

# **Greening the pastures: Can New Zealand's experience with agricultural intensification guide Brazil's pathway?**

Theme: Managing Natural Capital for the Future

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## 1.) Research Objectives and Importance of Project

Global demands for food, feed, and fuel continue to be major drivers of climate change and the cause of widespread habitat conversion, particularly in the tropics. Over the next decade, population growth and increasing affluence will accelerate this demand, especially for animal-based protein, which will stimulate even more agricultural expansion and intensification. Agriculture, including livestock and crop production, already accounts for the largest utilization of water and land worldwide. At the same time, it provides the largest single occupation in the world and is crucial for rural livelihoods. The pathway to meet these global demands for agricultural products in the coming decades will have a profound impact on our social and environmental systems, and thereby on our ability to manage natural capital for our future.

Forest and other land-based solutions are essential in order to limit global warming to less than 2°C and avoid dangerous climate change as described in the Paris Climate Agreement. Deforestation contributes 10 percent of global anthropogenic greenhouse gas emissions, and preventing it has the potential to provide as much as 40 percent of the emissions cuts needed to mitigate climate change. In the Brazilian Amazon, where beef exports have increased 18-fold since 2000 and have made Brazil the second largest exporter of beef in the world, ranching alone accounts for up to 80 percent of deforestation. However, a combination of public policies and private sector zero-deforestation commitments to “green” supply chains has led to substantial reductions in deforestation (e.g., the 2006 Soy Moratorium and the 2009 Zero-Deforestation Cattle Agreements). Farmers are beginning to respond to these market demands to preserve forests and to the tightening enforcement of public policy requirements that nearly all farmers must reforest or otherwise compensate for previous illegal clearing. Agricultural intensification— improved land management practices to increase yields per unit of area— is likely the only option to avoid deforestation while maintaining food production and profit levels, but it could also create unintended environmental and social problems if not done well.

Agriculturalists in New Zealand (hereafter NZ) have also responded to changing public policies along with market pressures and consumer preferences, but unlike Brazil they have maintained their “clean, green” image internationally. In the decades following the removal of nearly all agricultural subsidies in the 1980s, NZ farmers doubled production through rapid specialization and intensification with only a moderate increase in greenhouse gas emissions. The farming sector achieved this reduction in emissions per unit of production by concentrating on the productivity of its livestock. Today, NZ producers are global leaders for pasture management and intensified production systems, especially for dairying. However, despite the environmentally friendly image of NZ’s agricultural production, concerns are growing about the costs arising from intensification, especially for dairying, which has led to nitrate contamination of drinking water, pollution of lakes, soil compaction, and greenhouse gas emissions.

Comparative analysis of agricultural intensification pathways and outcomes in the Brazilian Amazon and NZ could open the door to co-learning and improved management practices in both countries. NZ and Brazil make particularly interesting case studies because both are globally important agricultural regions dominated by pastoral landscapes, but they have very different policy contexts and levels of intensification. Pressure is growing in both countries to reduce the environmental impacts of agricultural production, which accounts for 35 percent of total greenhouse gas emissions in Brazil and 49 percent in NZ. Each has ambitious national commitments to reduce these emissions through reforestation and avoided conversion, which means that further agricultural intensification must occur. However, NZ has made substantially more progress with intensification and could offer insights on incentives that lead farmers to adopt “climate-smart agriculture”.

The objectives of my fellowship were twofold: 1.) to conduct a comparative analysis of agricultural intensification using NZ and the Brazilian Amazon as case studies, and 2.) to lay the foundation for a future econometric study that will quantify intensification outcomes from different policies and conditions.

## **2.) Were the objectives achieved?**

Yes, objective one is well on the way to being achieved. I am in the midst of compiling and processing data for the comparative analysis. Much of the work for Brazil was completed before I arrived in NZ, and I am now working to make the NZ and Brazil data more compatible. One challenge has been that there is more data and more detailed data available in Brazil, and I have worked on developing new ways to finding data in NZ.

My perspective on objective two has evolved during my fellowship. I have now shifted from intensification outcomes to consider broader land use analyses in NZ. I am particularly excited to explore potential land use scenarios and associated environmental outcomes of NZ’s One Billion Tree Programme and what that could mean for the cattle and tourism sectors.

## **3.) What were the major achievements of the fellowship?**

There have been many achievements of my fellowship, but foremost on my mind is that my accelerated learning about a new geography that opened doors to new ways of understanding the global challenges of increased food production with less environmental harm. Moving out of my home institution and to another country allows for innovation, creativity, and openness that is not always possible amongst the routine and meetings of my typical life as a professor. I’m confident that this time in NZ will open up new and more innovative pathways for research and for teaching.

More specifically, I have created new datasets to depict NZ's agricultural systems including an Agricultural Atlas of NZ that relies on extensive photographs taken during field surveys to highlight NZ's approach to agriculture and agricultural intensification.

#### **4.) Follow-up work**

The comparative analysis will be published on its own or lessons incorporated into other articles that I will publish in scientific journals about Brazil's cattle sector. I will also stay in touch with my host institution and look forward to developing NZ-focused projects and writing grants together, as well as future research visits.

#### **5.) How might the results of your research project be important for helping develop regional, national or international agro-food, fisheries or forestry policies and, or practices, or be beneficial for society?**

My research will inform land use and agricultural policies in Brazil, New Zealand, and possibly in the U.S. In particular, my findings are highly relevant for grass-fed beef systems and for broader land use planning efforts that include goals connected to climate change mitigation. These results can be used to develop more effective and new types of policies in Brazil that encourage cattle ranchers to intensify production and reduce deforestation – but with approaches that account for the broader impacts on greenhouse gas emissions and health of neighbouring waterways, as well as animal welfare.

#### **6.) Relevance to CRP and Research Theme**

My project crosses all three themes in many ways but fits best in the Managing Natural Capital for the Future. Indeed, my entire research program including the work proposed here focuses on finding realistic solutions to produce the needed food and improve food security while minimizing environmental harm. My final project outcomes will offer lessons to improve the use of agricultural landscapes in Brazil, New Zealand, and the U.S., which could simultaneously help to end future conversion of natural landscapes. This work will connect back to address issues around soils as well as water quantity and quality issues associated with agricultural expansion and intensification.

#### **7.) Satisfaction:**

I had an outstanding fellowship experience. The opportunity to study land use change and sustainable agriculture in a new country and context in the middle of my

academic career was incredible. I was able to come in and learn so much while also applying my experience and knowledge from studying agricultural land use change in other countries, such as Brazil and the United States. It was invigorating to consider deforestation and sustainable agriculture in this very different place but to also be able to tie together the threads they have in common to develop new synthetic understanding.

I enjoyed connecting with my host and host institution and I am especially excited about what is to come as I develop new research directions based on my fellowship outcomes that will include writing proposals and furthering my collaboration with my host.

### **8.) Advertising the Co-operative Research Programme**

I learned about the fellowship opportunity after asking colleagues if they had ideas beyond Fulbright. I'm sure that word of mouth will continue to help, but perhaps there could be a stronger or more obvious way to search for the program? For example, make sure the program includes key words so that it pops up for anyone searching the web for faculty research programs?