

Introduction

- Agriculture is the **main source of income** for many rural families.
- Forest and grassland fires are strongly related to **agricultural expansion** in the Bolivian Tropical Andes.
- These events often start as “**supervised fires**”, a common practice amongst rural farmers.
- Environmental conditions such as wind speed, steep slopes, and dryness often lead to these **controlled fires becoming unmanageable**.
- Since agroforestry systems have been introduced (2017), the **frequency and intensity of forest fires have reduced**.
- Through remote sensing (RS) tools, the **positive effect of implementing these systems** has been assessed.

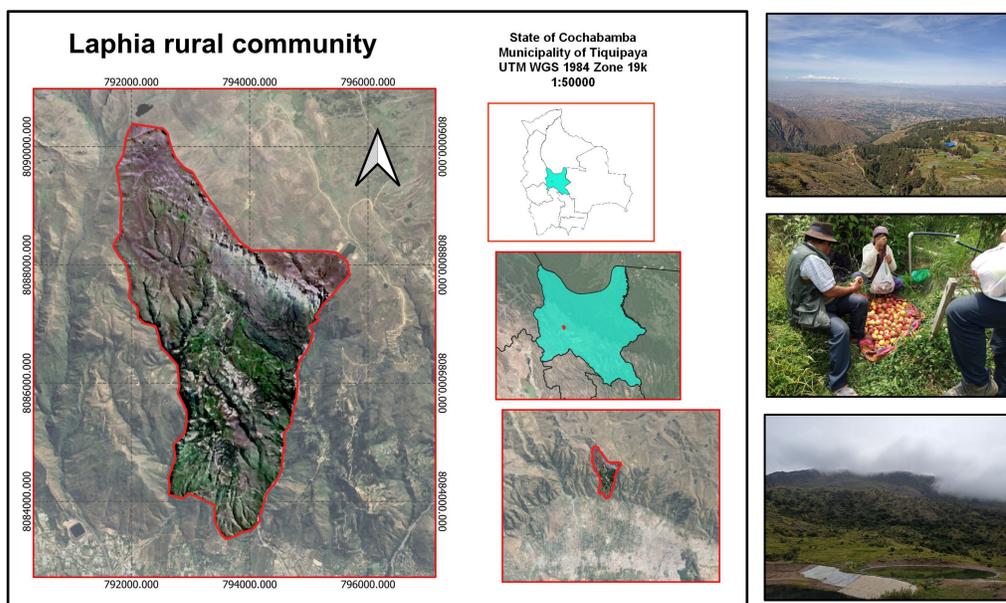


Fig.1. Geographic location of Laphia rural community (left), pictures of the community's territory, apple production from an agroforestry system, and one of the main water sources (right, from top to bottom).

Materials and methods

- Fire events assessment was made for 6 years: 2011, 2013, 2015, and 2016 as **before-agroforestry systems years**; 2018, 2020, and 2022 as **after-agroforestry systems years**.
- Initial assessment through global databases:
 - The MODIS Fire_cci Burned Area pixel product version 5.1 (FireCCI51).
 - Hansen Global Forest Cover Change version 1.9.
- Secondary information was collected from **municipal fire reports, press notes, and interviews with local farmers**.
- High resolution burned land information generated through Landsat 5, and Landsat 8 images (30m), using the **Normalized Burn Ratio index (NBR)**.
- Final assessment through the difference between NBR pre-fire and post-fire values, using the **United States Geological Survey (USGS) burn severity classification table**.

Results

- Global databases **didn't detect “minor” fire events** in the study area. Only 2016's forest fire can be seen due to its magnitude.
- Secondary information reports **considerable fire events every year**, varying in magnitude. Local farmers report lower magnitudes from 2017 onwards.
- NBR burned areas assessment shows results for every studied year; pre-fire and post-fire image selection **was possible thanks to the secondary information** previously collected.
- NBR assessment shows a **reduction in the extension of burned areas after 2017**.

