

# Mexican bamboos in the XXI century: diversity, useful species, and conservation

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**What do we know about  
the bamboos in  
Mexico?**

# Poaceae (grass family)

- **Bambusoideae**
- **Bambuseae**
- **Arthrostylidiinae**
- **Chusqueinae**
- **Guaduinae**
- **Olyreae**



**We know who studies  
the bamboos of Mexico**



**We know how many  
species of bamboo  
there are in Mexico**

# Woody bamboos

**52 species**

*Arthrostylidium*

*Aulonemia*

*Chusquea*

*Guadua*

*Merostachys*

*Olmeca*

*Otatea*

*Rhipidocladum*





# Herbaceous bamboos

**4 species**

*Cryptochloa*

*Lithachne*

*Olyra*



**We know where are they**



**We know who they are**

**Woody bamboos**

# *Arthrostylidium*

*Arthrostylidium excelsum*

Native







# ***Aulonemia***

***Aulonemia laxa***

**Endemic**





# ***Chusquea***

**22 species**



# ***Chusquea matlazinca***

**Endemic**







# ***Chusquea enigmatica***

**The smallest Mexican woody bamboo (20-40 cm)**

**Endemic**





# ***Chusquea bilimekii***

**The species that grows on the heights (3150 m)**

**Endemic**





# ***Guadua***

**7 species**





# ***Guadua longifolia***

**Native**





# *Merostachys*

*Merostachys mexicana*

Endemic





# ***Olmecca***

**5 species**





# ***Olmecca recta***

**Endemic bamboo species that produces fleshy fruits**





# *Otatea*

**11 species**



# *Otatea carrilloi*

Endemic







# *Otatea victoriae*

One of the most drought-tolerant species in the world (300 mm)





