

# Geographical Dimensions of Population and Tropical Deforestation in Latin America

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Deforestation, Population, and  
Development in a Warming  
World: A Roundtable on Latin  
American

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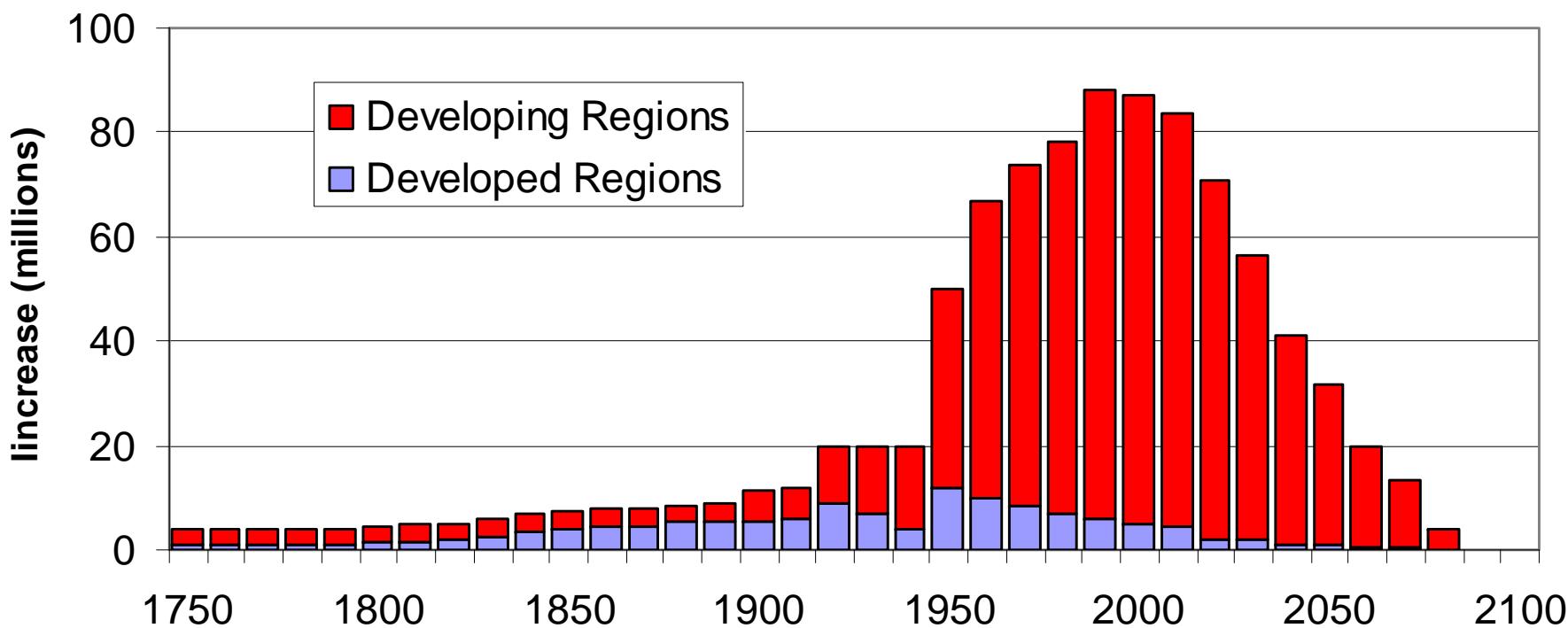
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[www.geog.ucsb.edu/~carr](http://www.geog.ucsb.edu/~carr)

# World Population Dynamics - 2 Big Trends: Urbanization & Aging

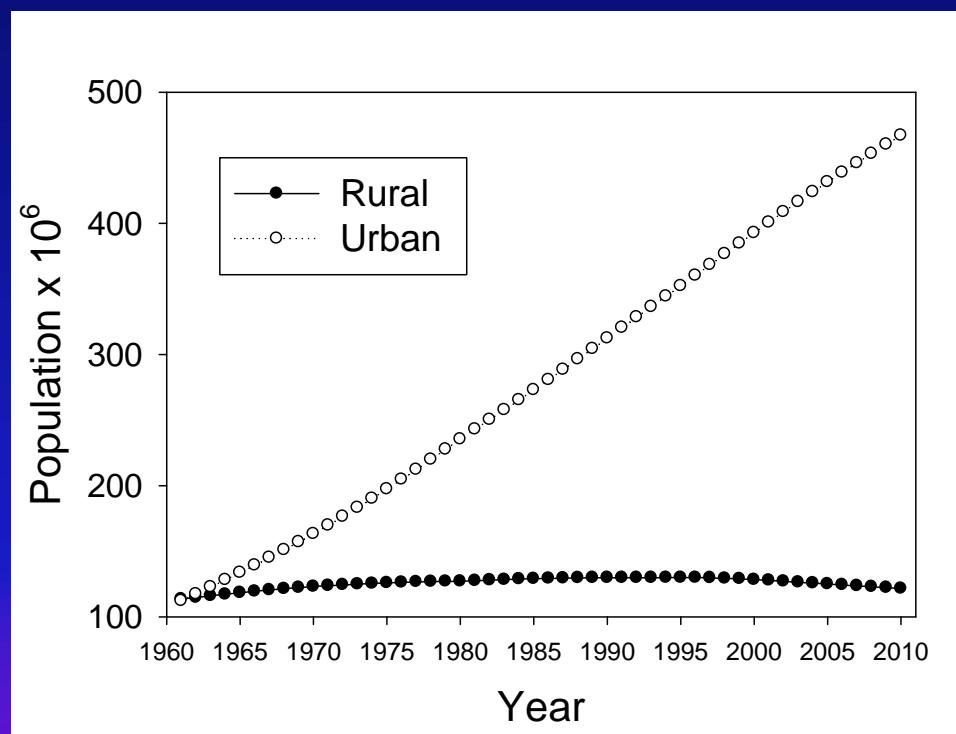
## World Population: Average Annual Increase For Each Decade, 1750-2100 (projected)

Source: "World Population in Transition", *Population Bulletin*, by Thomas W. Merrick and PRB



# NSF CHH Project: Latin America & Caribbean Demographic dynamics and LUCC

## Data from FAOSTATS



## Our analyses

Total population change (1990 – 2000)

