Gazelle
ECOSOLUTIONS

Technical Paper

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Research Brief: An overview of synthetic controls for assessing baseline conditions

Voluntary Carbon Markets, specifically nature-based solutions, have significant potential for mitigating climate change and restoring ecosystems at-scale. At Gazelle, we believe in the permanence and integrity of nature-based solutions (NBS) on grasslands ecosystems which cover roughly 40% of our planet's surface, hold 15% of soil carbon and are home to nearly 1/3rd of humanity.

Recent headlines have called into question REDD+ Projects (*not applicable to Gazelle)* and the potential misrepresentation of baseline conditions, or in other words the GHG emissions expected to take place in a business-as-usual scenario in the absence of a carbon project. The increased scrutiny around the quantification, monitoring and verification of such offsets is also focused on the idea of synthetic controls *(in the context of forest carbon projects).* This article details the use of synthetic control techniques under the VM0009 v3.0 methodology used by Gazelle on our grassland conservation projects in Botswana.

What are synthetic controls?
This essentially refers to the process of selecting a reference area of comparison (a control scenario) which in this context has been affected by land-use conversion, overgrazing and mismanagement. These reference areas are assessed against the project site using a set of covariates, or factors impacting land-use conversion and degradation in the control scenario. The full process is detailed in project design documentation provided by Gazelle to 3rd party auditors (VVBs) authorized by Carbon Registries such as Verra, Gold Standard, and ICR. As we near validation audit completion for our flagship project - MODISA - the full disclosure of our project documentation will be available online.

Our approach

Gazelle's process of selecting a reference area of comparison begins with searching for similar sites across the immediate geographic radius of 100-150 kilometers. Attributes we seek in suitable reference areas include geographic proximity, ecological conditions (types of habitat present) and land-use conditions. The site-specific conditions are analyzed by our on-the-ground team in order to assess suitability. Once a reference area is chosen the first layer of analysis is understanding the *cumulative proportion of conversion over time* also known as the *beta value* (β). This is essentially the logistic rate at which land-use conversion (and therefore degradation) took place on this property. As per the VM9 methodology this is done using available satellite imagery over a historic reference period- in this case it is 10 years. In the context of MODISA this was done using data from LANDSAT 9, the latest satellite launched in a joint program between NASA and the USGS.

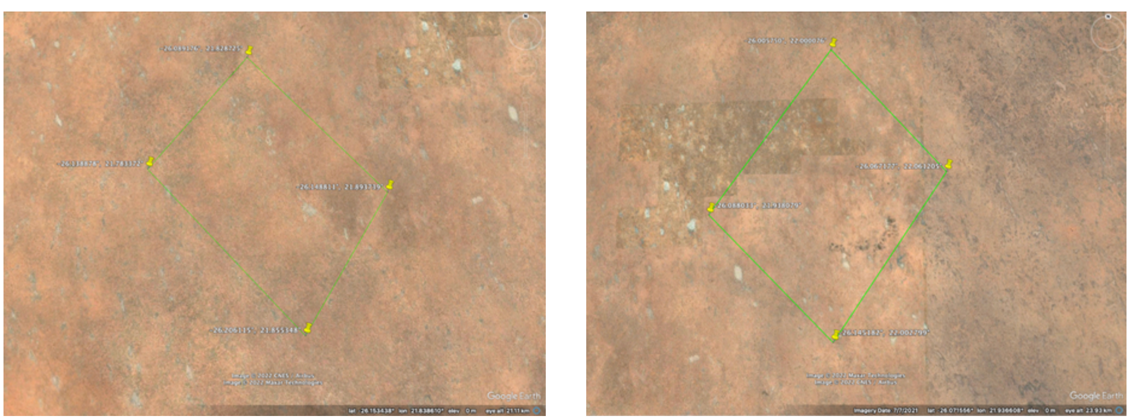


Figure 1: Google Earth Engine view of MODISA Project Site (accounting area A1) on the left, and reference area to the right

Selecting our Reference Area: After thorough analysis the reference area chosen for the MODISA Project was in KD-18, one of the Wildlife Management Areas in Botswana. WMAs are essentially buffer zones between protected areas (National Parks & Game Reserves) and civilian areas. Unfortunately the ongoing cycle of overgrazing and land degradation (via bush encroachment and desertification) is driving encroachment into protected areas. For this reason proxy areas (area where the actual sampling or analysis is done) on nearby WMAs that have been impacted by land-use conversion or encroachment by grazers on communal areas provide some of the best control scenarios to understand what would happen in the absence of a project.