# ***Rhipidocladum***

**4 species**



# ***Rhipidocladum pittieri***

**Native**







**Herbaceous bamboos**

# *Cryptochloa*

*Cryptochloa strictiflora*

The smallest Mexican bamboo species





# ***Lithachne***

***Lithachne pauciflora***

**Native**





# *Olyra*

*Olyra glaberrima*

*Olyra latifolia*

Native







**Mexico**

**56 species**

**52 woody bamboos**

**4 herbaceous bamboos**

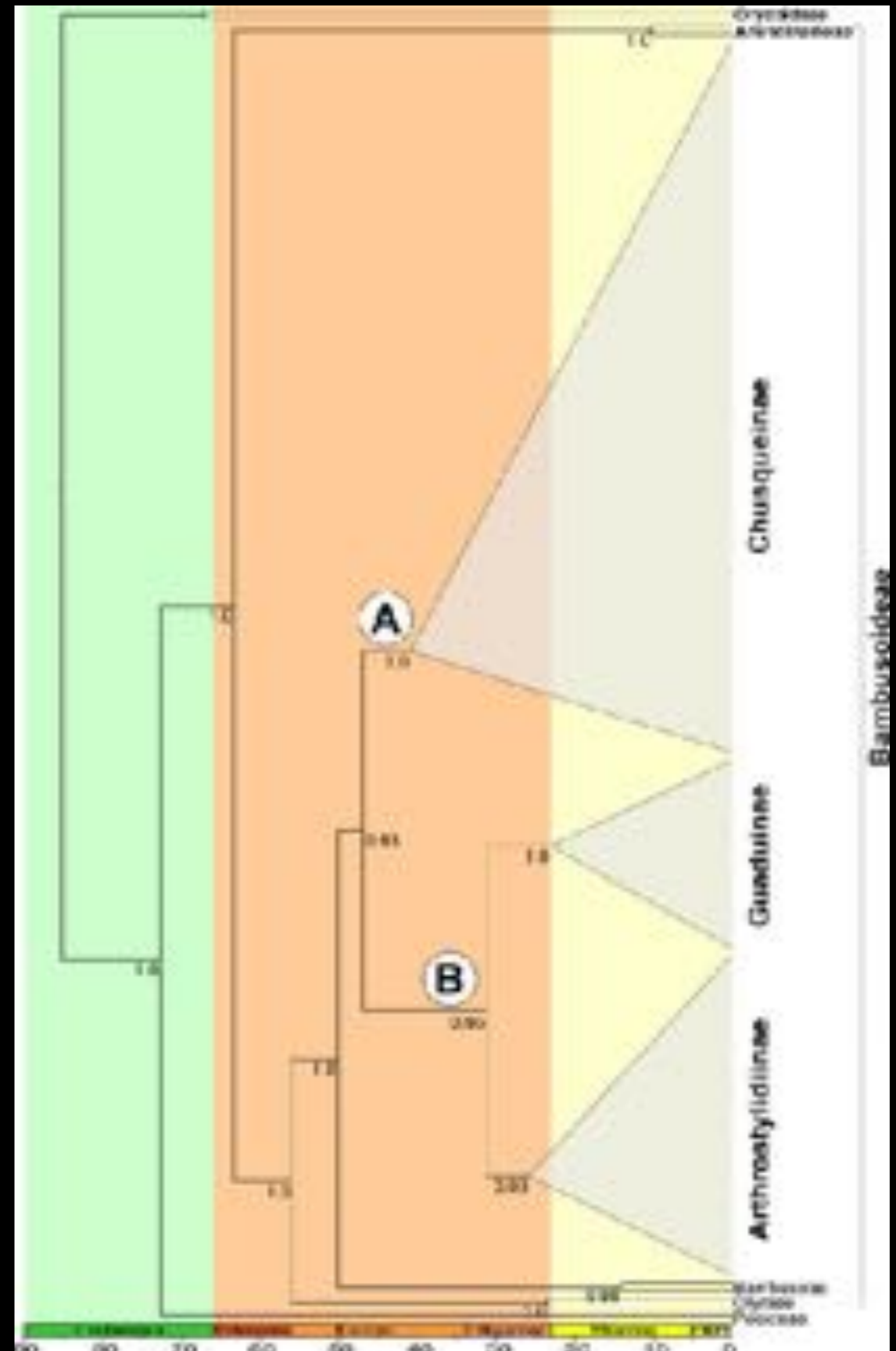
**36 endemic  
species**



**Since when are the  
bamboos in Mexico?**

# Molecular “clock” tree

Neotropical woody  
bamboo species of  
America







**Which species have the  
greatest economic potential?**



# ***Guadua aculeata***

**The tallest species in Mexico (15-20 m; 12-18 cm)**





# ***Ronulfo and Celia's house***

**Teziutlán, Puebla  
Pictures by Celia Calleja**











# ***Guadua inermis***

**Endemic (4-15 m; 5-12 cm)**







Oaxaca, "bajereque"



Oaxaca, "bajereque"



Oaxaca, "bajereque"