1990 – 426,465,021

2000 – 503,388,073

diff 76,923,052

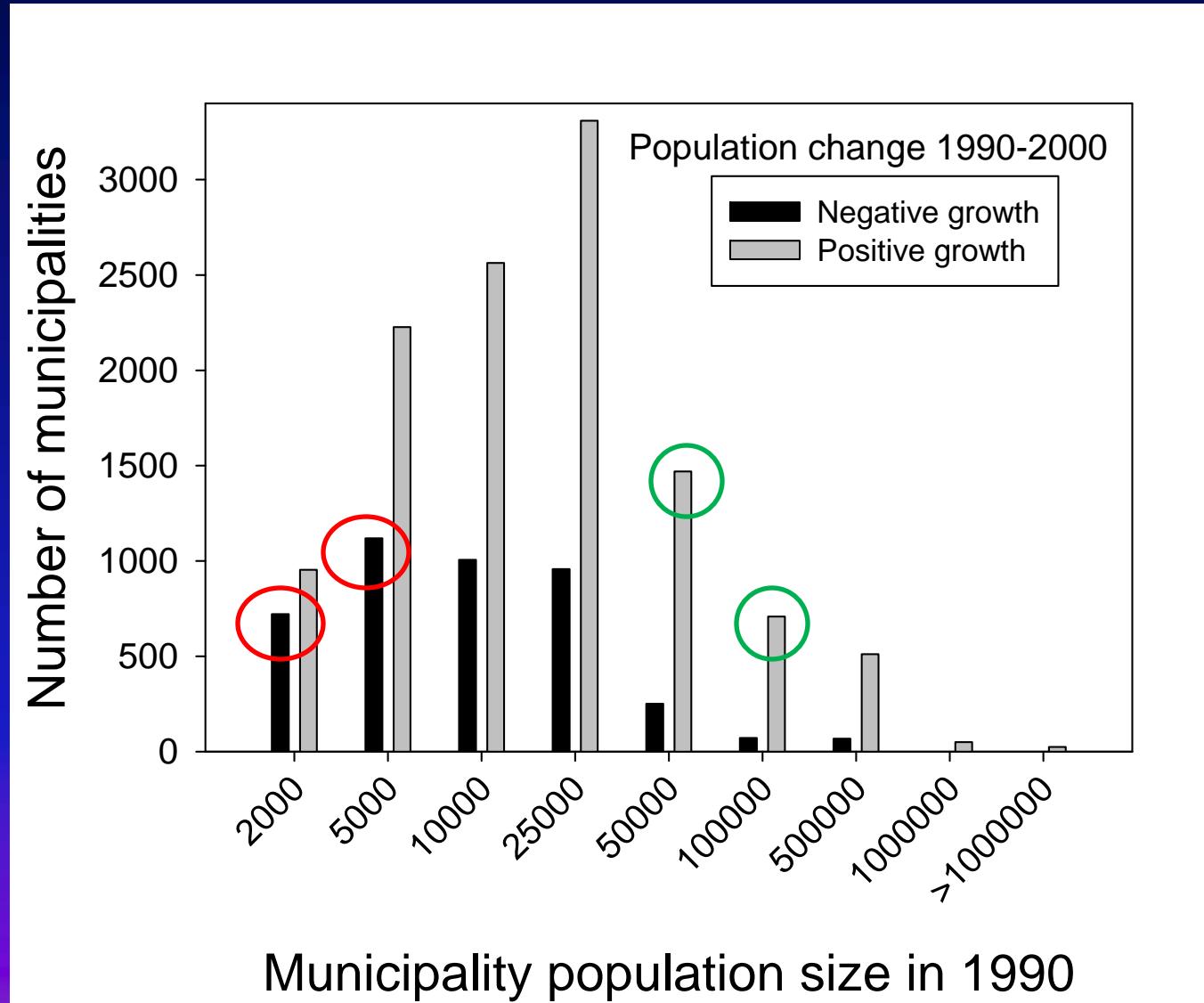
Municipality level change

# of municipalities: 16,052

# with negative growth : 4,200

% with negative growth: 26.1%

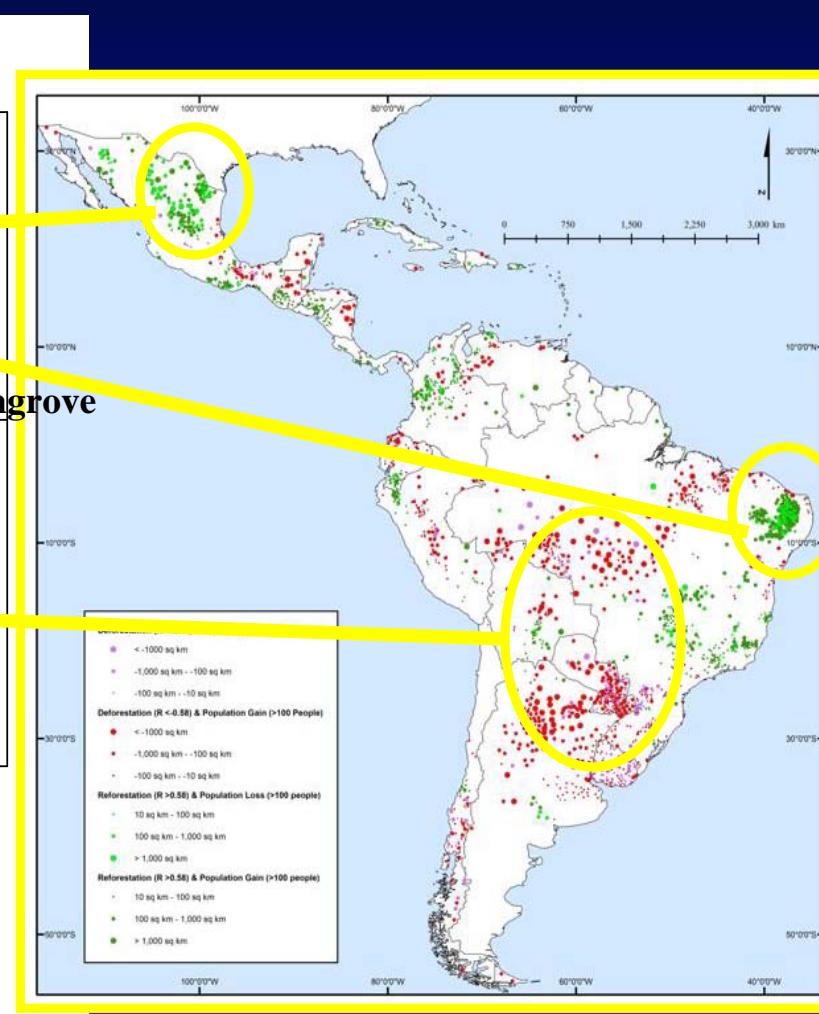
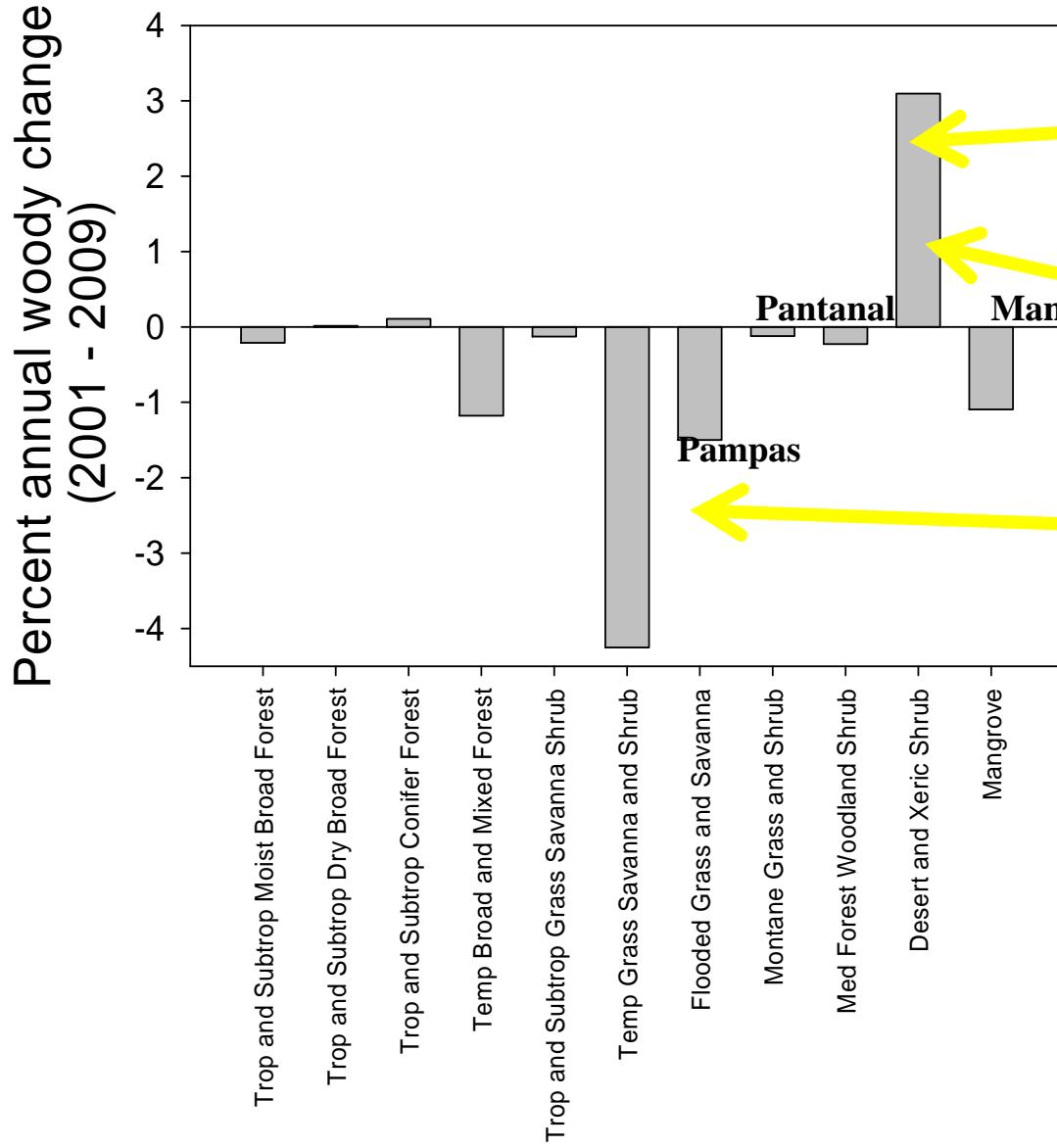
# What municipalities are gaining and losing population?