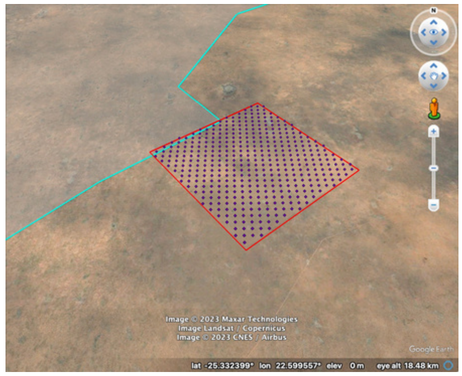


Figure 2: Google Earth Engine view of some reference area points analyzed across each year in the historic period

Using available LANDSAT imagery over a historic reference period of 10 years we conducted a land-cover/use analysis to determine the rate of conversion year over year. This was done by classifying a series of 800 random points on the proxy area (on the reference area WMA) and analyzing change over the last decade. This rate of conversion provides insight into the rate at which land conversion/degradation would have taken place in the absence of our project. This is important to understand for quantifying the offset emissions over the project's lifetime, which in this case in ten years.

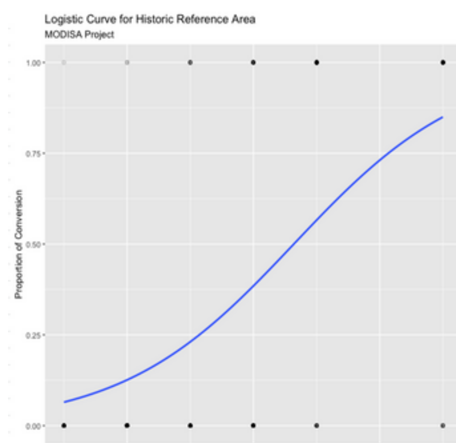


Figure 3: the application of β to the total forecasted emission reductions over the project lifetime

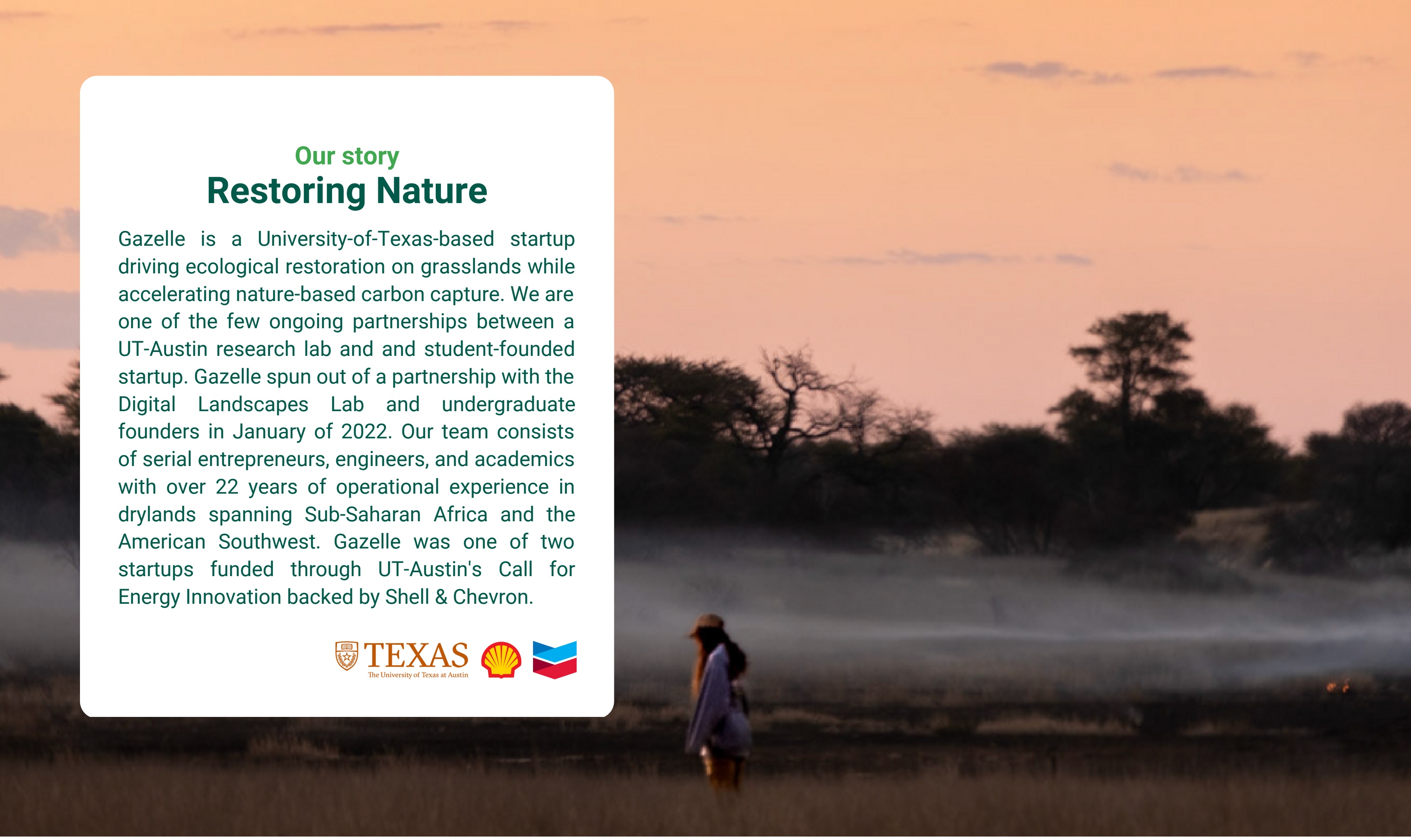
By modeling this over time we are able to create a clearer value proposition for our partnering ranchers to better understand the value of not converting and mismanaging their land. On another note, this roughly translates to the projected emission reductions (ex-post) throughout the project's expected lifetime. These figures can be affected by environmental, political, and economic risks which exist for every project developer. Accounting for all risks - disclosed to VVBs using standard outlines such as Verra's non-permanence risk report - we can determine and set aside a buffer pool of credits for the project's lifetime. Beyond active risk mitigation, we actively monitor baseline conditions on our project site(s) and reference area(s) as part of our ongoing MRV.

