

Restoring valuable diversity through patch clearcuts in tropical forests: slash and burn is best

**Laura K. Snook
&
Raimondo Capitanio**

Bioversity International

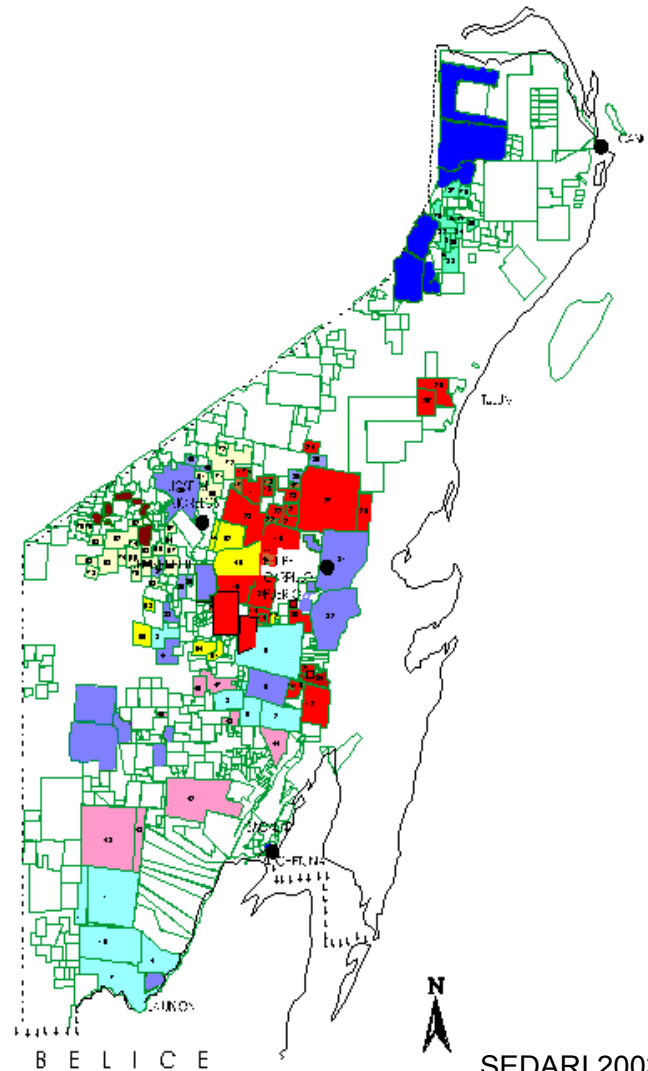


Quintana Roo, Mexico

Mostly forested; 46%
communal ('ejido') tenure

127 'ejidos'
organized for
timber production
forestry;

- Some have sawmills, sell boards
- Some sell logs
- All members share profits



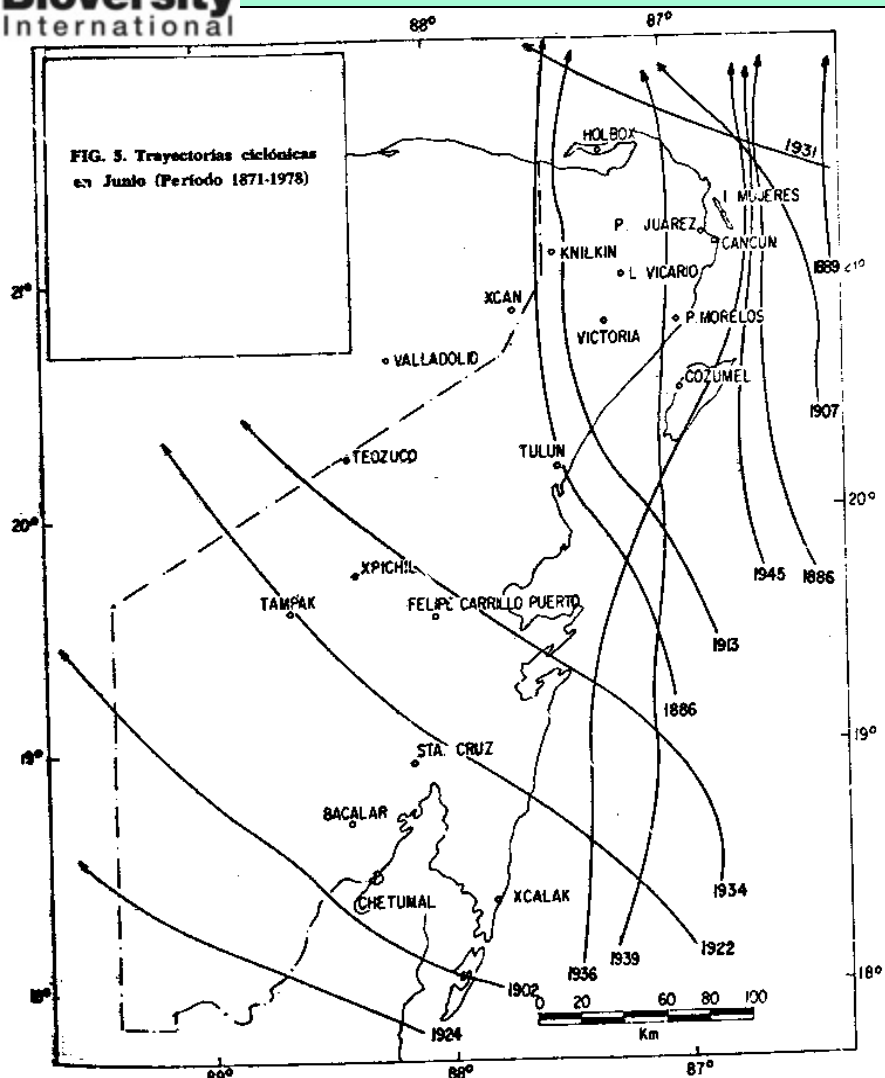
SEDARI 2003

The Maya Forest

- Sustains jaguars, tapirs, monkeys, toucans
- Tree species composition and diversity is key
 - 100 tree species
 - Shade tolerant “ramon” (*Brosimum alicastrum*) and “chicozapote” (*Manilkara zapota*) are most abundant
 - Shade intolerant mahogany (*Swietenia macrophylla*) and other species most valuable for timber
- Regeneration stimulated by disturbance
 - Frequent drastic disturbances (intense, but varying scales)
 - Logging over past decades is producing small gaps