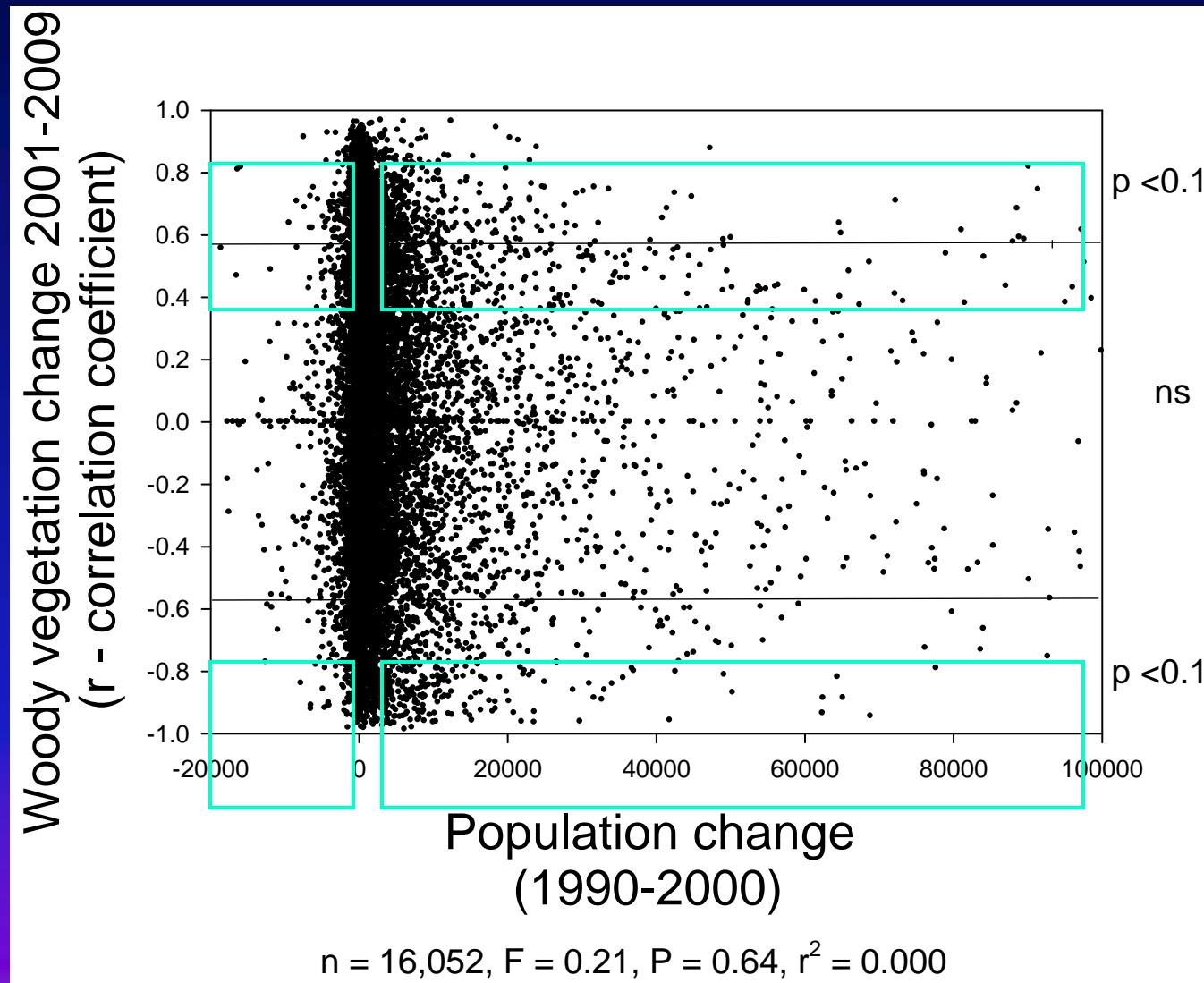
Chi-square = 689, df = 8, p < 0.001

Aide, Clarke, Lopez-Carr, et al. (2010).

# What municipalities are gaining and losing woody forest cover?

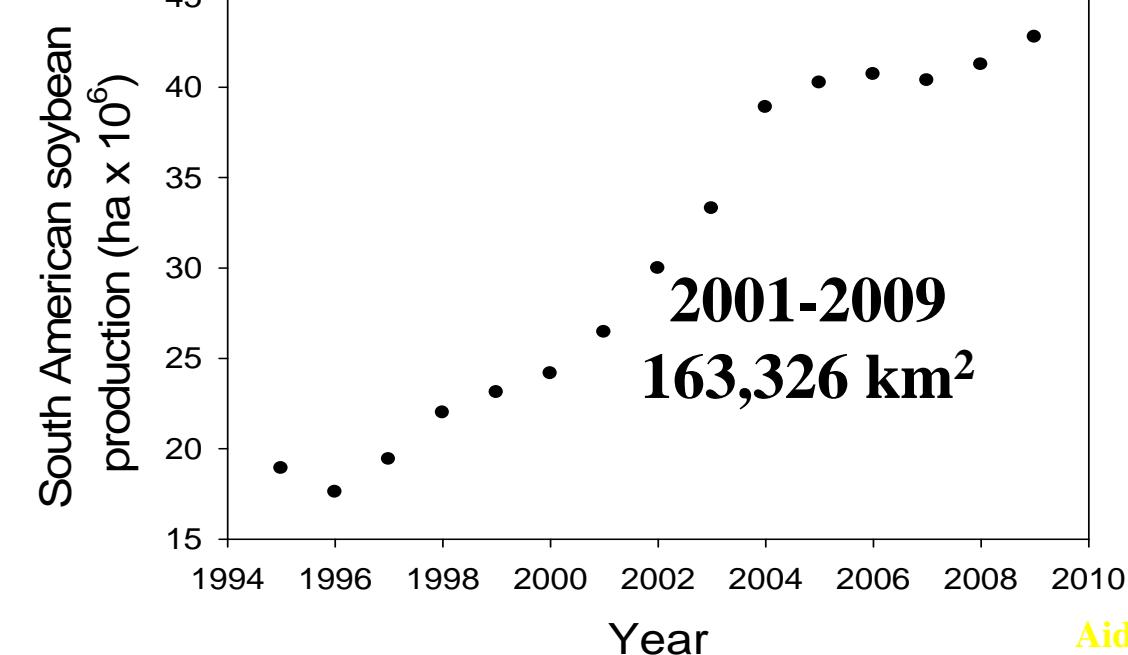
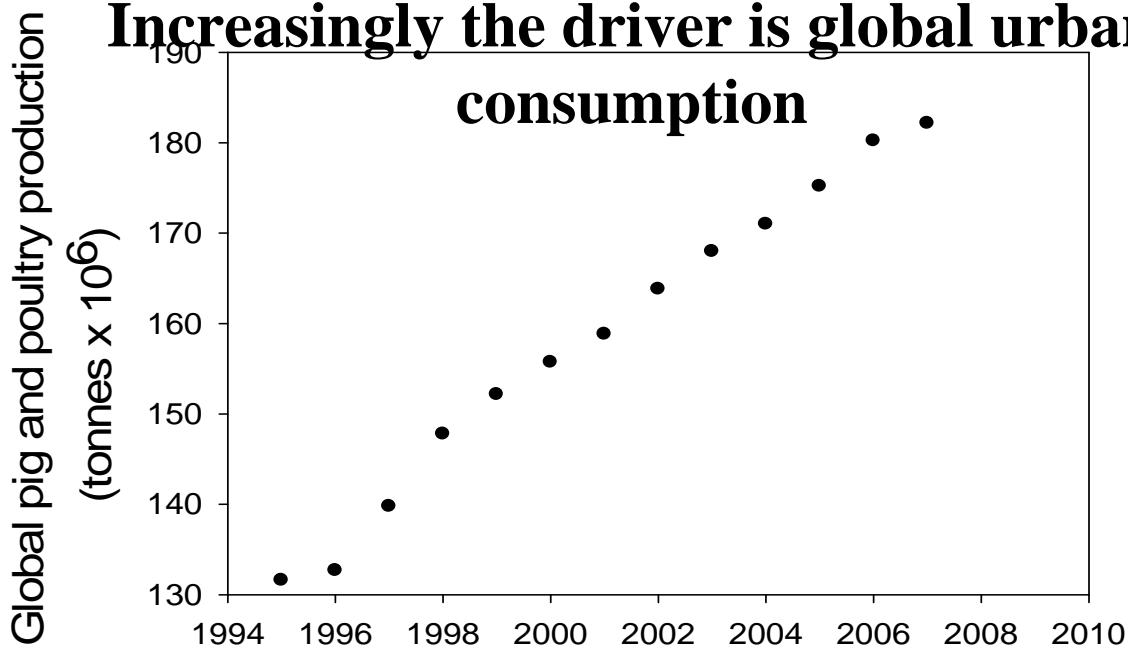


# What is the relationship between population change and woody vegetation change? Nada at the municipal level!



So what is driving forest conversion?...

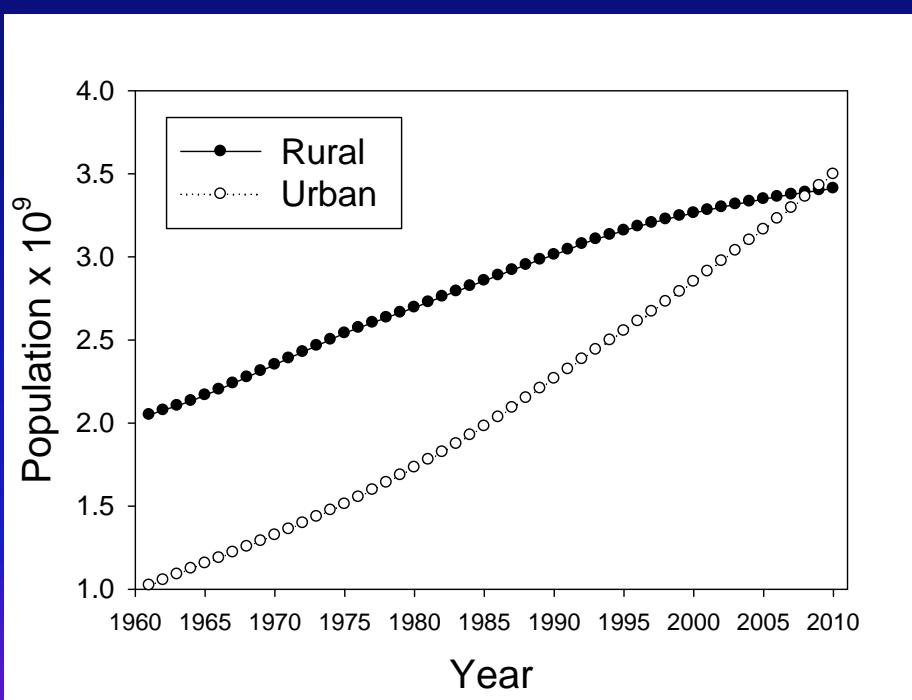
# Increasingly the driver is global urban consumption



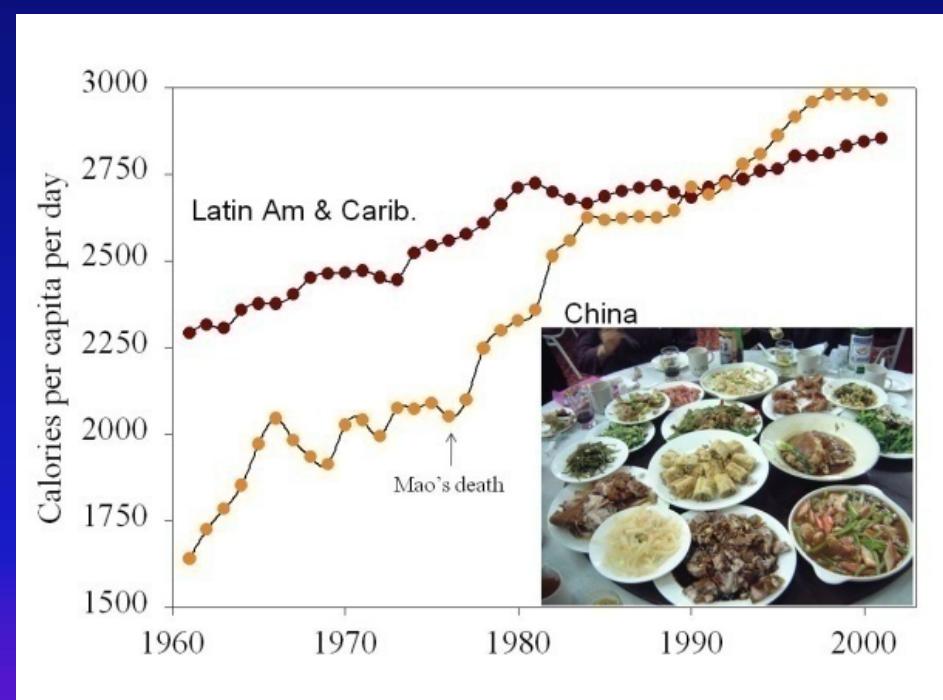
# Global challenge

## *Millennium Development Goals*

- Reduce the number of people living in poverty related to 2 trends:



Rural- urban migration



Increasing demand for food

Data from FAOSTATS

## 3 Big Questions:

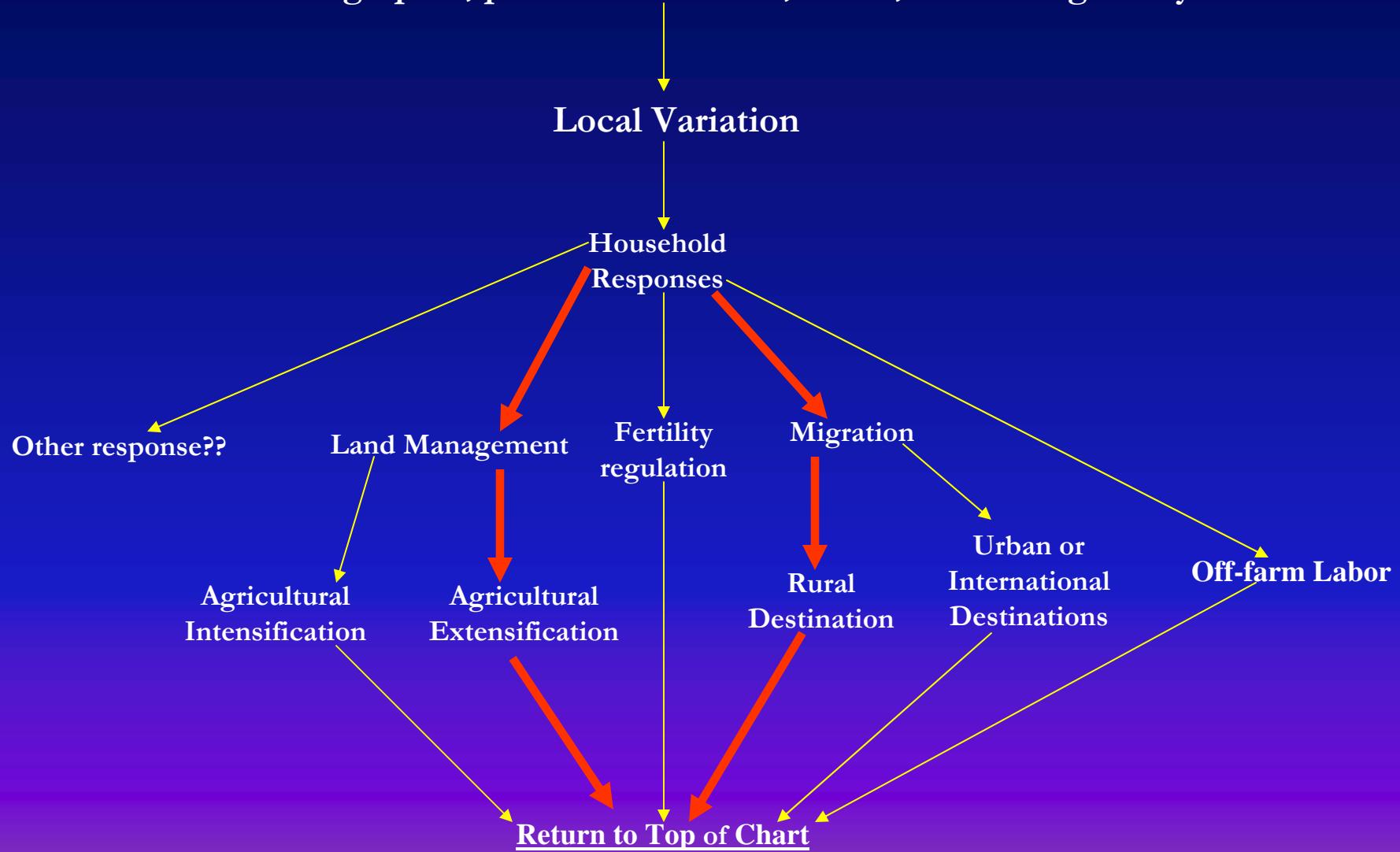
1. Is population and poverty no longer related to forest conversion in Latin America and the Caribbean? No! More on this...
2. What are the implications of changing population-environment dynamics for rural development policies relating to education, MCH, indigenous rights, and forest conservation? Huge! Synergy and Bang for \$
3. What are the implications for climate change? Mitigation! LAC has LOTS of forest

# Two Latin Americas: 75% Urban but...

- Argentina/Chile/Uruguay – 90% Urban
- Guatemala, Ecuador, Bolivia – 50% Urban
- And within these countries there is VAST variation
- What's going on among the remaining 25% rural? Bang for buck here? Or fait accompli?

# Why poverty-driven deforestation WITH rapid urbanization? Disproportionate Scale Problem

Macro-Scale demographic, political-economic, social, and ecological dynamics

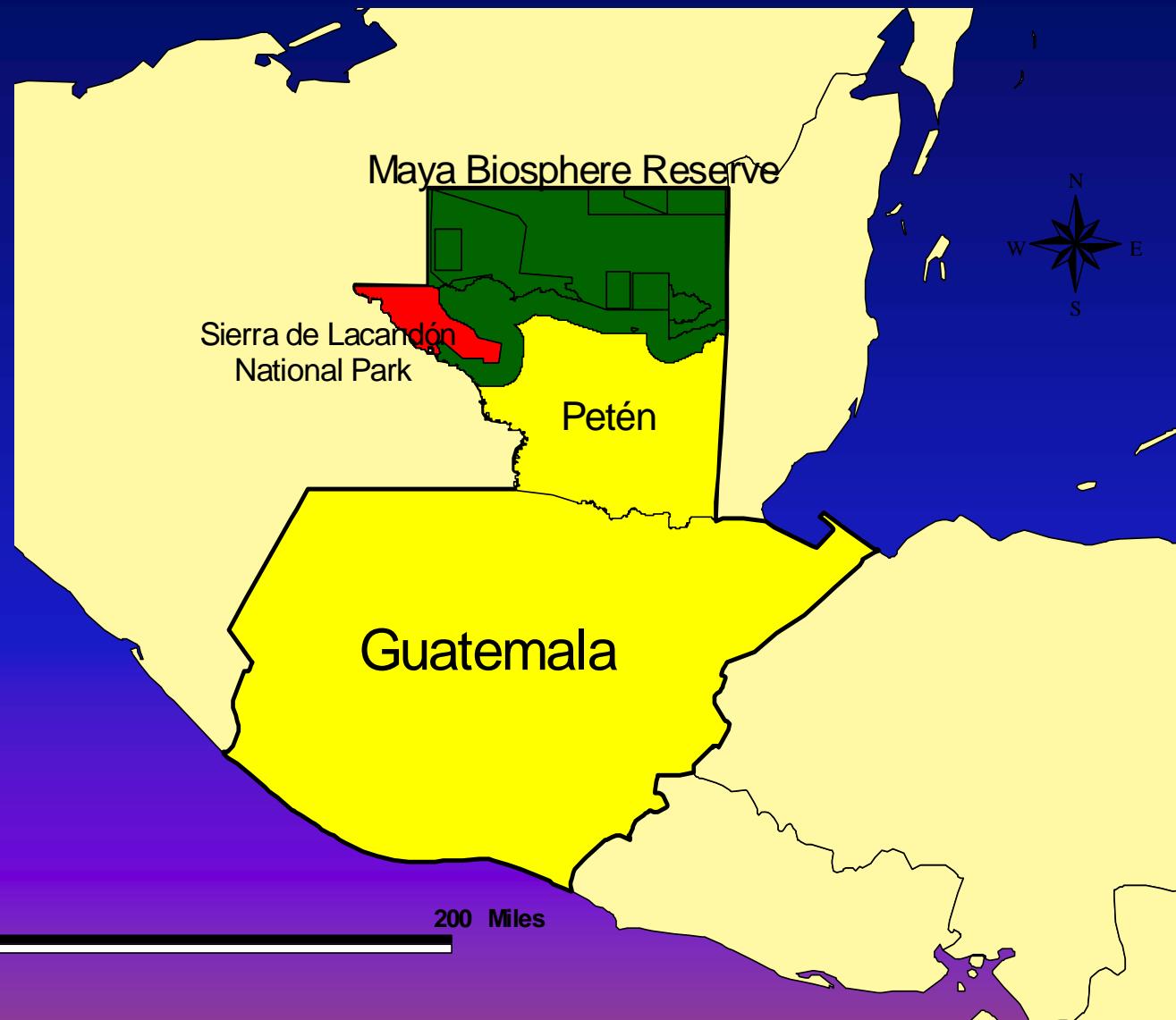


Poverty-driven forest conversion tends to target unoccupied forestland, the external frontier. Commercial agriculture often follows land consolidation and thus may or may not be converting old growth forest (internal frontier)