# ***Guadua paniculata***

**Native (5-10 m; 2-5 cm)**









**Chiapas, “bajereque”**



**Chiapas, “bajereque”**



**Chiapas, “bajereque”**



**Chiapas, "bajereque"**



**Chiapas, “bajereque”**



**Chiapas, “bajereque”**

# ***Guadua tuxtlensis***

**Endemic (10-20 m; 5-12 cm)**







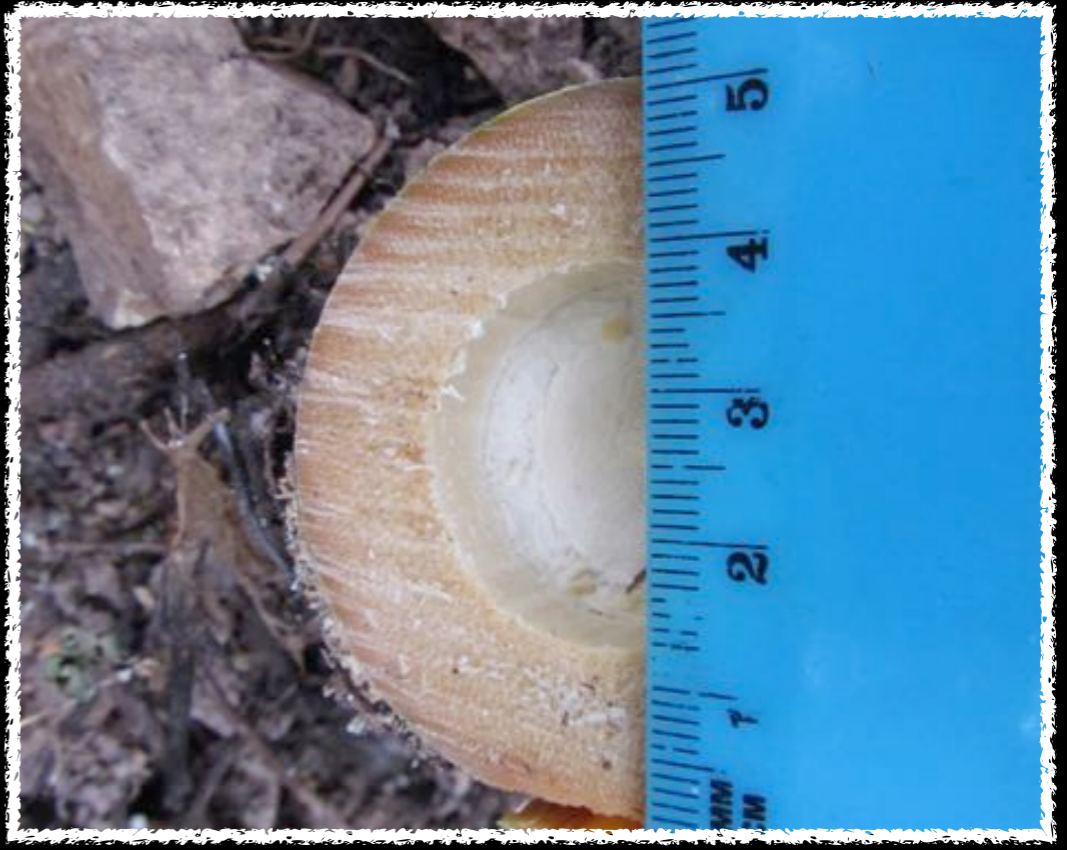


**Pictures by Rogelio Macías**

# ***Otatea acuminata***

**The most useful bamboo species in Mexico (2-8 m; 1-5 cm)**







**Jalisco**



**Jalisco**





**Jalisco**



**Jalisco**

**Pictures by Fernando Partida**



**Jalisco**



**Guadalajara, Jal.**



**Guanajuato**



**Veracruz**

# *Otatea fimbriata*

Native (4-8 m; 2-5 cm)