Forest Dynamics: Hurricanes

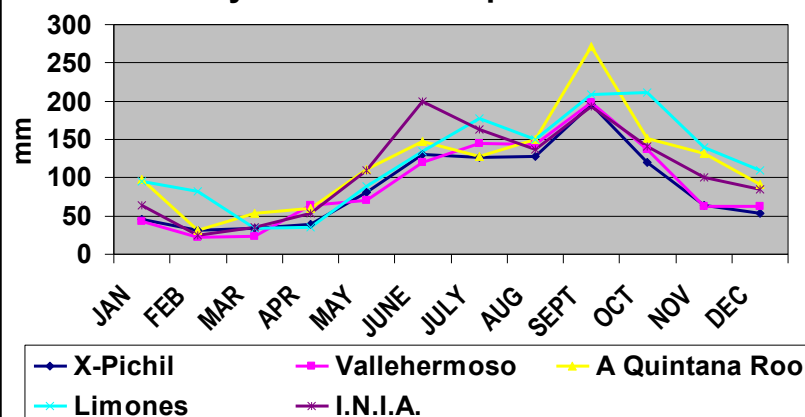
FIG. 5. Trayectorias ciclónicas en Junio (Período 1871-1978)



followed by **fires** during dry years



Monthly rainfall near experimental sites



Communities, slash and burn agriculture and forest are linked

- Diversified forest-based economies and shifting agriculture (maize)
- 730,000 ha permanent forest reserves established by 127 communities (1000 – 40,000 ha ea)
- Deforestation rate has been less than in protected areas
- >25 years of continuous efforts and advances, supported by gov't
- Research supports silviculture and management



Income from forest resources



Chicle latex 5%

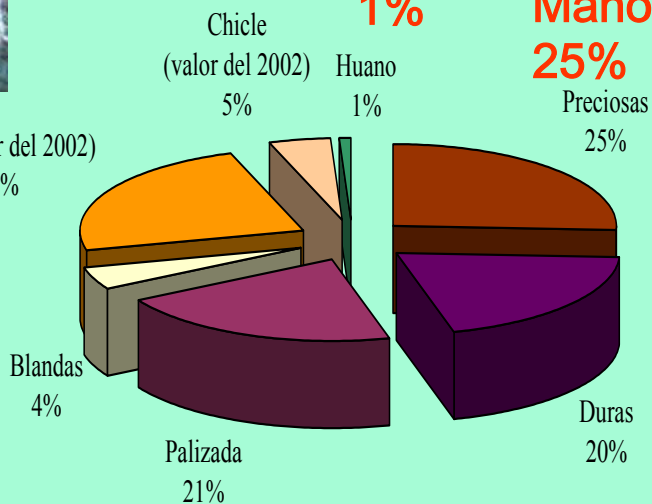
Palm thatch 1%

Mahogany 25%



Honey 24%

Soft woods 4%



Poles 21%

Hard woods 20%



Markets developing for more timber species



Polycyclic selection management

Harvest management



- 25 year cutting cycle, 1 cutting area harvested per year
- Inventories of ca 20 species to define harvest volumes
- Felling all mahogany trees > 55 cm in each annual cutting area
- Up to 15 additional species harvested, if contracted

Polycyclic management

Regeneration treatments

- Collection of seed from standing or felled trees
- Establishment of seed reserves
- Nurseries in some ejidos, associations
- Enrichment planting by ejido members in felling gaps, skid trails, log yards within production forest

The challenge of sustaining forest diversity and value

- Selective felling does not create conditions favorable to regeneration of species adapted to drastic disturbance
- Many species need high light
- Gap sizes too small
- Understory is a competitive environment