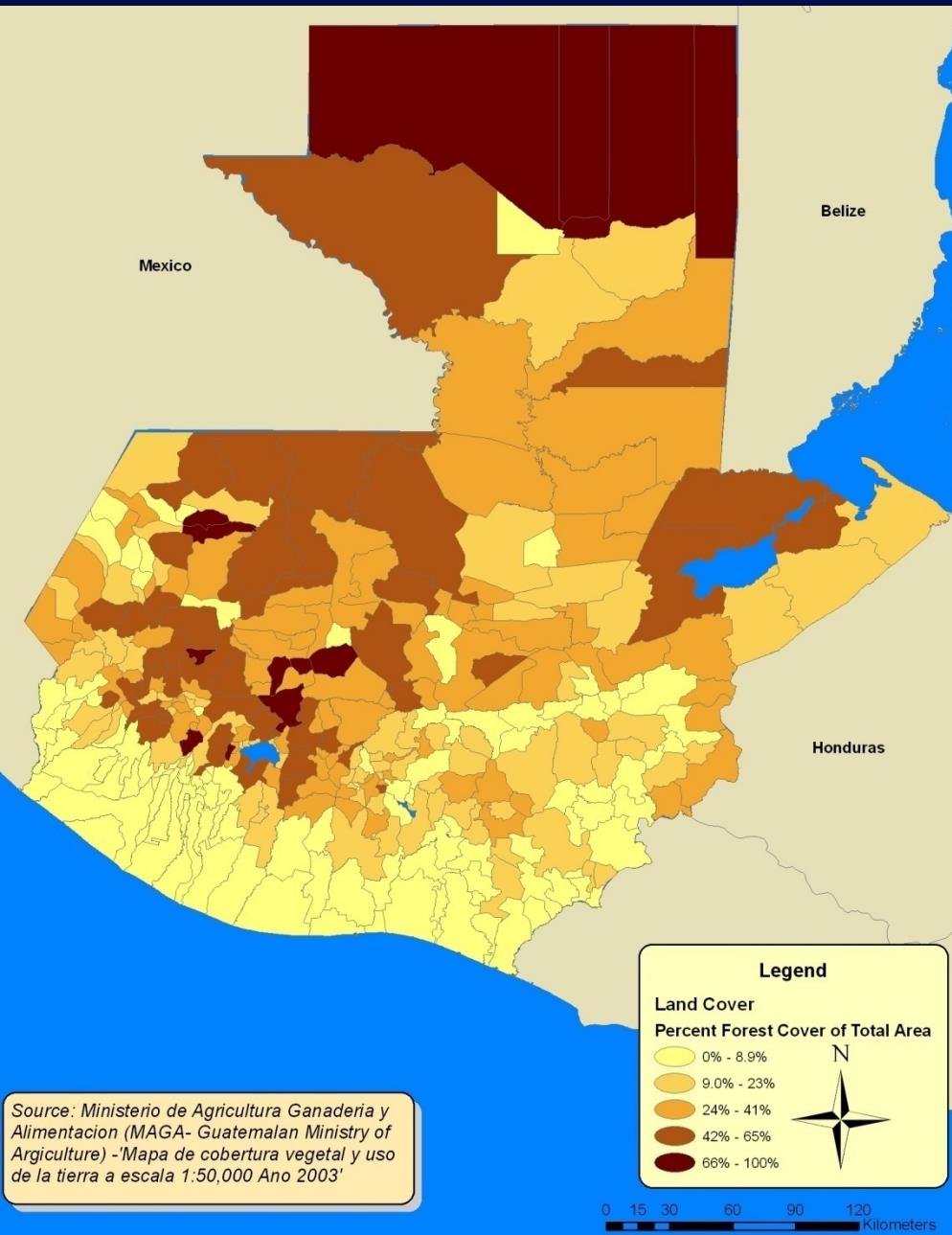
Internal (place) versus external (space) forest frontiers.



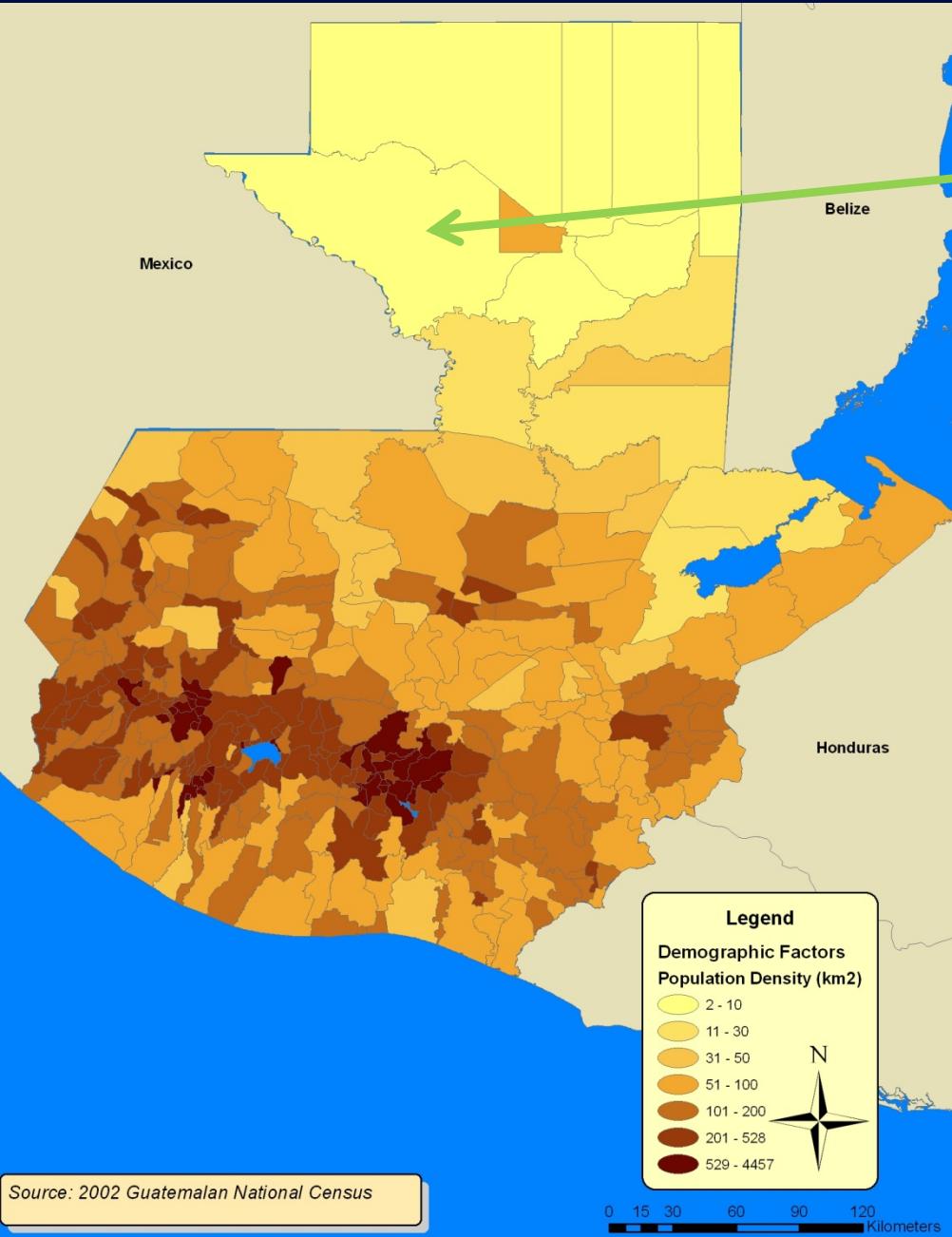
# Case Study: Agricultural Expansion in the Sierra de Lacandón National Park



