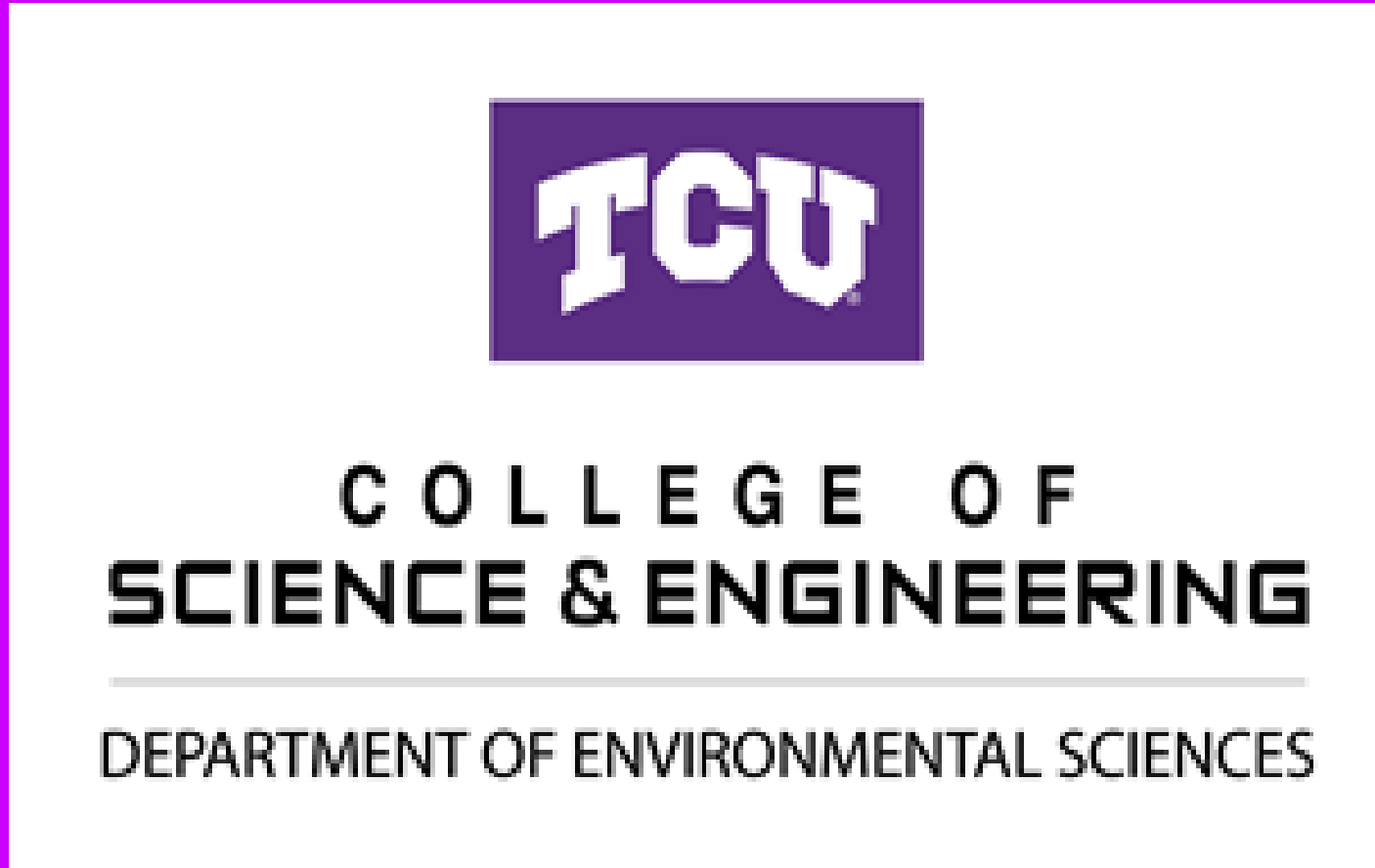# The Effects of population growth and agriculture on Gishwati forest