Impacts of concentrated harvesting to enhance gaps

183 trees (15 species) on
100 ha

2.4 % of area opened

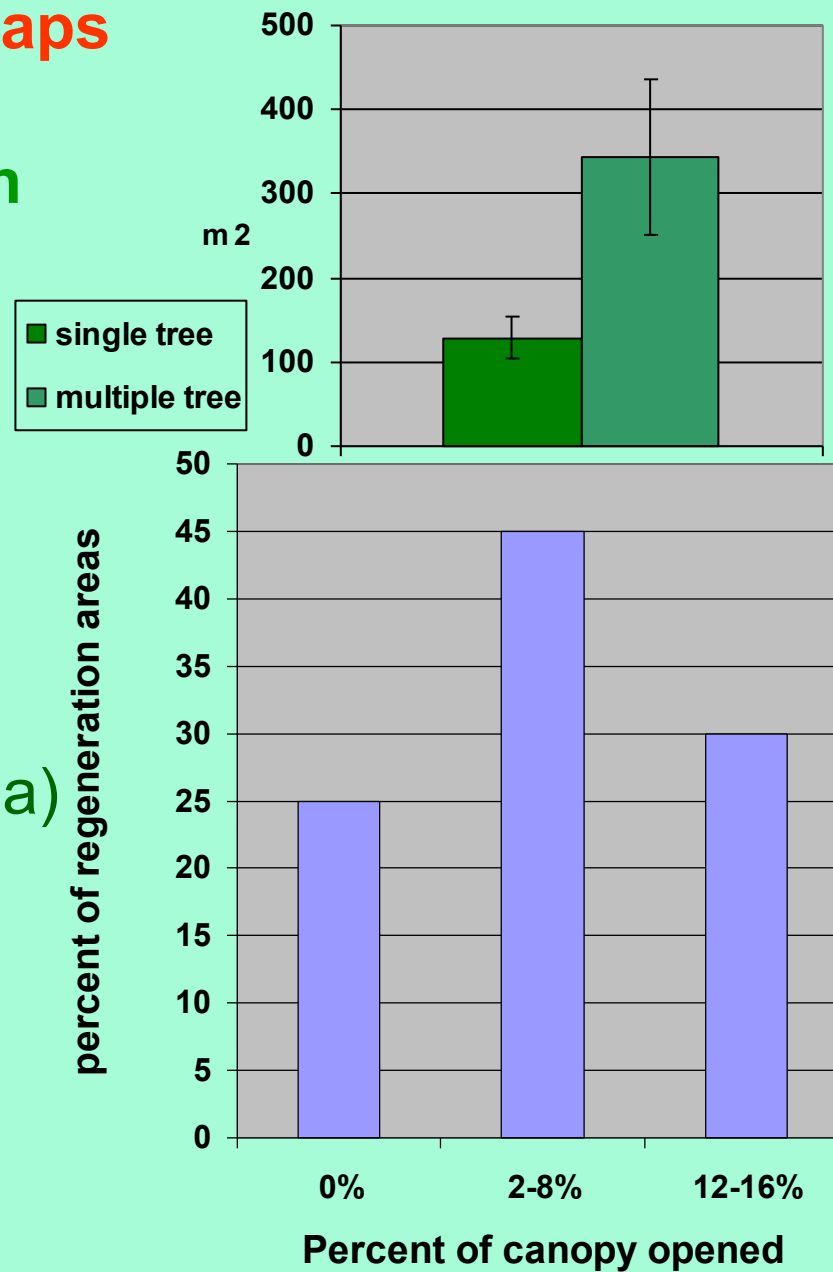
151 single tree felling gaps

13 multiple tree felling gaps

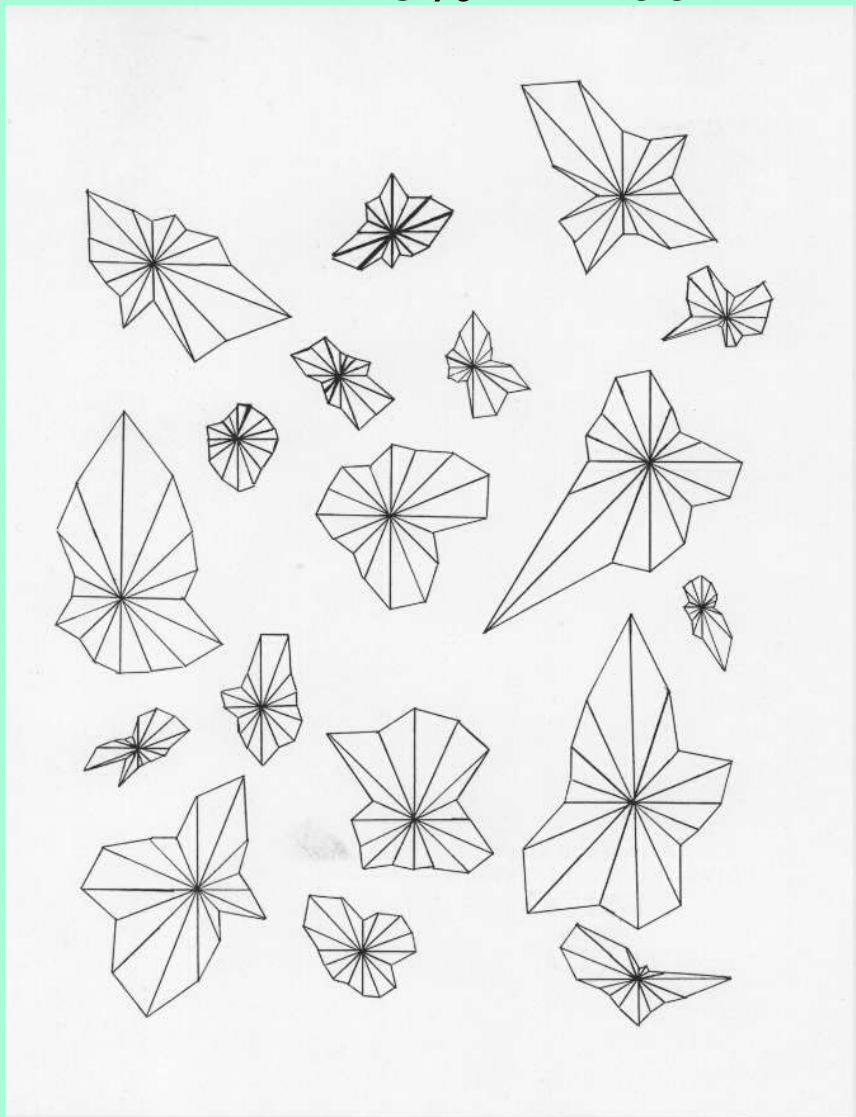
14% of openings in 20
predefined downwind
regeneration areas (6% of area)

but only 6% avg opening of
downwind regeneration areas
(and 25% not at all)