# Land for People (% of Land in Forest)



# ...for People without Land (Population Density)



1 Reason Why Municipal  
level population change is  
unrelated to Deforestation!

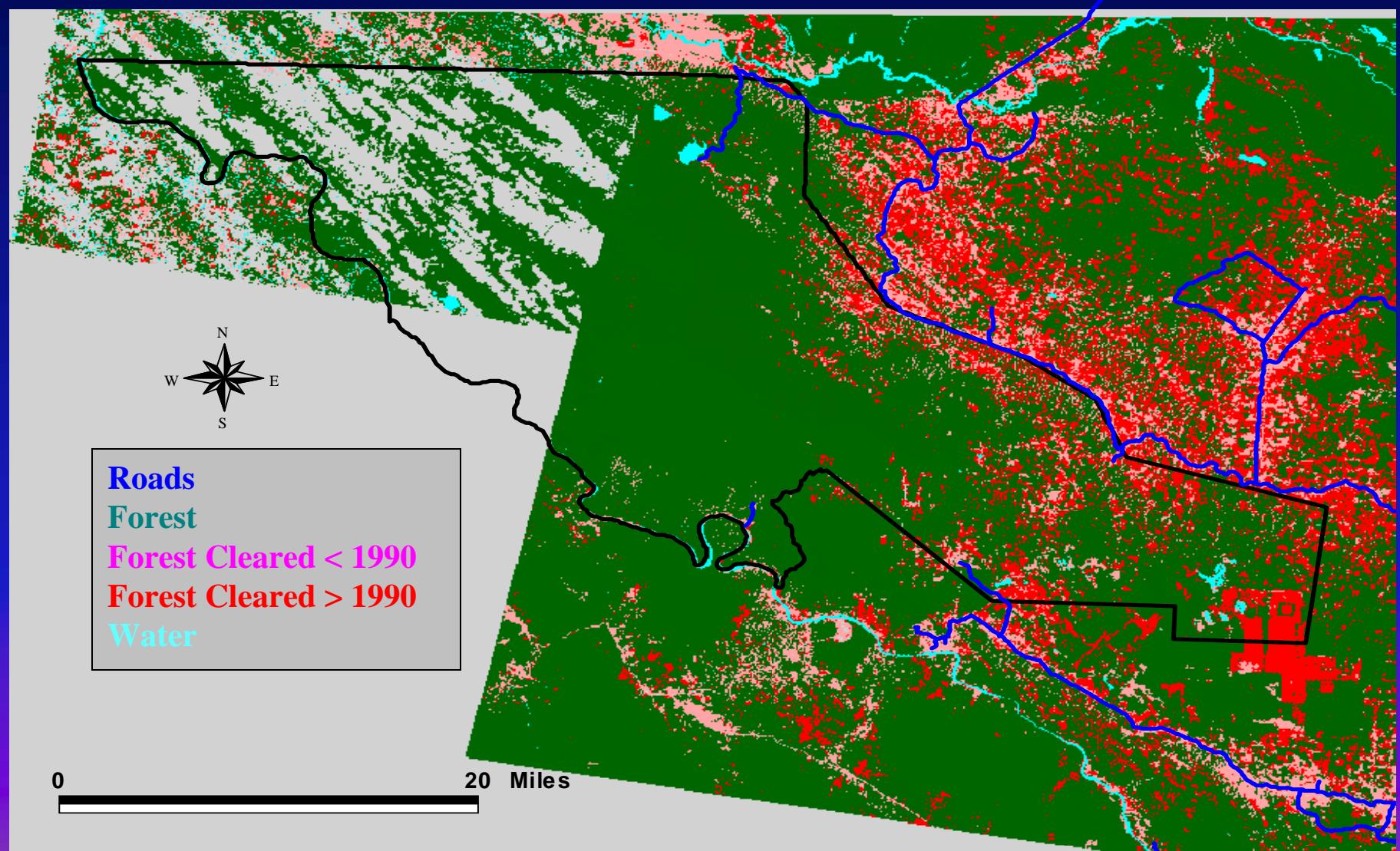
The SLNP boasts the richest biodiversity in the Maya Biosphere Reserve.



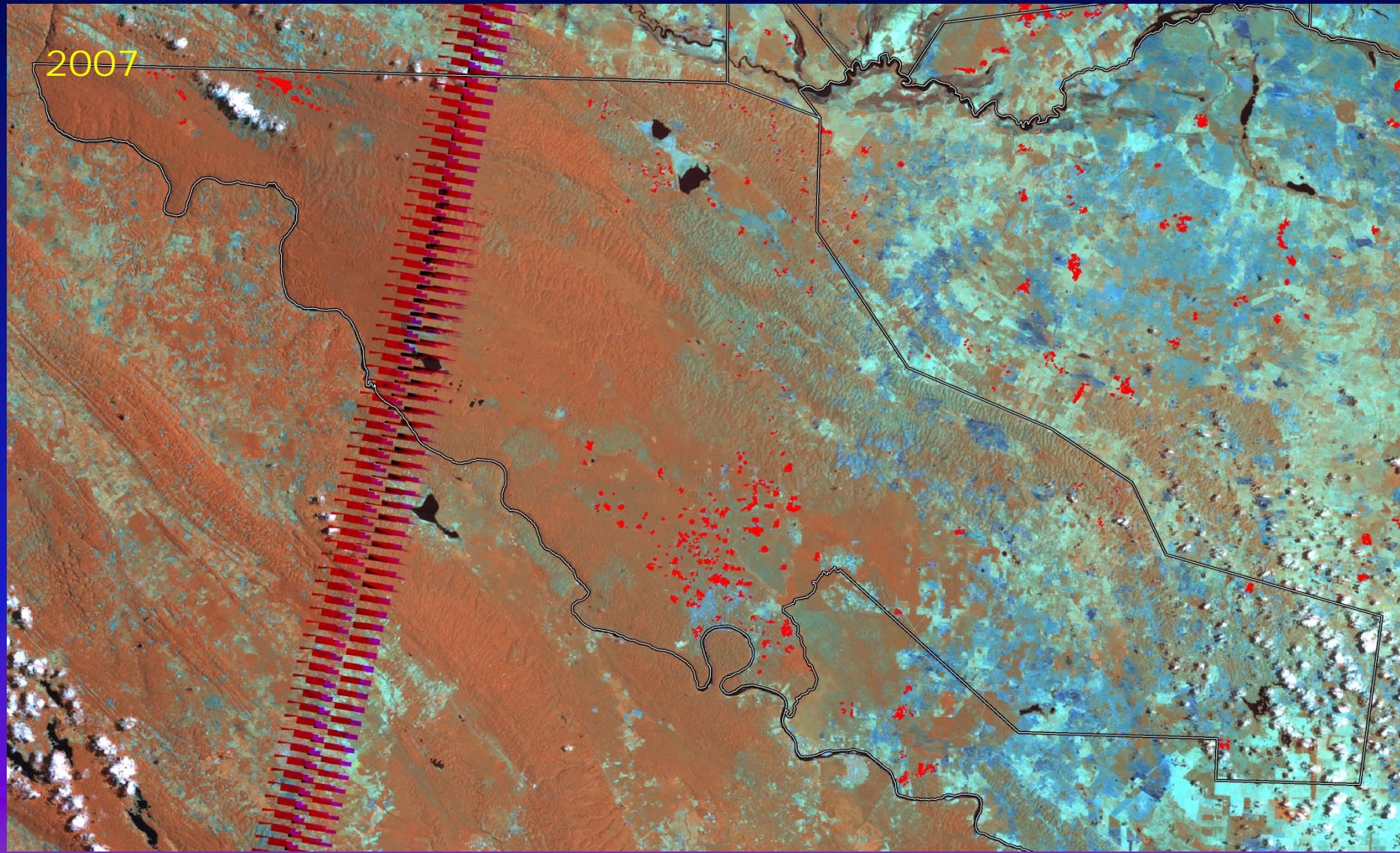
# The Naranjo Road in 1987



The SLNP suffers some of the highest rates of population growth and agricultural expansion in the MBR



# Deforestation: 2005-2007



# Roads collapse space



# Research Methods

## Field Work 1998 & 2009

a. Interviews with community leaders in 28 communities responsible for LUCC in the SLNP.

b. Surveys with several hundred men and women from 9 communities.



# Población y Uso de la Tierra en el Parque Nacional de Lacandón

## Cuestionario de hogar - Para Jefes de Hogar

Nombre:

Comunidad:

Encuestador:

### Sección I: La familia y la casa

Qué edad tienen? Ud. \_\_\_\_\_ Su esposa (o pareja) \_\_\_\_\_

En qué año se casaron (se unieron)? \_\_\_\_\_

Ha vivido casado o unido con otra mujer antes?

01 - SI                    02 - NO [salte a la siguiente pregunta]

Cuántos hijos tuvo Ud. antes de vivir con su actual mujer? \_\_\_\_\_

Cuántas personas viven en la casa actualmente? [indique hombre “H” o mujer “M”]

edad	hijos/as	Hijos que están estudiando	hermanos/as	padres	tios/as	Suegros/as	cuñados/as	otros, especifique
0-5								
6-12								
12-18								
18-49								
50 o más								

A qué trabajo le dedica más tiempo?

01 - agricultor    02 - extractor de recursos boscosos    03 - negociante    04 - otro, explique

Quién maneja los ingresos de la familia? 01 - el hombre    02 - la mujer    03 - los dos

Su religión es: 01 - Católica 02 - Evangélica 03 - Ninguna 04 - Otra, especifique

Cuando era niño, su mamá le hablaba en qué idioma?

01 Español    02 Q'eqchi    03 Otro, especifique \_\_\_\_\_

Y ahora, Ud. habla qué idioma en casa?

01 Español    02 Q'eqchi    03 Otro, especifique \_\_\_\_\_

**Población y Uso de la Tierra en el Parque Nacional de Lacandón**  
**Cuestionario de hogar - Para Jefes de Hogar (Q'eqchí)**

**La K'ab'á:**

**K'aleb'aal;**

**Laa K'ab'á Laat laj Isihom Esil:**

**Jun Raqal: Li Junkab'al ut li ochoch.**

Jarub'chihab' wankaawe? La Sun aatin jarub' ahhab' wankre

Li chihab' xex Sum la wi' Maraj li xelaq'wi' erib')?\_\_\_\_\_  
01 - He' He' 02 - Inka'

jarubi la Kok'al laat naq maji' nakat wan rik'in li tz'aqal?\_\_\_\_\_

Ani nach'eok relix tuminal lijunkab'al? 01 - li winq 02 - li Ixq 03 - Sa'  
wiib'al.