land cover and biodiversity from 1986 to 2015 Rwanda
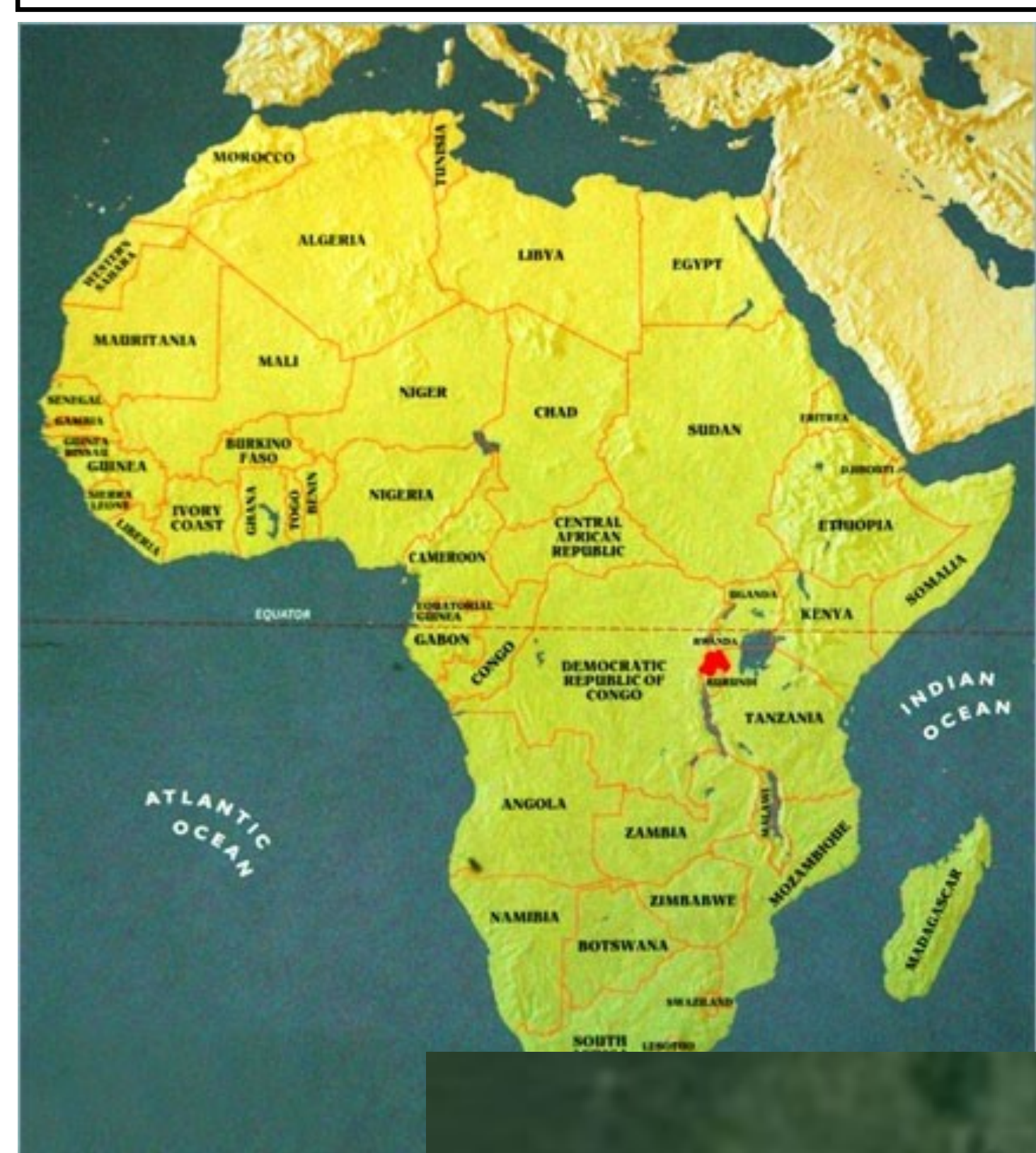