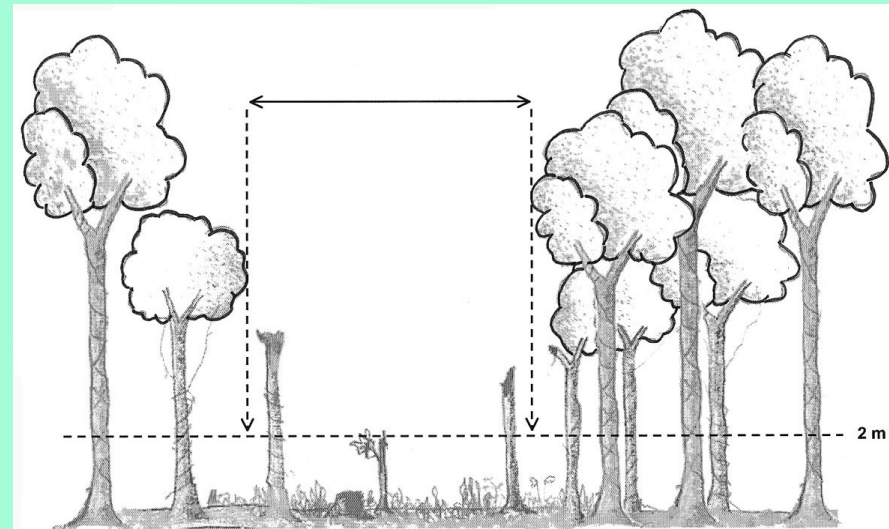
Sizes of felling gaps



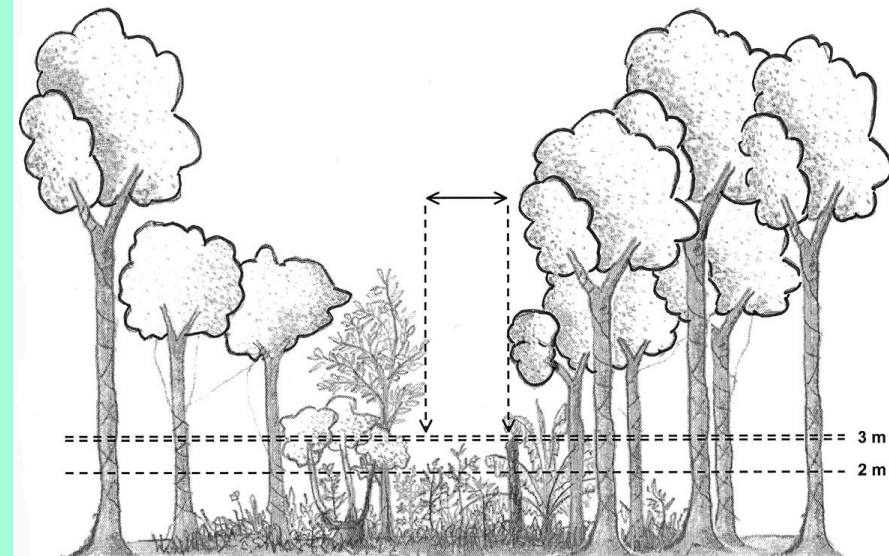
Felling gaps were
irregular: 90% $\leq 100 \text{ m}^2$
5% $\geq 400 \text{ m}^2$