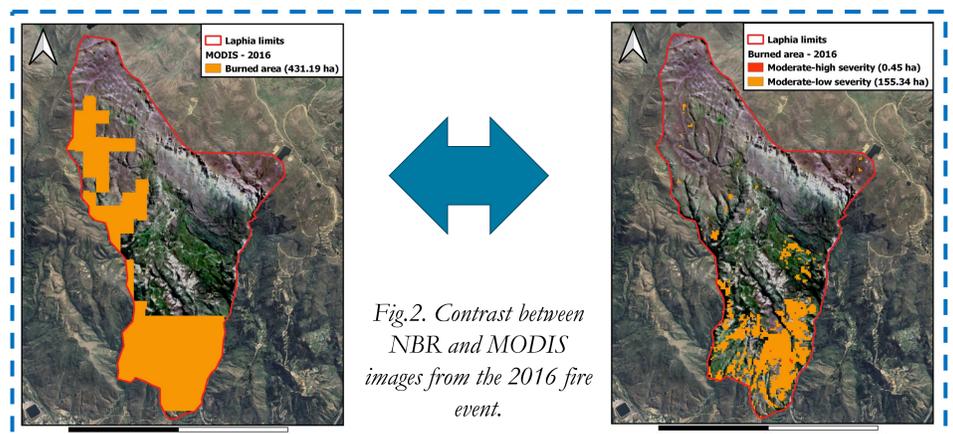


Fig.2. Contrast between NBR and MODIS images from the 2016 fire event.

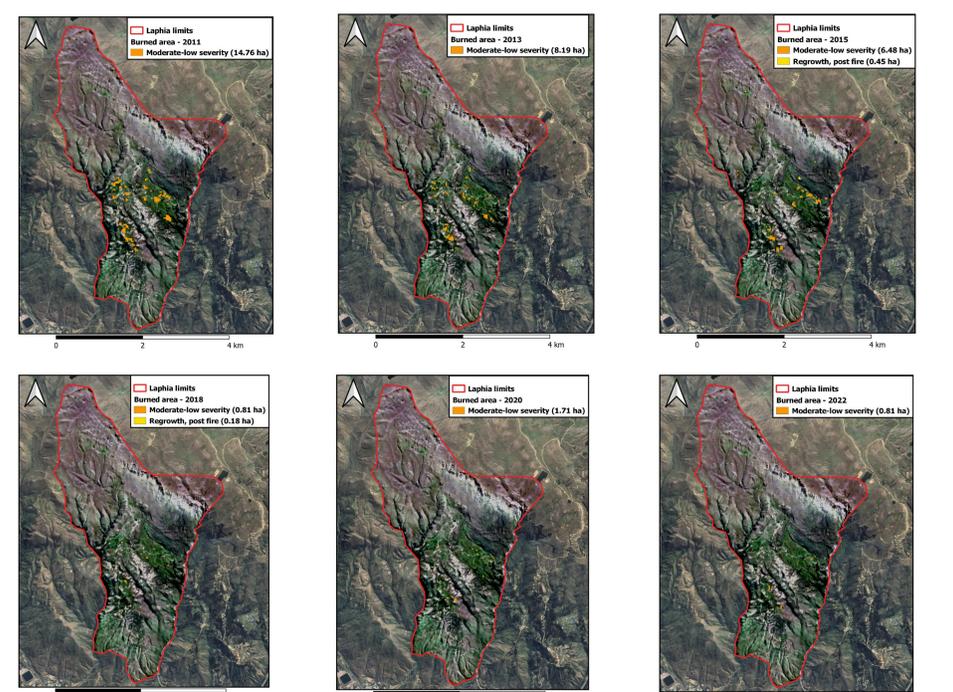


Fig.3. NBR images from the years prior and subsequent to the 2016's major fire event and to the implementation of agroforestry systems.

Conclusions

- Global date bases are useful for assessing major fire events, showing a good level of accuracy, but **resolution is too low for assessing minor or isolated fire events**.
- The NBR index is **useful for minor and/or isolated fire events assessment** (e.g. Grasslands and shrublands fires).
- RS fire events assessment **needs to be complemented with on-site information to be reliable**.
- Agroforestry systems implementation **has shown effective in reducing fire events (91% less burned areas on average)**. This means not only a contribution to biodiversity conservation but also an attractive economic alternative for rural farmers.