Building consensus on Land Use Change analysis: Key gaps and opportunities for action

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Why land use quantification matters

Accurate analysis of land use change (LUC) holds critical importance for a wide variety of stakeholders, impacting critical societal facets such as food production, the economy and the environment. In the United States, LUC assumes varying implications for diverse groups including academia, conservationists, government bodies, retail and food companies, rural and Indigenous communities, and the agricultural sector.

LUC assessments play a pivotal role in shaping resource management decisions and policy formulation. Stakeholders are all directly affected by LUC, and consumers also ultimately feel an impact. LUC has far-reaching implications for biodiversity, water security, food security, energy security, ecosystem resilience, and other vital ecosystem services. The very nature of LUC, along with its estimations, can significantly influence the livelihoods of farmers and ranchers as well as rural and Indigenous communities. In fact, LUC estimations have already had repercussions on the United States' sustainability ratings on the global stage, restricting our access to some international markets.

The establishment of consistent frameworks and classifications for LUC quantification holds paramount importance in mitigating risks of impairment, thereby fostering resilience, both in environmental and economic terms, as we move forward with the challenge of feeding a growing population and addressing climate change.

What are the critical issues and gaps?

Land use change can mean change of native prairies or grasslands to farmland, or change of farmland to houses or parking lots. Others view land use change, land management change or land cover change as transitions of row crops to pasture or other uses. Many do not agree on the basic definitions of land use, land cover, land management, or marginal lands. Further, there is no agreement on how many years we look back to define land use change.

In short, direct LUC assessments in the United States are inconsistent. This is problematic from a technical and programmatic standpoint because inconsistency brings confusion and uncertainty to stakeholders on the amount of conversion and its related impacts. There is variation in LUC assessment based on terms, datasets, methods and interpretations. The accuracy of data sets vary over time, location and methods for reporting results (e.g., net vs gross LUC). Accuracy also impacts previous land use baselines (managed vs. unmanaged).

Several technical challenges create barriers for accurate and consistent LUC assessment, such as the following:

- An often limited scope that does not include broader dynamics in land shifts (e.g. farm land conversion to urban sprawl, municipalities and temporary shifts in land management).
- Lack of access to information (i.e. data), difficulties with remote sensing in differentiating between managed lands, and difficult and minimal independent validation of reported accuracies bring challenges in trusting data for assessment.
- Evolving and expensive models limit access and trust in quantification.
- A failure to consider the social aspects of rural communities leaves them at risk.

The various stakeholders do not agree upon key definitions related to land use change. Disagreement in definitions creates confusion in estimates of the amount and location of LUC. The context-specific nature of LUC may mean that universal definitions are neither workable nor desirable. However, there is still a need for greater clarity and specificity in LUC definitions. This is also needed for greater alignment and selection of terminology and data for each target topic or application. For example, there is inconsistent use of the terms "land cover" and "grasslands" (IPCC, 2006, 2019; Meyer and Turner, 1994; USDA 2015 update of NRI Glossary; U.S. Department of Energy, 2016). This inconsistency results in ambiguity across data sets. Some datasets define perennial crops such as hay/alfalfa and lands set aside for the United States Department of Agriculture's (USDA) Untilled native grasslands and Conservation Reserve Program as grasslands. Some stakeholders understand land use change as when grassland areas convert back to commodity crops such as soybeans, corn and wheat, regardless of whether any intact native grassland was converted.

The connections across loss of farmland to urban sprawl, cropland expansion and grassland loss serve to highlight the uncertainty around LUC quantification. Demand is high in the U.S. and globally for lands to meet agricultural needs, with competing needs on the same lands—not to mention pressure from climate change—further complicating the situation. According to American Farmland Trust, from 2001 to 2016, our nation lost or compromised 11 million acres of farmland. North America is also home to some of the last remaining intact temperate grassland ecosystems. These ecosystems provide critical habitats, which hold approximately one-third of global terrestrial carbon stocks. They also provide critical resilience in the face of climate change, including drought, heat and wildfire. Healthy grasslands improve water quality and increase water storage capacity for downstream communities. Water users in the Missouri River Basin see benefits in reduced downstream flooding and high-quality water supplies for future generations.

A growing number of industry organizations and governments worldwide are developing commodity-sourcing guidelines to disincentivize the conversion of native grasslands to cropland. Thus it is important to demonstrate and have programming on the importance of preserving native lands in the U.S. to ensure that U.S. agriculture doesn't lose critical market access. Losing critical market access could drive down the U.S. commodity prices and impact the economic viability of U.S. farm operations. The mentioned data and definitions issues leave little consensus around the amount of land use change occurring. Some analyses identify commodity crop expansion as a contributor to grassland loss and others find little to no evidence of it.

Where can we take action?

While LUC quantification approaches currently struggle with ambiguity and inconsistency, none of the issues identified are insurmountable. Through a coordinated effort engaging a diverse group of relevant stakeholders, a shared vision for LUC quantification can be developed that provides improved farmland preservation, greater certainty for native ecosystem protection, access to global markets, carbon accounting, and the many other sectors that rely on accurate measurement of land use change. This effort could provide:

- Clarity on the scope and objectives of relevant LUC quantification frameworks.
- Guidelines for the appropriate use of relevant datasets.
- An approach that is compatible across sectors but allows for frameworks to be tailored to specific use cases.
- Consideration of datasets and relevant lookback periods.
- Agreements for data privacy, sharing and use that balance the values of open access and producer privacy.
- Data platforms that enable accurate LUC tracking across scales, from the entire U.S. to specific regions such as the Central Grasslands to county- or farm-scale.
- Working with USDA to create greater consistency in data collection to further the state of the science, ensure data quality and transparency, and integrate with models that incorporate the factors that drive LUC.
- Prioritized investments from the government, non-governmental organizations (NGOs) and the private sector to ensure consistency across data layers and the ability to distinguish current land cover, including characteristics of various crops, conservation programs, and natural habitats.
- The resolution of inconsistencies across data sources and methods of calculation, which result in a considerable range of LUC estimates and a wide range of definitions and terminologies.
- Stakeholder and agency alignment on a consistent evaluation framework for LUC quantification that addresses stakeholder needs and climate, ecosystem, and resilience needs in a user-friendly platform.

Conclusion: Future generations depend on our action

Through the lens of environmental outcomes and food security, the importance of addressing Land Use Change analysis in a unified manner right now cannot be overstated. Despite diverse interests, fostering engagement and collaboration from within these groups is paramount. The United Soybean Board's initial steps in laying this cooperative path carry the promise of a more viable system for all.

For farmers, a favorable outcome holds the potential for continued international market access and profitability while fortifying their commitment to long-term land stewardship. Farmers also stand to gain from this endeavor through improved corporate and public conservation programs.For ranchers, a favorable outcome will provide confidence in a reliable pathway to keep grasslands intact as the foundational landbase for their sector and the sustainable grazing that is vital to their economic viability. Collaboration and alignment on LUC methodology and definitions to support both sectors and landscape resilience is essential for success on all fronts.

The stakes loom large, with soaring demand nationally and globally for lands to meet agricultural demands amid competing interests and climate change pressures. Yet our ability to nourish a growing population while preserving invaluable ecosystems, fortifying climate resilience, safeguarding critical habitats and upholding nearly a third of global terrestrial carbon reserves is within reach.

Rising to the challenge of this call for action today could yield enduring rewards for decades to come.

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