After 4 yrs,
gap sizes decreased > 90%



gap dimension in 1998

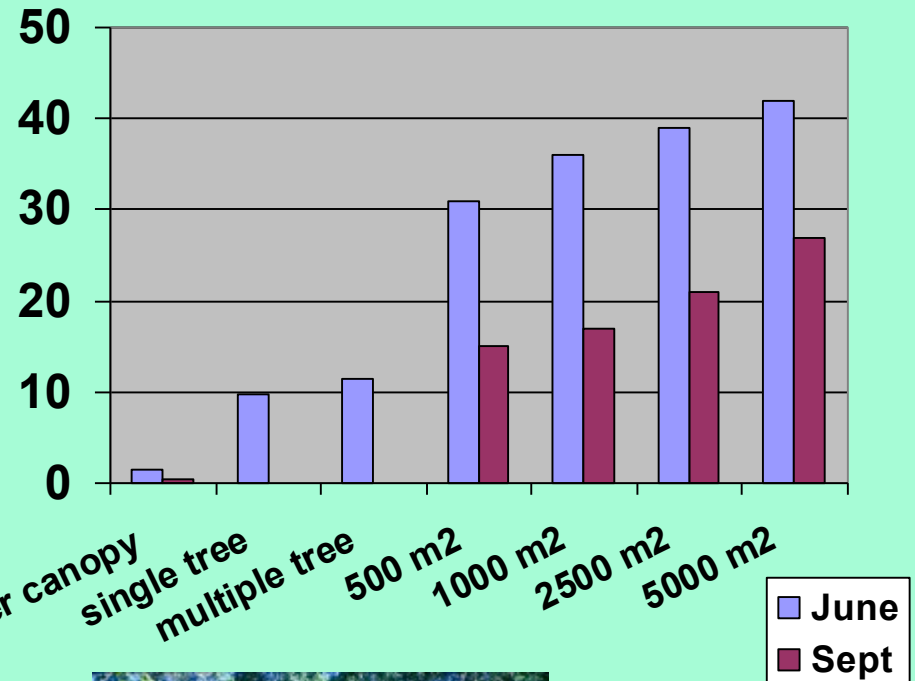


gap dimension in 2002

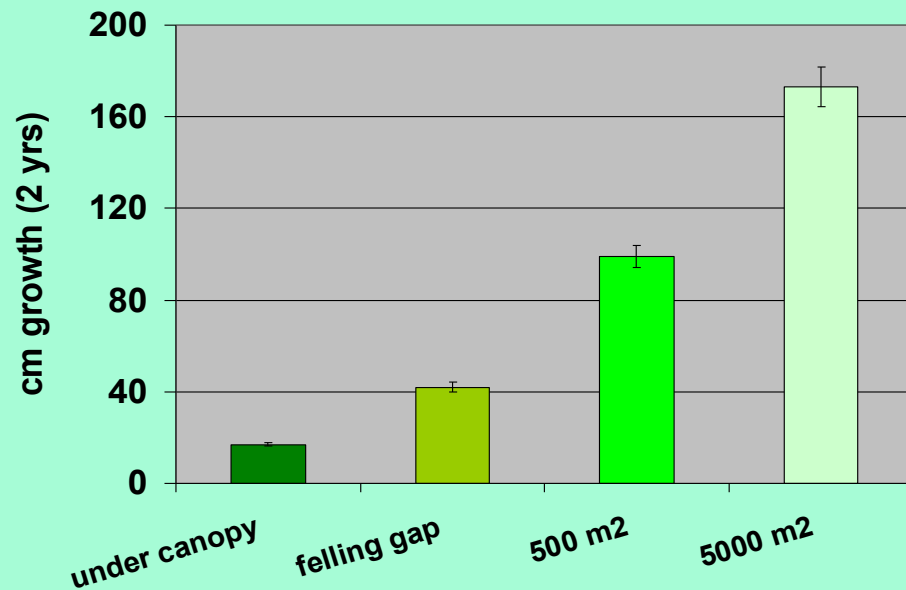
**BIGGER
OPENINGS,**

MORE LIGHT

PAR in moles/m²/day



**BETTER
GROWTH
(mahogany)**



Light at noon

**Light isn't all that matters:
Three ways of producing
5000 m² clearings yielded
different outcomes**



Machine-clearing

**8 replicates per clearing treatment
established 1996 in 4 forest areas in
Quintana Roo**



Slash, fell, and leave



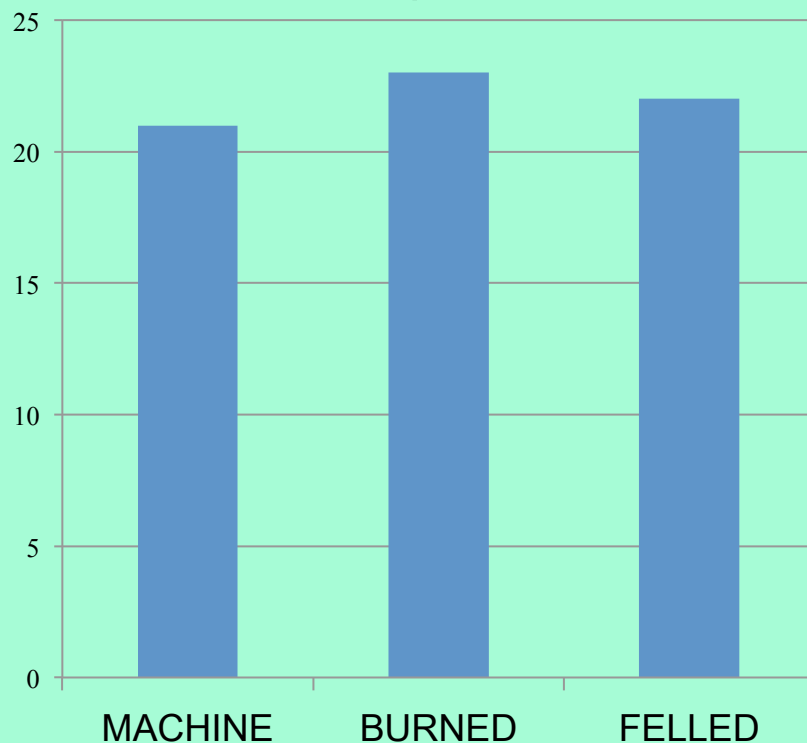
Slash, fell, and burn

11 yrs later,
natural regeneration had
restored a forest...