La Paab'aal: 01 - Katoolk 02 - Wanjeel 03 - Manjun 04 - juna, chik

Naq toj kac'inot chaq K'achi aat' b'aal nakat' raatinalui?  
01 Kaxlan chi' 02 Q'eqchi 03 Otro,  
especifique\_\_\_\_\_

ut najwak?  
01 laa'at K'aru 02 la waatina'b'aal 03 nakat aatinak Sá la  
wochoch\_\_\_\_\_

Ma xat hulak ? Sá Rochóchil li tzolok

Toj K'a chi Raqalil xa tzolok?\_\_\_\_\_

Ma nakat yaab'asinkru hu ut Manakat Tz'iib'ak? 01 - He' He'  
Inka'

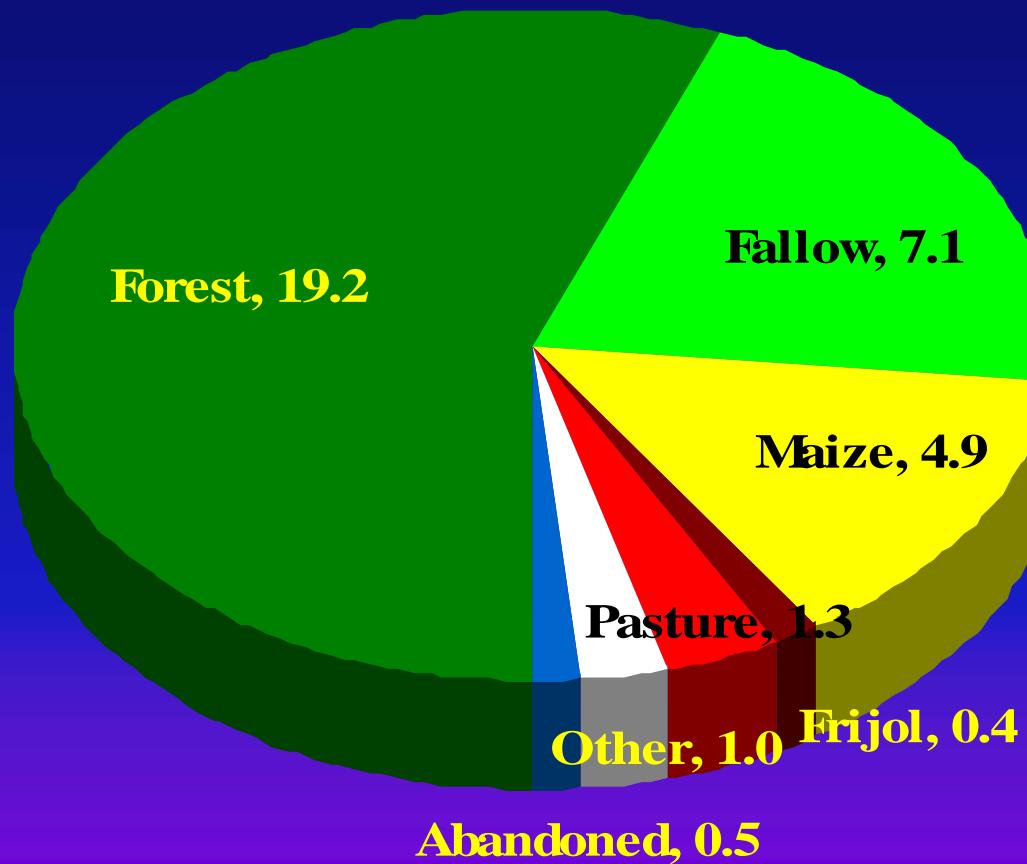
Ma tawaj naq eb'la Kok'al te' tzoloq? 01 - He' He' 02 - Inka'

[ Wi' tsum e hehe' '| toj k'a chi Raqalil? a ) toj b'ar truuq b'

bar nuchal la si' ? 01 sa'li kioche Sa' lin K'anjelab'aal 02 sá lin parseel 03 sálin  
alk'al Reliwochoch' 04 Sá K'iche?)

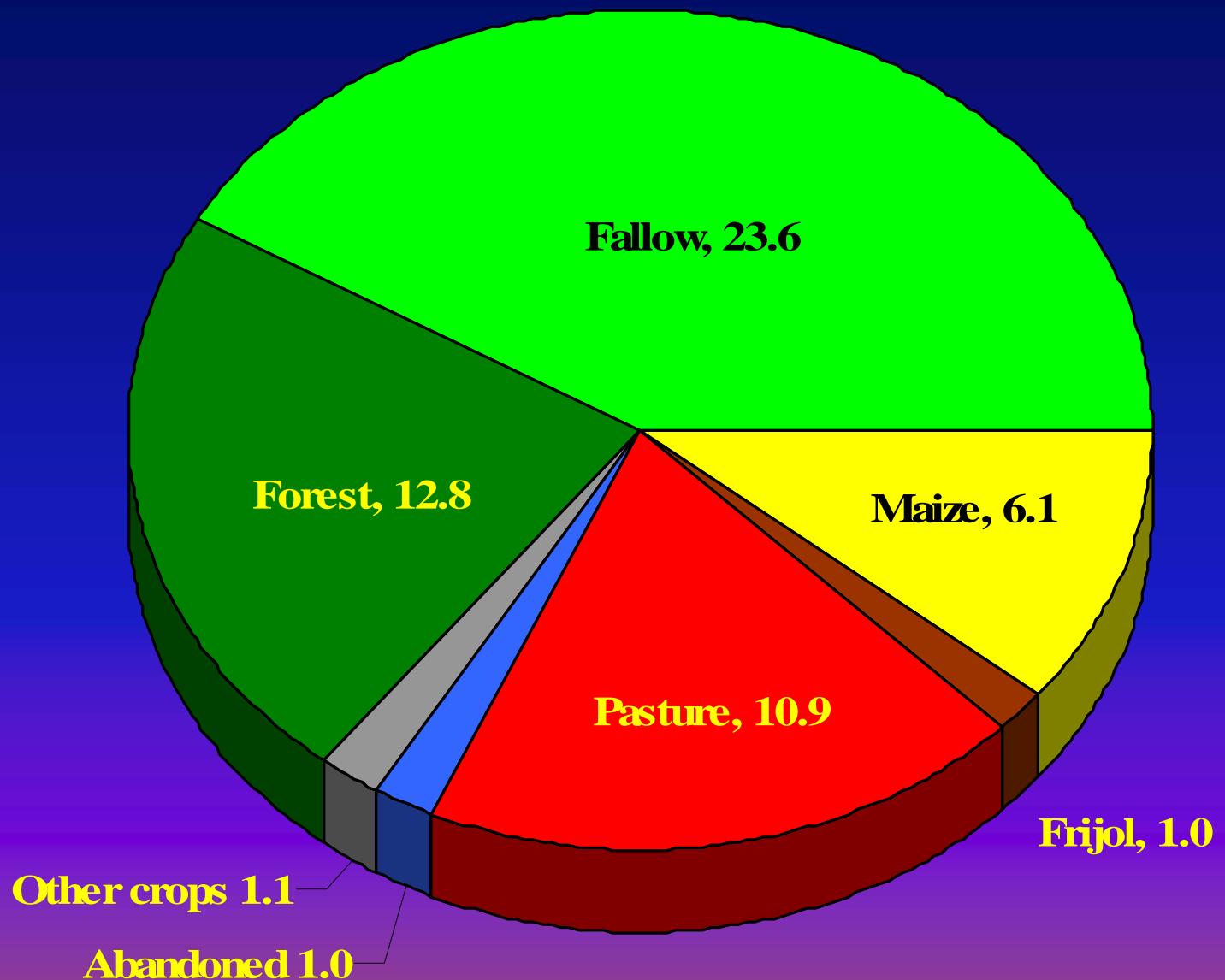
# 1998: Average Land Use in Hectares.

Farm Size = 34 ha.



# 2008: Average Land Use in Hectares

Farm Size = 49 ha.



# Demographic Factors: A Fraction of the National Population but with a Major Ecological Impact.



- 10% Annual Growth mid 1990s
- **Larger Communities → More Agricultural Expansion.**
- 8 Births per Woman
- **Larger Households → More Agricultural Expansion.**



Indigenous Large Family Preference

Desired Family Size?

Education link? Religion?

Future Migration?

