step, and your progress through the workflow. The navigation bar steps will reflect the workflow you select. The step and sub-step you are currently on are highlighted in green.

**Data Cart:** Provides a summary of the data you have selected to include in your extract. The data cart is updated as you make selections throughout the workflow.

**Availability Grid:** Shows the availability of variables by dataset and enables selection of variables and datasets.

**Variables Panel:** Lists topics for which area-level variables are available. Clicking on a topic will populate the rows of the availability grid with the variables in that topic.

**Datasets Panel:** Lists countries in the IPUMS Terra system, and provides options to filter by time and hide countries without area-level data. Clicking on a continent will list the countries in the continent. Clicking on a country will populate the columns of the availability grid with the datasets available for that country. You may add all countries in a continent to the grid by clicking the “Browse All” line.
Step 5
Browse datasets for countries of interest

- Click on **Africa** in the Browse Datasets Panel.

Countries are listed alphabetically, with numbers in parentheses indicating how many years of data are available for the country.

- Click on **Zambia**. The available datasets for Zambia appear as columns in the availability grid.

- Click on **Europe** in the Browse Datasets Panel
- Click on **Switzerland**. The available datasets for Switzerland will appear as columns in the availability grid.

Step 6
Select datasets

- Check the boxes to select year **2000** for both countries.
Step 7
Select area-level variables

To see available variables, choose a topic in the Browse Variables panel.

- Choose the *Education* topic.

The availability grid will be updated with available education variables.

- Choose the variable group *EDATTAIN*, by checking the multi-select box.

EDATTAIN is available for Zambia and Switzerland in the year 2000. The variables in the EDATTAIN group will be added to your Data Cart.

You can expand the variable group to see the individual variables by clicking the arrow widget.

*Note: EDATTAIN contains 4 variables for different levels of education.*

*Note: To hide unselected datasets in each country, click on “show only selected datasets.”*

- Also select the *POPTOTAL* variable from the *Demographic* category.
IPUMS Terra also provides metadata about each variable. To access the metadata, you must first expose the individual variables within a variable group.

- Once the variable group is open, click on the individual variable name **TOTPOP** to get additional metadata (e.g., documentation about the variable, description, availability, and source).
Before moving on to the next step, verify that your Data Cart has the correct number of variables and datasets.

When you have selected both area-level variables and datasets, the NEXT button will become active and turn green.

The Navigation Bar indicates that the next step will be to select raster data:

- Click **NEXT** to move to the Raster Data selection screen.

You will need variables from the Agriculture and Land Cover topics.

- Click on the *Crop and Pasture lands* variable category.

The Crop and Pasture lands variables will be listed.
• Select two variables, *CROPLAND2000* and *PASTURE2000*, to add them to your cart.

![Select Variables](image)

Note: Clicking on variable labels will provide additional metadata

• Click on the *Land Cover* topic and then click on the *Global Land Cover 2000* variable category.

![Select Variables](image)

• After clicking *Global Land Cover 2000* select three variables, *LCBRDEVGRN, LCDECIDCL, LCDECIDOP*, to add them to your cart.

![Select Variables](image)

• Click *NEXT* to go to the Submit step.
Step 10
Check data cart and submit extract

Review your cart in the right panel

- Give your extract a short, descriptive **Extract Title**, maybe, “Zambia and Switzerland, education, land cover and use, population.” The Extract Title will appear in your Extract History.

### Submit Extract

**Extract Details**

**Extract Title**

TerraPop Extract_Zambia and Switzerland, education, land cover and use, population

**Extract Notes (Optional)**

- Click **Submit Extract**
You will receive an email when the extract is ready

IPUMS Terra data extract #9 is ready.

ipums@umn.edu
to me

Your IPUMS Terra extract 'Zambia and Switzerland, education, land cover and use, population' is ready. To retrieve your data, codebook, and command files, for Extract #9, go to the link below.

https://demo.terrapop.org/user/extract_requests

Thank you for your support.

Sincerely,
The IPUMS Terra Team

- To download the data, follow the link in the e-mail, which will take you to your account's "Extract History" page as shown below. This page can also be accessed by clicking ACCOUNT in the IPUMS Terra page header.

The data will be delivered in a compressed format, make sure you have software available to extract the files.

Raster extracts are provided in geoTIFF format, suitable for analysis in GIS or other software for handling spatial data.