Notes from Geospatial/GIS Meetup

August 11, 2022

Rivera Library, Room 140, and via Zoom

Attendees: Janet Reyes, facilitator;
In Rivera Library: Bart Kats, Gopal Mahajan, Mike Cohen
Via Zoom: Amninder Singh, Andrea Wilson, Anto Paul, Debbie Stocking, Elia Scudiero, Gerald Winkel, Grace Nguyen, Jay Spencer, Luciane Musa, Lynn Sweet, Mary A, Natalie Glasgow, Shanon Langlie, Soumya Agarwal, Steve Ries

Announcements

This meeting was recorded; video is available here. The passcode to view is K=L0dP0#

Janet shared a few of the notable takeaways from the virtual sessions she attended at the Esri **User Conference** in July.

Janet will offer an **Introduction to QGIS workshop** on Thursday, August 25 from 2:00-3:00 pm.

"The **2022 Tribal ArcGIS StoryMaps Challenge**, hosted by Esri, encourages US tribal nations and tribe members and college students to tell place-based stories about tribal heritage and sustainability." The submission deadline is in the middle of November.

The next Esri GIS in Higher Education chat, on Tuesday September 6 at 9:00 am PDT, will cover "**Best Practices for Engaging Your Community with ArcGIS Hub**."

First-time Attendees

Amninder Singh, Natalie Glasgow, and Soumya Agarwal were all first-time attendees.

Welcome, and we hope to see you again!

Presentation

Dr. Gopal Ramdas Mahajan, a Senior Scientist at the Indian Council of Agricultural Research - Agriculture Research Services (ICAR-ARS) in India, and currently a Fulbright visiting Research fellow in Environmental Sciences at UCR & Visiting Scientist at the USDA Salinity Lab, gave a presentation titled "**Using GIS and geospatial techniques for salinity mapping and GIS-Geoserver based information system.**"

The research topic of Gopal's Fulbright fellowship focuses on mapping soil salinity incorporating remote sensing imagery techniques, specifically by using proximal soil sampling combined with satellite imagery to map soil salinity and characterize the crop-yield response to salinity in California farmland.

Salinity refers to the presence of ions (sodium, magnesium, and many others) in the soil solution. It's estimated that 23% of the total cultivated area of the world is saline; most of the salinity is naturally occurring. A significant proportion of farmlands in California, India, and other areas are saline to some degree, causing poor crop yields and economic losses. Other impacts of salinity include less cultivable area, loss of biodiversity, and degradation of water quality and supply.

Given the severity of the impacts, more precise and reliable measurements of soil salinity are needed at field, landscape, and regional scales. Better monitoring results are obtained when proximal and remote sensing data are integrated with field and lab data, with GIS and geospatial tools playing a key role in assessing spatial distribution.

In the Imperial Valley, crop yields have been reduced by salinization and other problems. Improved measurement will lead to better management of water as well as salinity. Proximal sensing is done with an instrument that measures apparent electrical conductivity, which is a function of soil salinity. The instrument is dragged along the field's surface in transects spaced 5 meters apart. Soil samples are also taken at strategic locations in the field. When the two sets of data are integrated and geostatistical interpolation is employed, a more detailed map results.

On the west coast of India, visual and near-infrared remote sensing was used in a study comparing spectral reflectance patterns with lab results for salinity. The relationship that was seen between the two types of data allows soil salinity to be predicted using remote sensing. In another study in Goa, India, GIS helped determine appropriate levels of lime application to mitigate high soil acidity levels.

The second part of the presentation was a demonstration of the preliminary GIS-Geoserver based information system Coastal Agricultural Information System (CAIS), which was created using QGIS. The team has just finished with Phase 2 of development.

The coastal region of India faces challenges such as demographic pressure, environmental degradation, natural disasters, coastal erosion, and sea water ingression. An accurate and comprehensive resource inventory is essential for implementing best management practices.

The CAIS system contains a large number of systematically arranged land-based data layers. The main categories of data include agroecology, socio-economic data, land use land cover, terrain characteristics, water resources and availability, and animal and fish resources.

A user starts by selecting an administrative unit of interest (down to the village level), then selects the data they want to examine. Gopal discussed several of the available data layers. Size of land holdings is one such layer. In areas where land holdings are very small, it wouldn't be practical to devise an agricultural plan that involves use of large machinery. In another example, the crop productivity layer gives an indication of which crops have good or poor yields in a given area.

Among the potential uses of CAIS are potential crop zone mapping, determining suitability of particular types of technology, and informing policy-makers of challenges.

Discussion

Mary asked if global warming has negative effects on soil salinity. Gopal replied that it has some positive and some negative effects, depending on the area.

Mike commented that he recently was in Salt Lake City, where there are concerns about wind-blown salts as the lake level recedes.

Shanon asked which crops are the most vulnerable. Answer: in coastal areas, rice is most vulnerable due to salinity and excess flooding. Coconut and cashews are vulnerable due to uprooting in cyclones. Livestock are also at risk when there's standing water for several days due to flooding.

A success story of how farmers have been aided by the information available in CAIS: a tribal community living upslope has water scarcity due to runoff. Using data including soils, slope, and natural springs, the team designed a more efficient irrigation system for the local conditions. In two years, average coconut yields increased from 40 to 80 per tree.

When the system is ready to be shared in a month or two, Gopal will write a brief description and send a working link to Janet, who can then share it with the UCR geospatial community.