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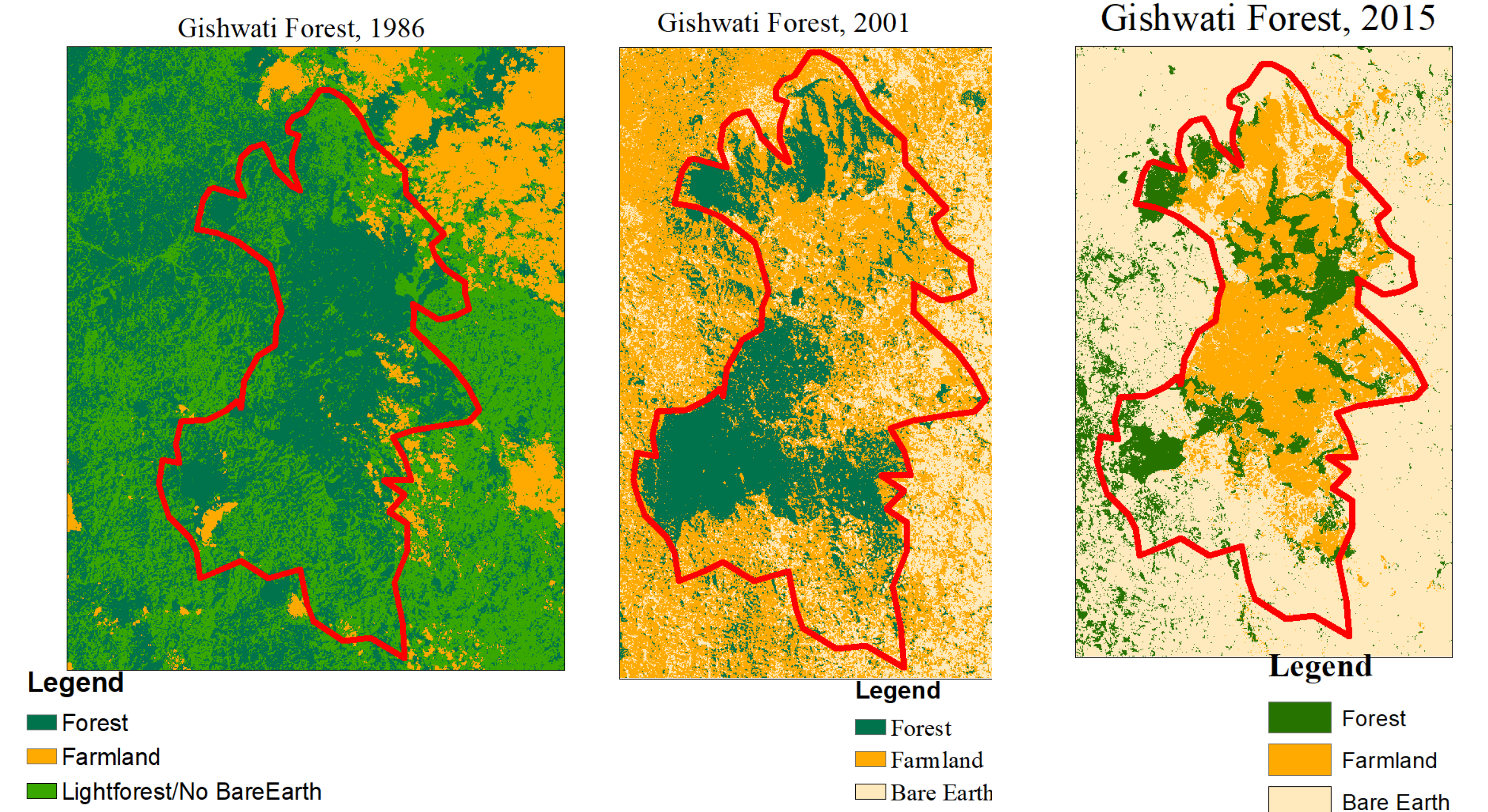DEPARTMENT OF ENVIRONMENTAL SCIENCES