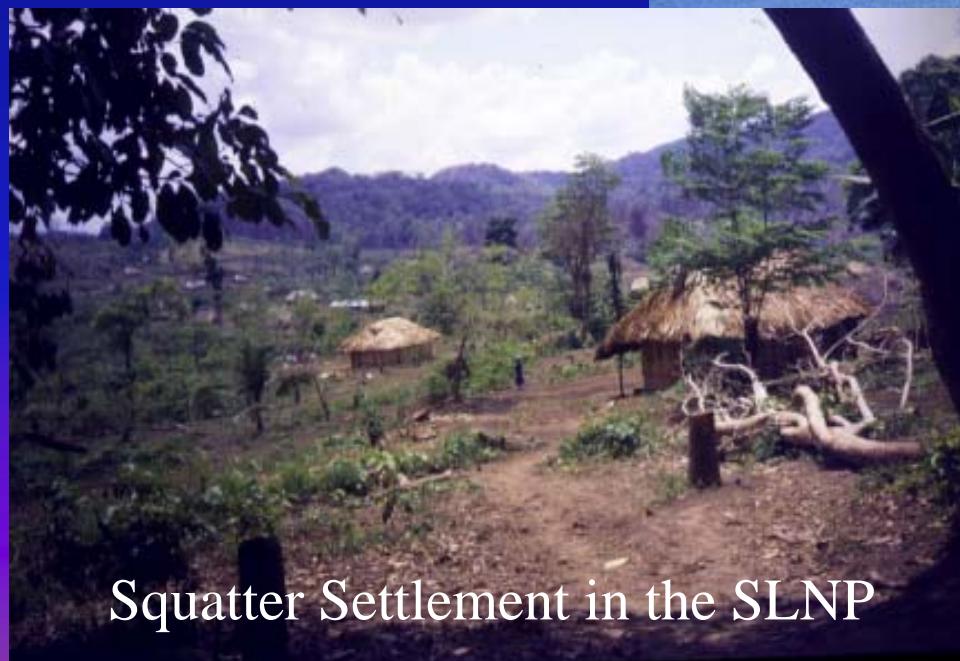
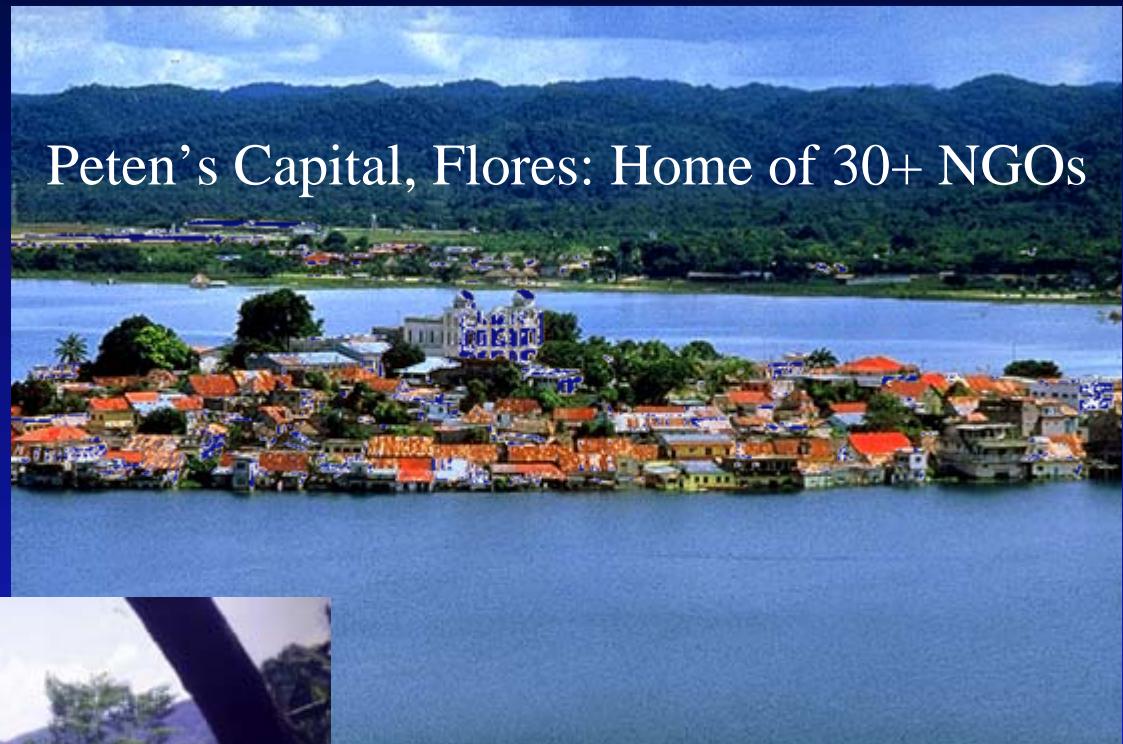
# Ecological Factors: Spacious Space or Few people?



- Population growth high but population density low
- Relative Forest abundance = Expansive swidden and avoidance of farming steep slopes



# Political-economic Factors: Proximity = More Contact



- Land Title →  
More Ag. Expansion.

## Place and Space: Maya & Maize vs. Ladino & Cattle



- 25% Maya

- **Maya Farmers → More Extensive Farming. But less likely to have cattle.**



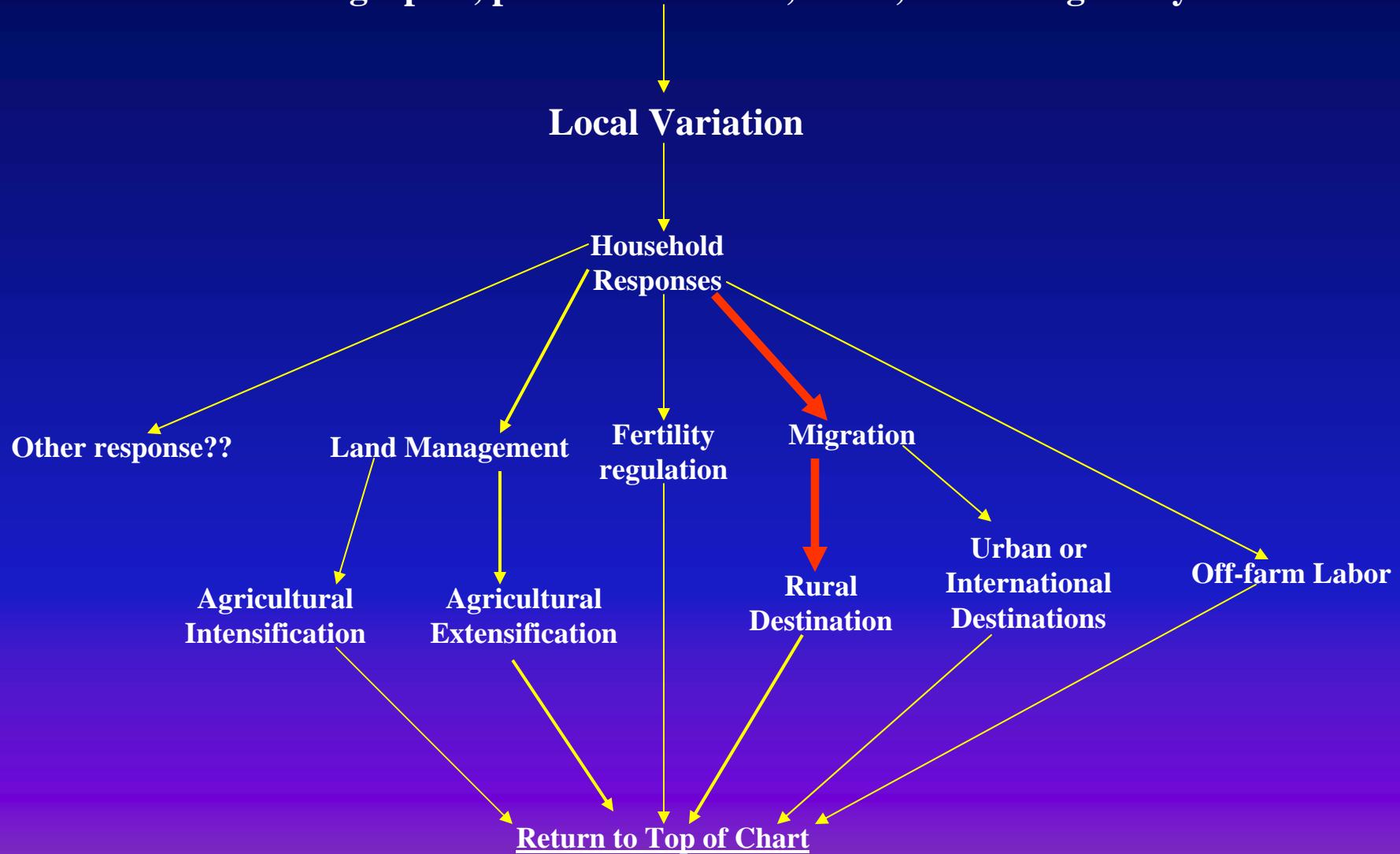
# Where did the SLNP colonists come from and why from there?

- Processes in distant places - skewed land distribution, demographic pressures, poverty, war - lead to LUCC in another place



# Migration to the SLNP

Macro-Scale demographic, political-economic, social, and ecological dynamics



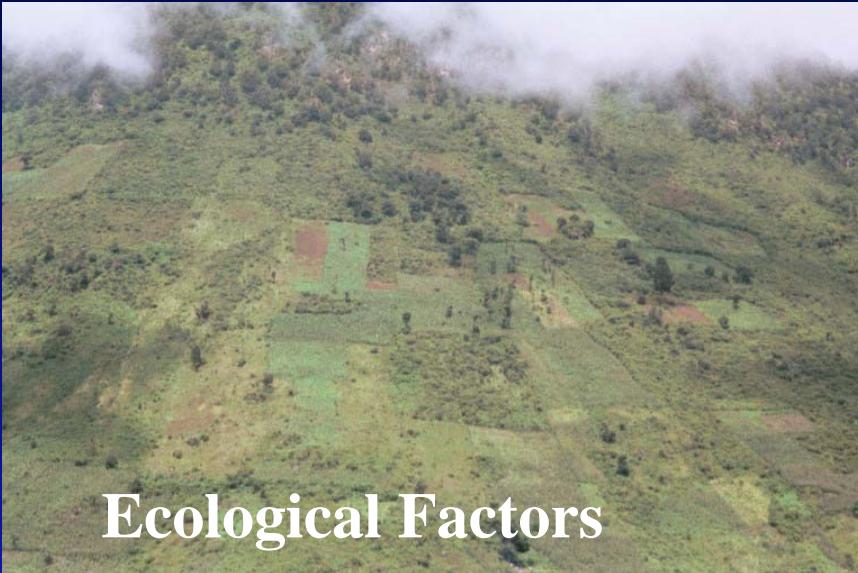
# Departamentos of Guatemala and Migration Origin Municipios



Municipios in red are the three case studies explained in greater detail.

Original map source: <http://www.inguat.net/redtp/map/indexe.html>

# Why did people migrate to the MBR?



Ecological Factors



Demographic Factors



Socio-economic Factors



Political-economic  
Factors

# Two Municipios: Fixed vs. Shrinking (Expanding) Space



Land Titling the Answer?

Jobs the Answer?

# Two reasons why place matters:



Southeastern Coastal Plains: Morales



Pacific Coast: Nueva Concepción

## Implications for policy

Scale and geography matter!

Rural investment in MCH, education, indigenous rights, conservation, and sustainable livelihoods in migrant origin areas can help arrest vicious pop.-env. Cycle m = win-win for people and nature and offers tantalizing bang for buck – in long term investment.

How? Can expedite rural conservation and development and the transition from rural–rural to rural-urban migration

Climate Change: Mitigation!

# Sunset or Sunrise over the LAC Forests?



# Which way is LAC LUCC heading?



# El fin