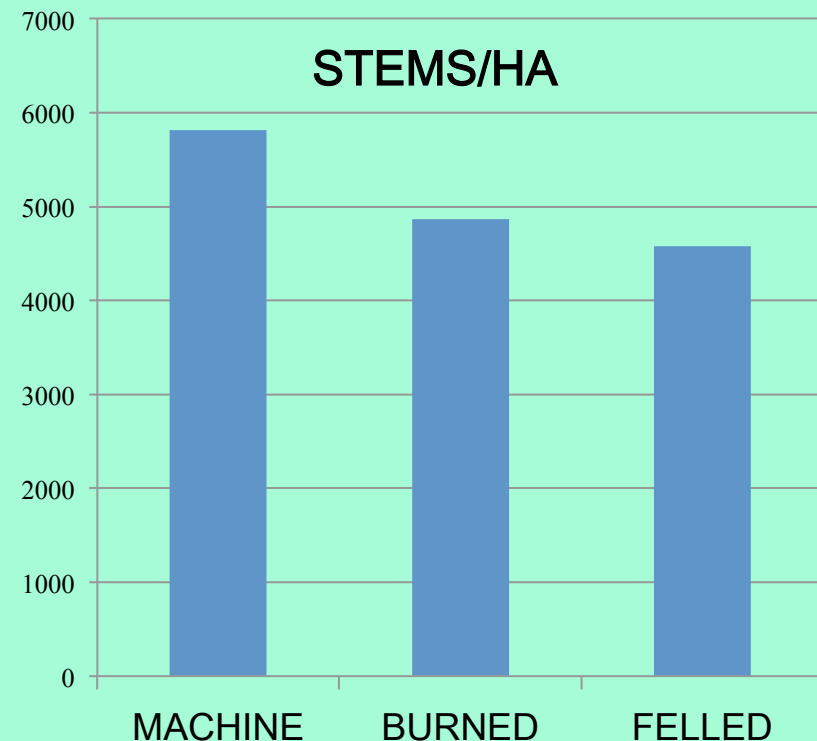


Basal Area

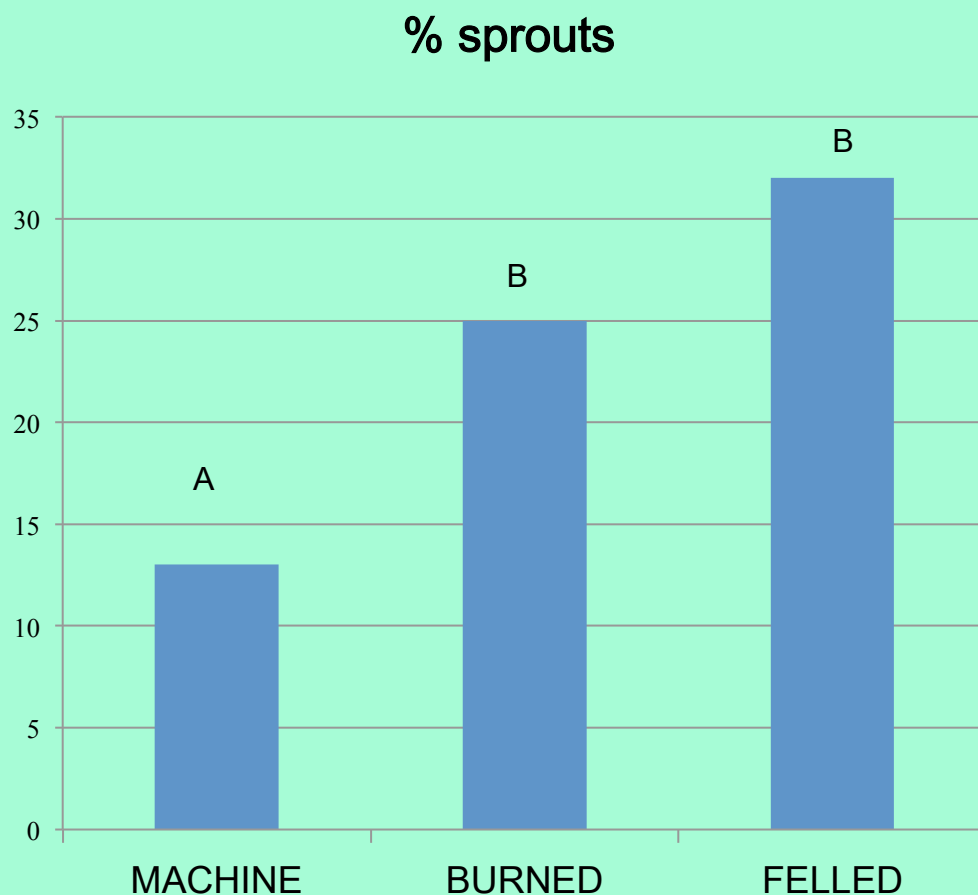
M²/HA



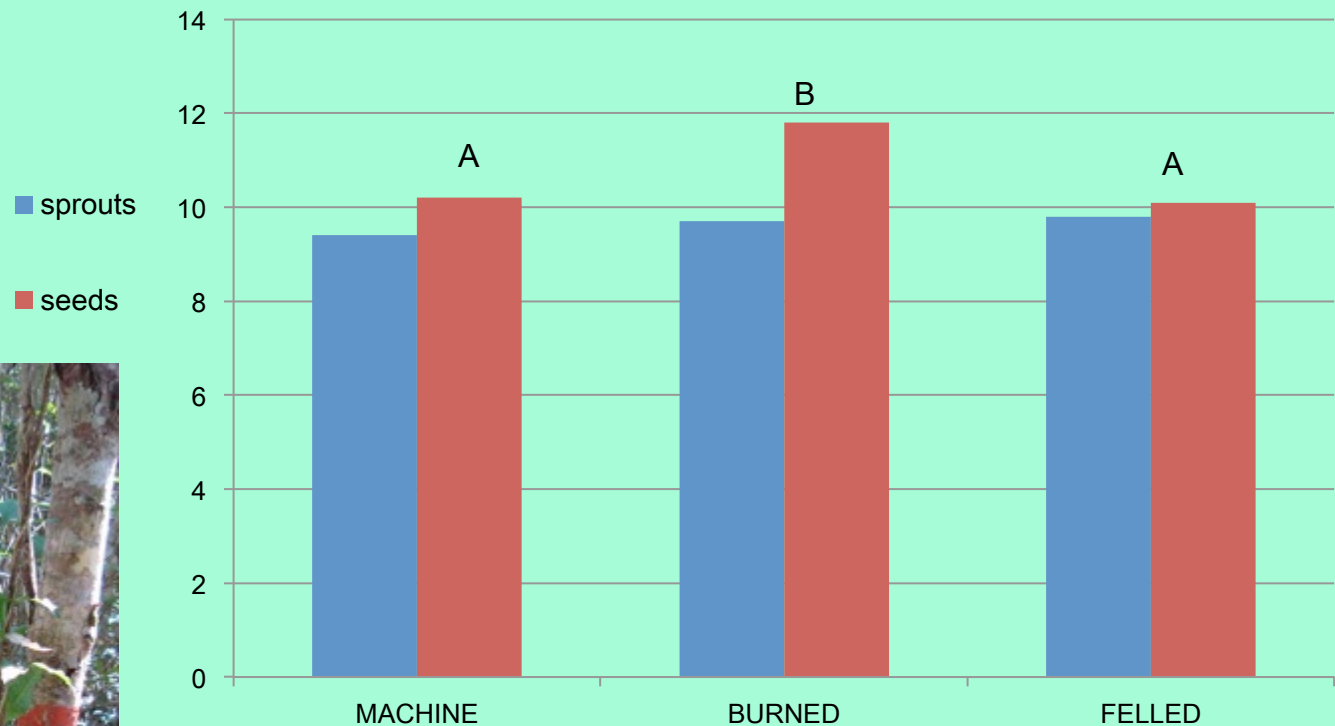
STEMS/HA



11 years later: Sprouting was more common after felling and incomplete burns

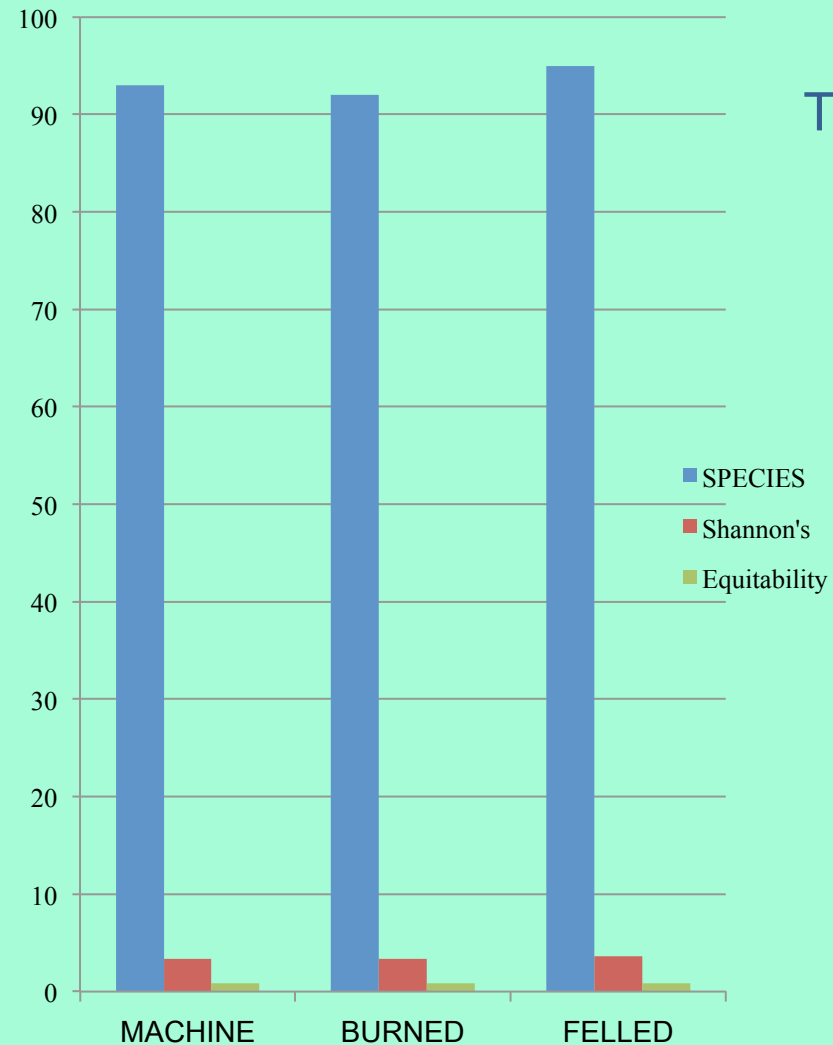


11 years later: dbh(cm)
of top 10% was highest on slash and burn



Better growth from seeds

11 years later: > 90 tree species restored



Then



Now



About 25 species have timber value

- **Decorative hardwoods**

Tzalam (*Lysiloma latisiliquum*)

Chechem (*Metopium brownei*)

Siricote (*Cordia dodecandra*)

Granadillo (*Platimiscium yucatanum*)

Chacte cok (*Simira salvadorensis*)

Katalox (*Swartzia cubensis*)

Chakte viga (*Caesalpinia violacea*)

- **Potential hardwoods**

Yaxnik (*Vitex guamerii*)