**Chiapas, “bajereque”**



**Chiapas, “bajereque”**



**Chiapas, “bajereque”**



**Chiapas, “bajereque”**



**Chiapas, “bajereque”**



**Chiapas, “bajereque”**

# ***Rhipidocladum racemiflorum***

**Native**

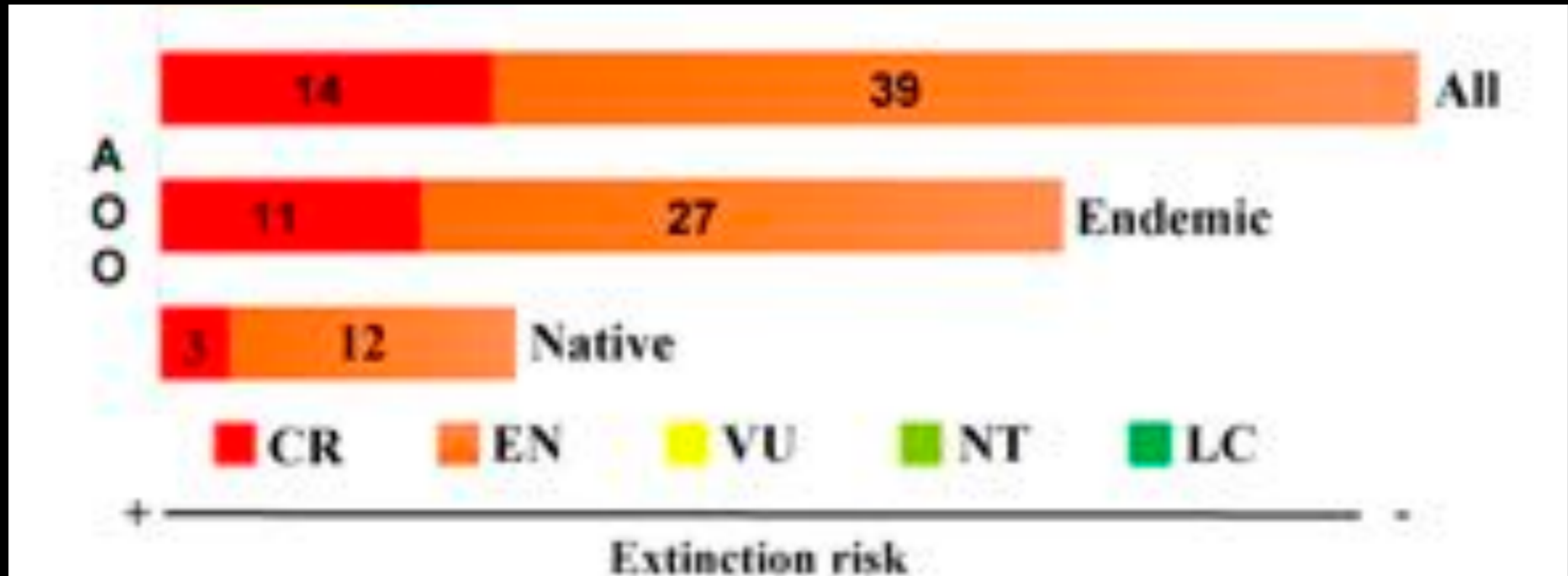






**Jalisco**

**Which species need to  
be protected?**



# Number of species to be protected

Endemic and Native bamboos of Mexico



*Chusquea* sp. nov

A



*Chusquea enigmatica*

B



*Chusquea aperta*

C



*Chusquea* sp. nov

