

# Vulnerability of Rural Small-scale Producers in the Brazilian Amazon: Priorities and Research Needs for Climate Change Adaptation Planning

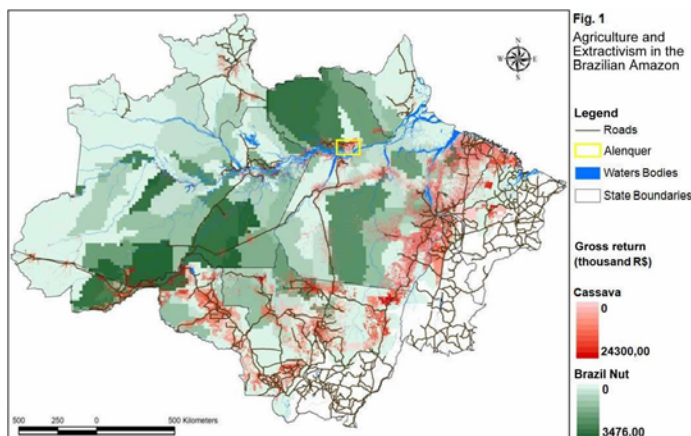


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## Climate Change and Smallholders in the Brazilian Amazon

Climate Change is considered a serious threat to poor farmers in the developing world (Stern 2007). Are the rural poor in the world's largest rainforest as vulnerable as climate change research suggests for other parts of the developing world? 72% of almost 800,000 rural producers in the Brazilian Amazon are smallholders, with household incomes often below the national minimum salary (IBGE\* 2010). Cassava production, extractivism (e.g. Brazil nuts), and fisheries represent the key livelihood strategies for the majority of the region's smallholders (Fig.1). This study complements regional top-down vulnerability assessments based on a case study of smallholder production systems in the municipality of Alenquer, Northern Amazon.



## Decomposing vulnerability

The vulnerability of a group or individual is generally determined by its **exposition**, and **sensitivity** to climatic changes as well as its **adaptive capacity**. Most regional climate change impact assessments, however, focus on exposition as a proxy for vulnerability.

### Exposition

Climate Change models point to increasing occurrence of extreme weather events with higher probability in the Eastern Amazon (Fig.2).

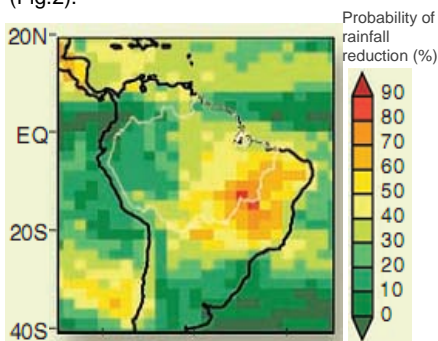


Fig.2 Drought probability (Malhi et al. 2008)

Some extreme events, e.g. droughts, are expected to be more pronounced in the Eastern Amazon, whereas excessive rainfall and flooding are spatially less concentrated. Nonetheless, high seasonal variations in rainfall and water levels are common in the region.



Amazon Drought in 2005 Amazon Flood in 2009

### Sensitivity

Even at local scale, Amazonian smallholders differ in terms of income diversification (Fig.3). Some are highly specialized and adapted to their environment (river people), others engage in multiple economic activities from agriculture to extractivism and fisheries (traditional populations). Virtually all smallholders produce cassava.

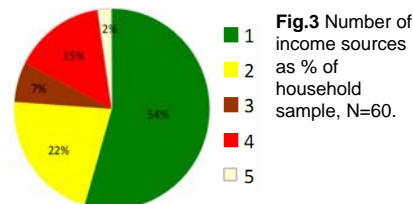


Fig.3 Number of income sources as % of household sample, N=60.

Using data from smallholders in Alenquer we simulated the impact of doubling the incidence of extreme rainfall events on the relative importance of other risk sources, i.e. price risk and natural yield risk. The results suggest that climate related risks could become dominant in farmers risk profiles (Fig. 4 and 5).

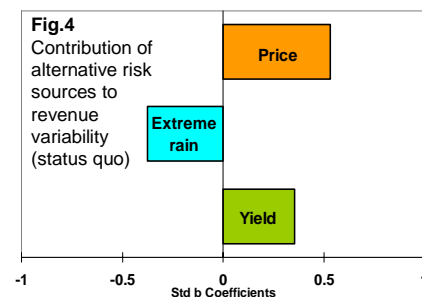


Fig.4 Contribution of alternative risk sources to revenue variability (status quo)

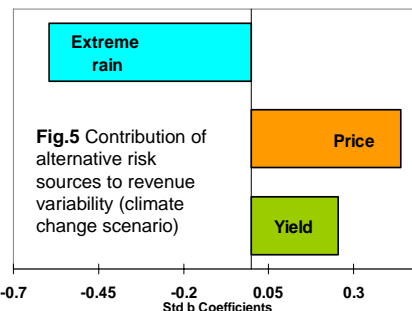


Fig.5 Contribution of alternative risk sources to revenue variability (climate change scenario)

### Adaptive capacity

Few means exist for farmers to adapt to excessive rain. Options, such as switching to more sandy soils and elevated terrains are limited as landholdings are small. Access to improved varieties depends on external interventions. Drought on the other hand, tends to occur at the beginning of the cassava production cycle, thus often involving little more than replanting costs.

River people may suffer temporal displacement during extreme floods, but report that high floods increase fish stocks later in the year. Adaptive capacity among this group is highest for families with strong urban or upland rural family ties.

Traditional populations, such as black communities ("Quilombolas"), tend to have a stronger social safety net, apart from receiving more government support than migrant farmers. This plus their engagement in extractive activities with low climate risk sensitivity increases adaptive capacity through income diversification.

## Preliminary Conclusions

Our case study suggests that climate is a significant, yet currently not dominant risk source for Amazonian small-scale producers. Farmers that strongly depend on cassava production, however, are highly sensitive to the climate change phenomena predicted in the Amazon. Sensitivity is regionally and locally heterogeneous and depends on the availability of highly valued natural resources, such as fish and selected non-timber forest products (e.g. Brazil nuts) as well as on market access, and traditional skills and knowledge. Overall, Amazonian smallholders appear vulnerable to climate change induced impoverishment. External support ought to be actor specific and locally targeted to be effective.

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