Abstract

Rwanda is a country in Central-East Africa and one of the smallest countries on the African continental, being only 10,169 mi²/ 26340 sq. Km. Rwanda is a landlocked country bordered by Uganda, Tanzania, Burundi, and the Democratic Republic of the Congo. The current population of Rwanda is 12,830,205 as of 2020, based on latest United Nations data with a population density of 525 per Km² which equates to about 1,360 people per mi² with 17.6 % of the population living in urban centers.

Rwanda forests have historically played a very significant role in the economy and livelihoods of its population through tourism, energy, and other industrial purposes. They provide around 86% of the primary energy source mainly as domestic cooking energy. Rwanda experienced 50.9% total forest loss since 1990, in order to address this deforestation and imbalance in wood supply/demand, Rwanda has over the years taken a consistent stance on increasing the forest cover by 30% by 2025.
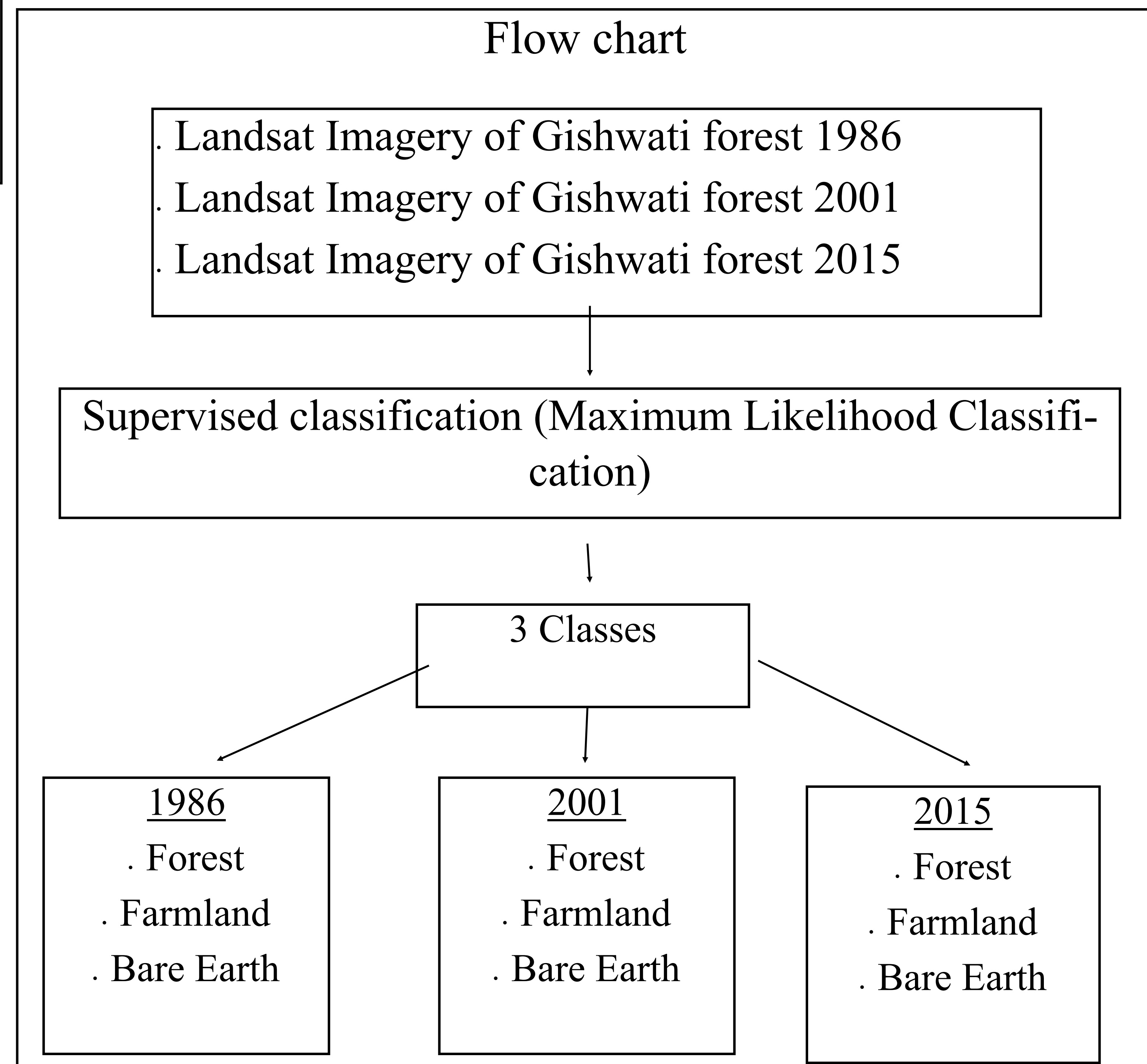
Introduction / Background