D



*Olmeca clarkiae*

E



*Chusquea* sp. nov

F



*Chusquea nedjaquithii*

G



*Olmeca zapotecorum*

H



*Otatea ramirezii*

A



*Otatea victoriae*

B



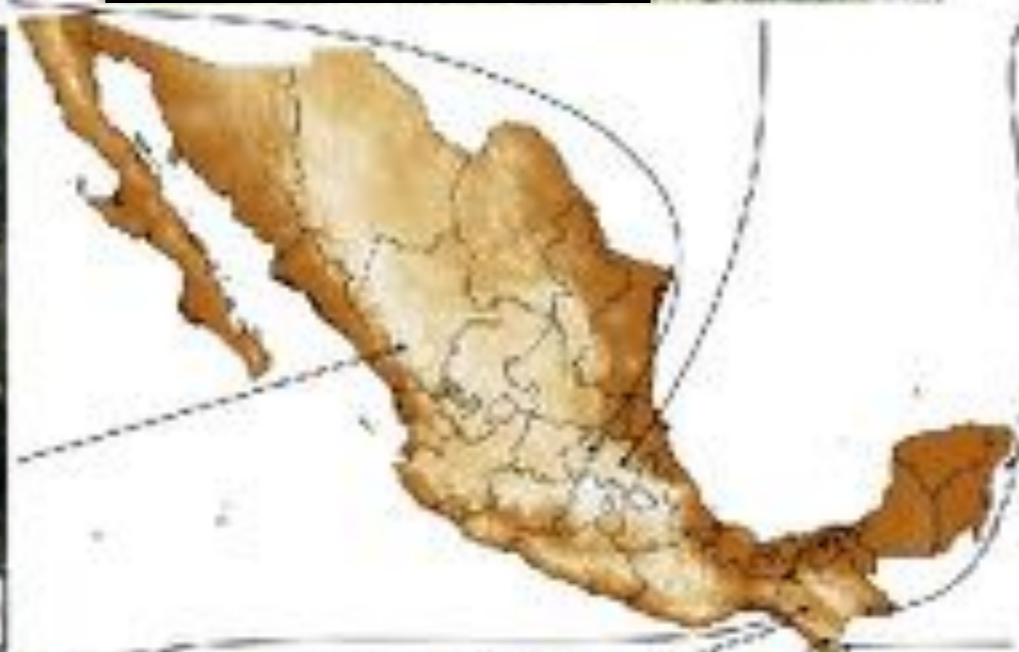
*Chusquea simpliciflora*

C



*Chusquea septentrionalis*

D



*Rhipidocladum martinezii*

E



*Otatea nayeeri*

F



*Otatea carilloi*

G



*Otatea glauca*

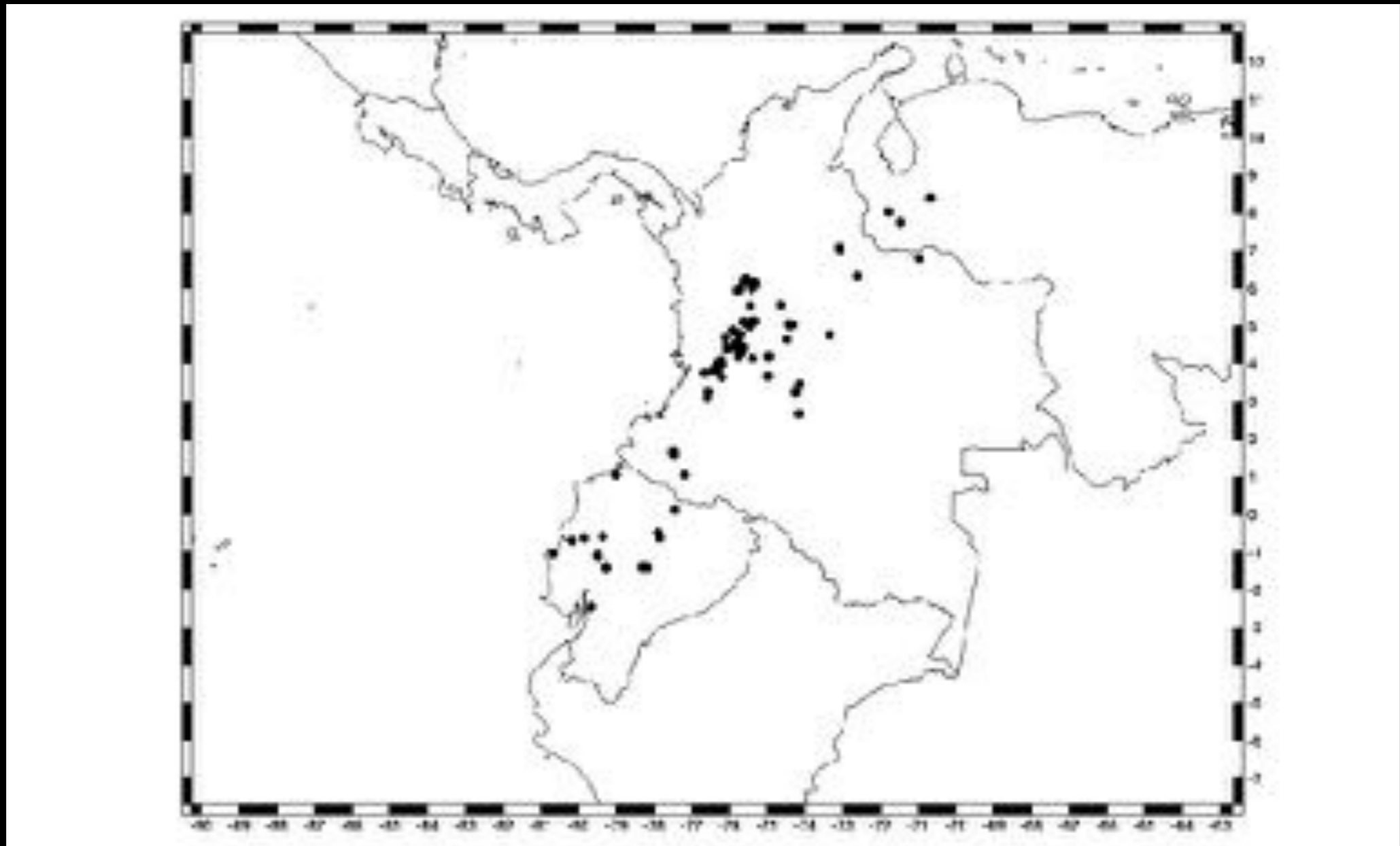
H

**Take-home message**

Where to grow *Guadua*  
*angustifolia* in Mexico?