Jabin (*Piscidia piscipula*)

Kanixte (*Pouteria campechiana*)

Boob (*Coccoloba barbadensis*)

Guayabillo (*Psidium sartorianum*)

Ramon (*Brosimum alicastrum*)

Chicozapote (*Manilkara zapota*)

- **Softwoods**

Paasak (*Simarouba glauca*)

Jobo (*Spondias mombin*)

Chaca rojo (*Bursera simaruba*)

Amapola (*Pseudobombax ellipticum*)

Sac-Chaca (*Dendropanax arboreus*)

Ceiba (*Ceiba pentandra*)

- **Commercial interest**

Xuul (*Lonchocarpus yucatanensis*),

Tabaquillo (*Alseis yucatanensis*)

Chintok (*Krugiodendrum ferreum*),

Zapotillo (*Pouteria reticulata*)

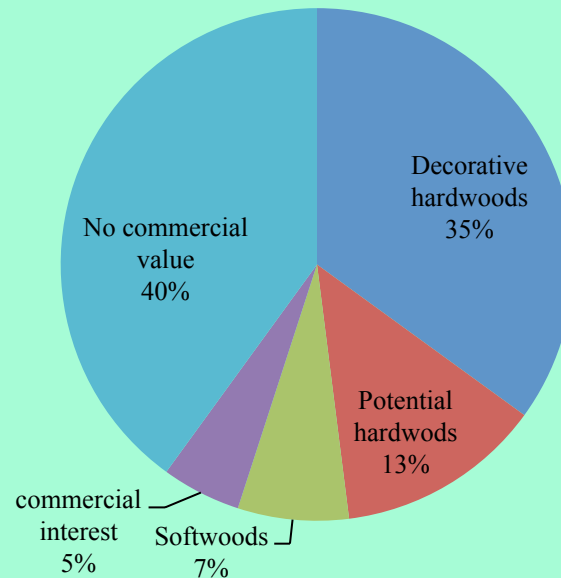
Tamay (*Zuelania guidonia*),

Tastab (*Guettarda combsi*)

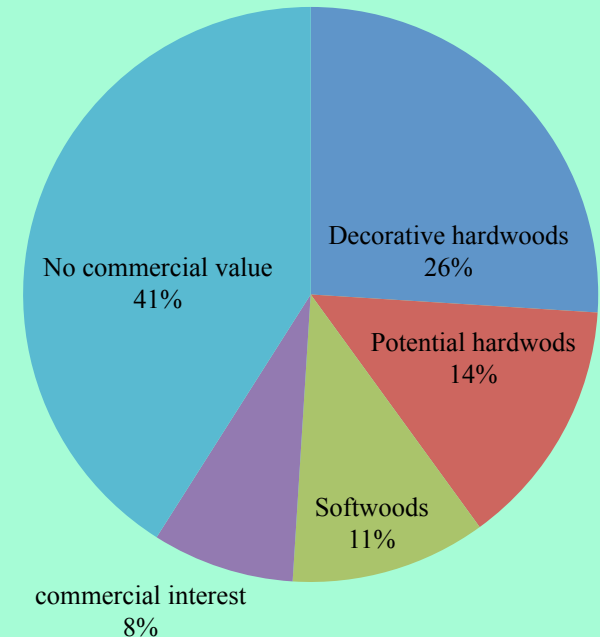
Proportion of timber species was best on slash and burn and machine clearings