With growing population, this case study is going to analyze how population growth in Rwanda has affected forest cover and biodiversity between 1986 and 2015. The study will integrate available geospatial datasets such as census, infrastructure, and satellite imagery to assess the impact of population growth on deforestation.

Gishwati Forest Reserve has experienced deforestation extending over more than 50 years. The main reasons behind the deforestation were large-scale outside cattle ranching schemes, resettlement of refugees after the 1994 genocide who main cut down forest to find settlement, slash and burn farming, and free grazing of cattle.

Flow chart

. Landsat Imagery of Gishwati forest 1986
. Landsat Imagery of Gishwati forest 2001
. Landsat Imagery of Gishwati forest 2015

↓

Supervised classification (Maximum Likelihood Classification)

↓

3 Classes

1986	2001	2015
. Forest	. Forest	. Forest
. Farmland	. Farmland	. Farmland
. Bare Earth	. Bare Earth	. Bare Earth

Reference

. https://earthobservatory.nasa.gov/images/38644/gishwati-forest-rwanda
. http://fharwanda.org/?Description-of-the-Gishwati-Forest
. http://www.greenafricadirectory.org/listing/rwanda-environment-management-authority-rema/

Results

Gishwati Forest, 1986   Gishwati Forest, 2001   Gishwati Forest, 2015

Legend
- Forest
- Farmland
- Lightforest/No BareEarth

Legend
- Forest
- Farmland
- Bare Earth

Legend
- Forest
- Farmland
- Bare Earth

Discussion

In 1986, the Gishwati Forest was a virgin forest, barely touched by any human activities. However, this changed due to increased population migration during the 2000s, including extensive agriculture practices. As a result, the forest area was overwhelmed with flooding, landslides, erosion, decreased soil fertility, decreased water quality, and heavy river siltation, all of which aggravate local poverty. In1980s, Gishwati forest was 28,000 hectares, by 2002, the leftover forest was only 600 hectares.

By 2015, the area coverage of Gishwati Forest continued to deteriorate to losing about 40% to 50% of forest cover due to agriculture. In addition to forest lost, there was also a serious deterioration of agriculture land from 2001 to 2015 due to soil degradation, erosions and land slides.

Conclusion

Overall, Gishwati Forest has lost over 95% of its forest cover from 1986 to 2015. The remaining parts of Gishwati Forest are now under the protection of Rwanda Environmental Management Agency (REMA) as a national park. Even though, Rwanda through REMA has taken over the years a consistent stance on increasing the forest cover by 30% by 2025 it is clear from those steps are not working as planned.

Judging from the collected satellite imagery, the forest cover of Gishwati is still decreasing at alarming rates and the main cause is agriculture. Due to small size of Rwanda and its fast growing population, the agriculture industry is crucial. However, our forests are also provide paramount ecosystem services that are essential for our livelihood. Therefore, REMA needs to reexamine previous implementation it had put in place inorder to prevent further deterioration of Gishwati Forest.

Gishwati Forest National Park
Rushenyi
Goma
Rwanda
Bukavu