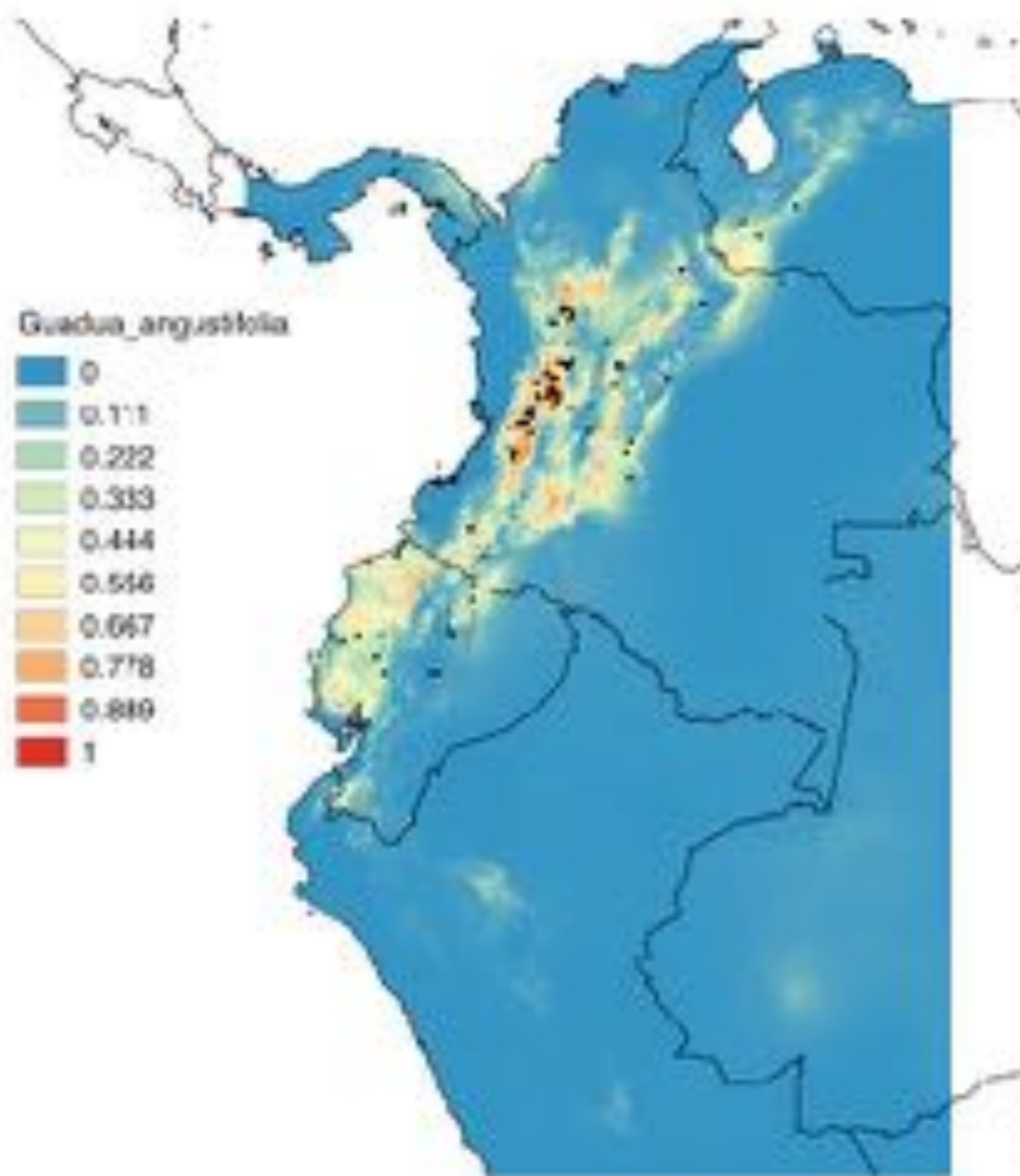
# *Guadua angustifolia*

GBIF records

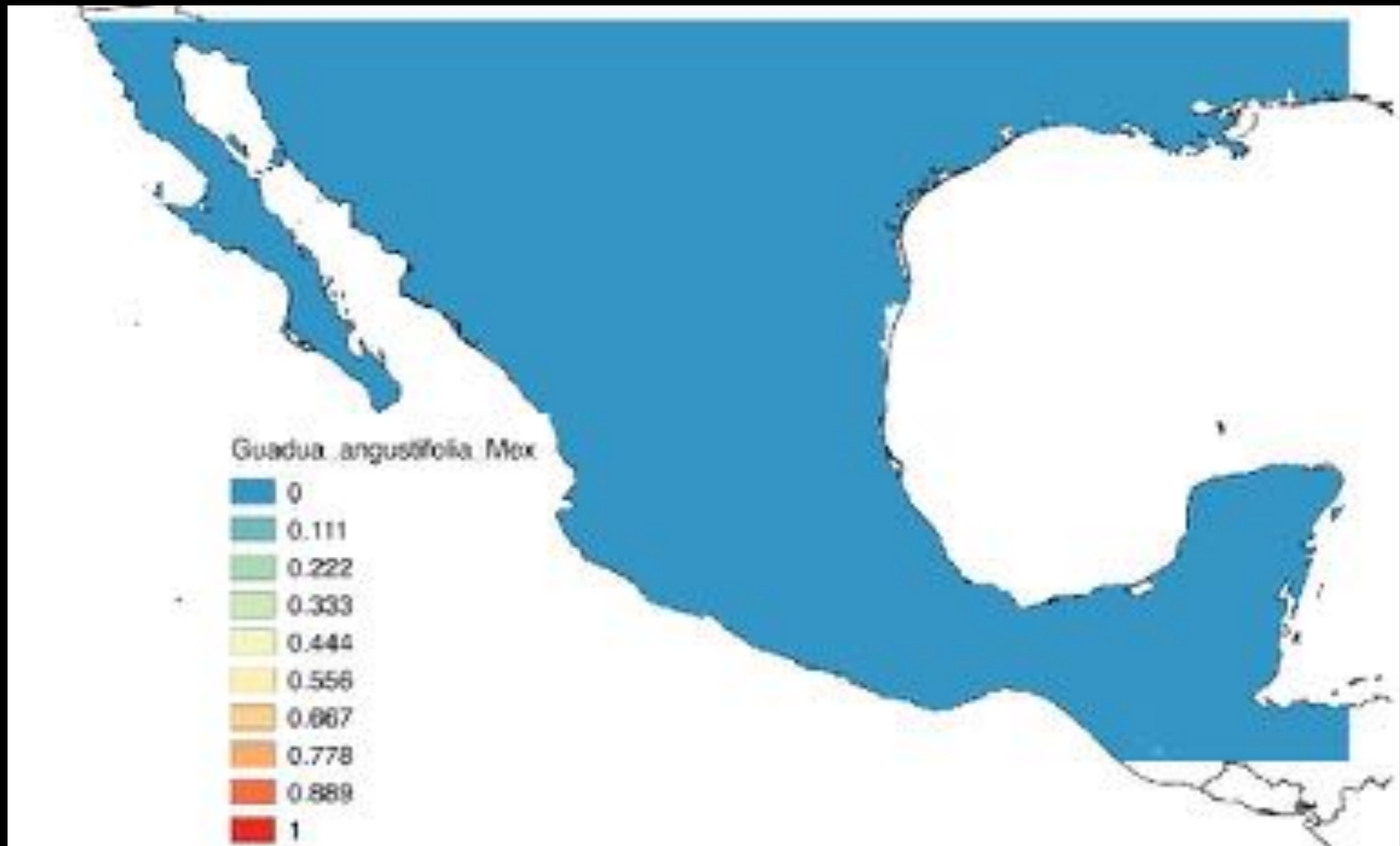
Variable abbreviation	Brief description	Units
annualPET	annual potential evapotranspiration: a measure of the ability of the atmosphere to remove water through evapotranspiration processes, given unlimited moisture	mm yr <sup>-1</sup>
aridityIndexThornthwaite	Thornthwaite aridity index: index of the degree of water deficit below water need	-
climateMonitorIndex	a metric of relative wetness and aridity	-
continentality	average temp. of warmest month - average temp. of coldest month	°C
embergerQ	Emberger's pluviothermic quotient: a metric that was designed to differentiate among Mediterranean type climates	-
growingDegDays0	sum of mean monthly temperature for months with mean temperature greater than 0°C multiplied by number of days	-
growingDegDays5	sum of mean monthly temperature for months with mean temperature greater than 5°C multiplied by number of days	-
maxTempColdestMonth	max. temp. of the coldest month	°C × 10
minTempWarmestMonth	min. temp. of the coldest month	°C × 10
monthCountByTemp10	count of the number of months with mean temp greater than 10°C	months
PETColdestQuarter	mean monthly PET of coldest quarter	mm month <sup>-1</sup>
PETDriestQuarter	mean monthly PET of driest quarter	mm month <sup>-1</sup>
PETseasonality	monthly variability in potential evapotranspiration	mm month <sup>-1</sup>
PETWarmestQuarter	mean monthly PET of warmest quarter	mm month <sup>-1</sup>
PLIWettestQuarter	mean monthly PLI of wettest quarter	mm month <sup>-1</sup>
thermInd	compensated thermicity index: sum of mean annual temp., min. temp. of coldest month, max. temp. of the coldest month, × 10, with compensations for better comparability across the globe	°C
tri	terrain roughness index	-
topoWet	SAGA-GIS topographic wetness index	-