Hardwoods are most durable;
Softwoods must be extracted and sold immediately

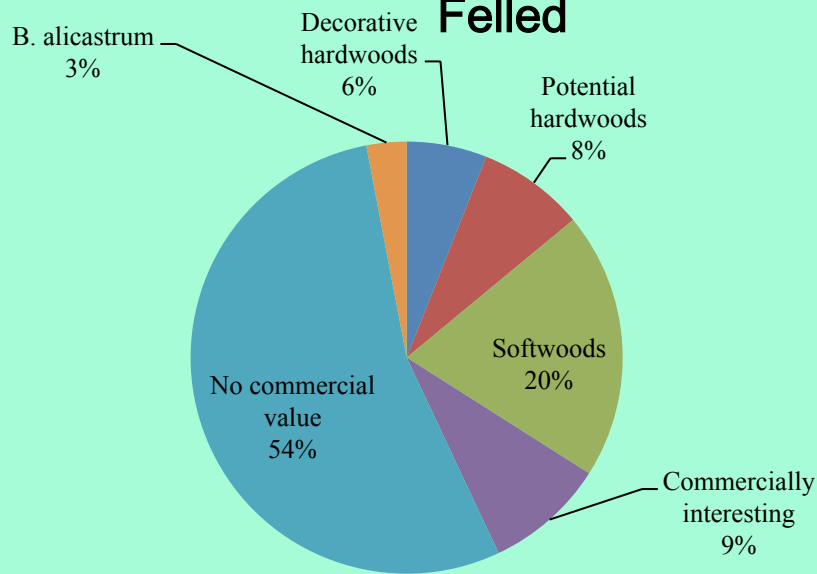
Machine



Burned



Felled

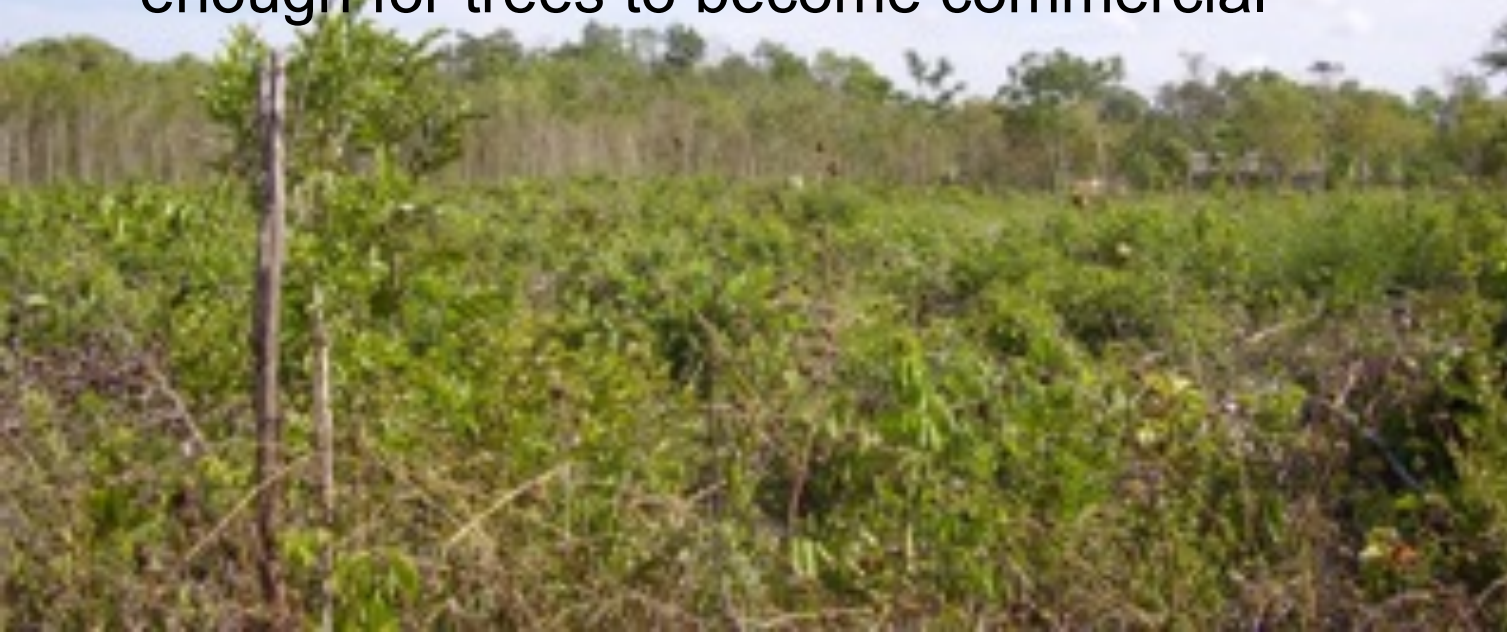


Machine clearing is expensive:
requires machines,
fuel, trained operators; and
reduces nutrient availability/growth

Slash and burn clearings favor rich future forests

- Creating small patch clearings on a small portion of each cutting area each year would sustain forest diversity and commercial value for timber
- In QR the population density is low enough that slash and burn “fallows” could extend long enough for trees to become commercial

BUT



Impediments to use of slash and burn for forest management

Policies for forest conservation may undermine forests

- Slashing and burning have been permitted only outside the permanent forest estate
- New Mexican laws against burning and clearing implemented to address Climate Change concerns since COP 16 in Cancun
- If light-loving species don't regenerate, the forest will become impoverished
- If valuable timber harvests can't be sustained, how will the forest hold its ground?

Forest
for
timber

VS



Land for
permanent
agriculture



Restoring timber species diversity requires clearing; slash and burn is best



- Local forest owners depend on slash and burn for their agriculture and it benefits their forest economies
- Let's keep the interaction going and the forest growing



Acknowledgements

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