Figure 4: Game fencing used to demarcate the project site on the left and our MODISA fieldwork team to the right

Implications

We believe at the moment hard field-data is the best method for accurately establishing baseline carbon stocks on project sites. Although we recognize the barrier this may pose for MRV (Monitoring, Reporting, and Verification) on larger projects at-scale the abundance of quality field-data will be key to developing accurate remote-sensing and allometric equation based methods for assessing baseline conditions.

Ultimately the integrity of a carbon project is dependent on each individual developer's methods and adherence to established methodologies. Leading standards (registries such as VCS) have made incredible headway through the approval of new methodologies, active revision of outdated/inaccurate practices, and pro-active involvement with refining the issuance process of credits. However, it is important for buyers in the down-stream market to consider the unique conditions present on each project site and practices employed by the developer. Our team remains optimistic on the future of nature-based solutions (NBS) and intersection of emerging technologies and methods.



Our story

Restoring Nature

Gazelle is a University-of-Texas-based startup driving ecological restoration on grasslands while accelerating nature-based carbon capture. We are one of the few ongoing partnerships between a UT-Austin research lab and and student-founded startup. Gazelle spun out of a partnership with the Digital Landscapes Lab and undergraduate founders in January of 2022. Our team consists of serial entrepreneurs, engineers, and academics with over 22 years of operational experience in drylands spanning Sub-Saharan Africa and the American Southwest. Gazelle was one of two startups funded through UT-Austin's Call for Energy Innovation backed by Shell & Chevron.

TEXAS
The University of Texas at Austin

Nature-based solutions

Harnessing Grasslands

We help ranchers sustainably manage grasslands and monetize the carbon value of their land.

Grasslands cover roughly 40% of the planet's surface and hold 15% of all soil carbon which is why the latest research in environmental science shows natural solutions can account for 30% of climate change mitigation efforts by 2030. At Gazelle, we are optimistic about the future of tech-enabled land management in order to monitor, verify, and monetize improvements in nature-based sequestration through global markets. Our carbon credits are verified and issued from the leading global standards (Verra & ICR).

Protect ecosystems
Sustainably manage land

Sequester Carbon
Let nature do its job

Earn Carbon Offsets
Measure, verify and monetize

RUN SUSTAINABLY

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