# ENVIREM dataset

Title & Bemmels 2018; Ecography 41: 291–307



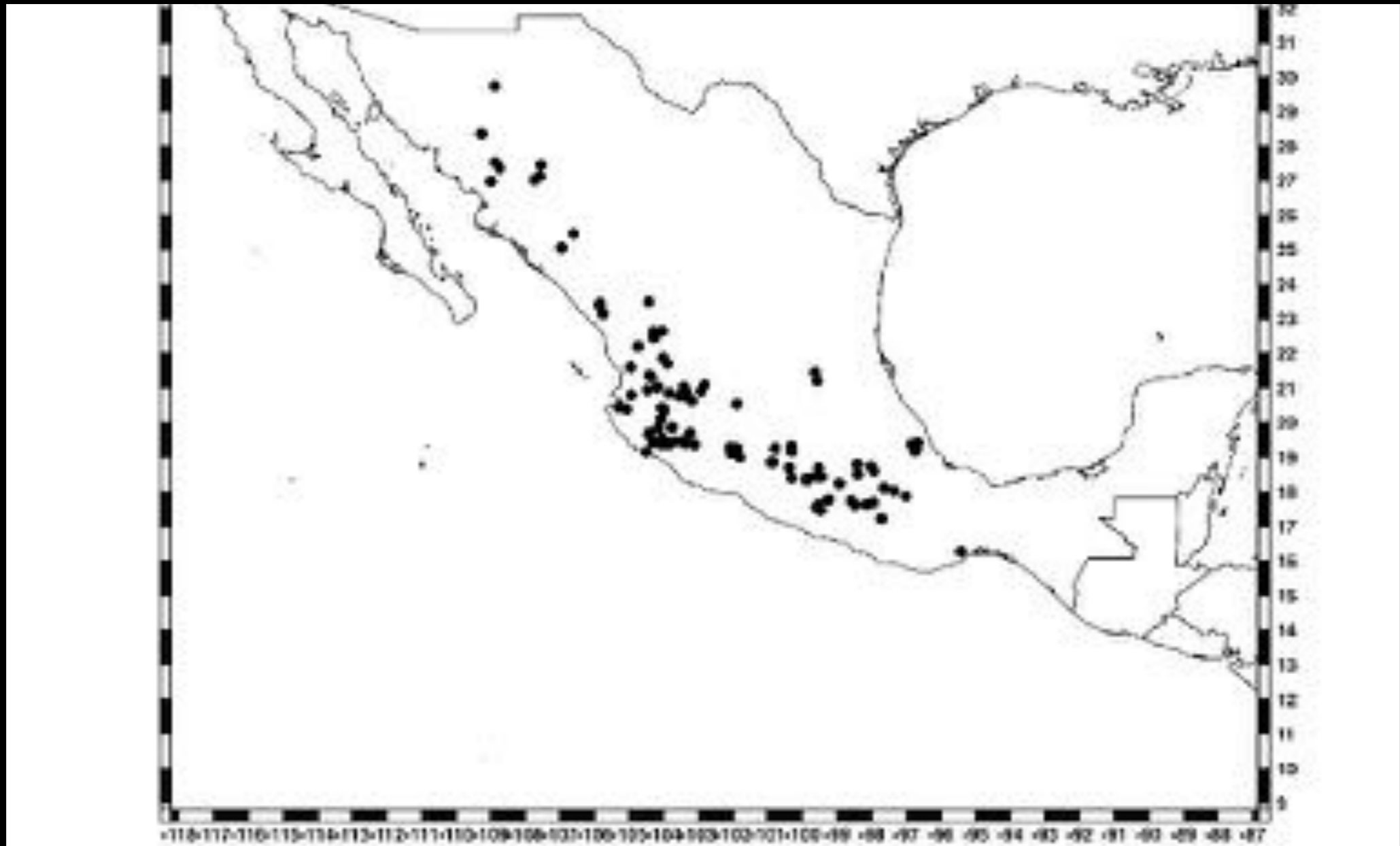
Variable	Percent contribution	Permutation importance
PETSeasonality	41.7	73.6
growingDegDays0	15.6	0.3
acidityIndexThcoast/wa/w	7.6	2.1
ti	7.5	2.9
enburgerQ	4.7	5.2
PETColdestQuarter	4.5	2.3
continentality	3.6	0.2
topWet	2.9	0.7
monthCoastByTemp10	2.6	0
PETWarmestQuarter	2.6	0.9
minTempWarmest	1.7	0.3
growingDegDays6	1.5	1.5
maxTempColdest	1.5	4.2
climaticMoistureIndex	1.2	0
en/wa/PET	0.5	5.7
thermicityIndex	0.1	0.2
PETWettestQuarter	0.1	0.2
PETDriestQuarter	0	0



Climatic variables of *G. angustifolia* from South America projected on Mexico

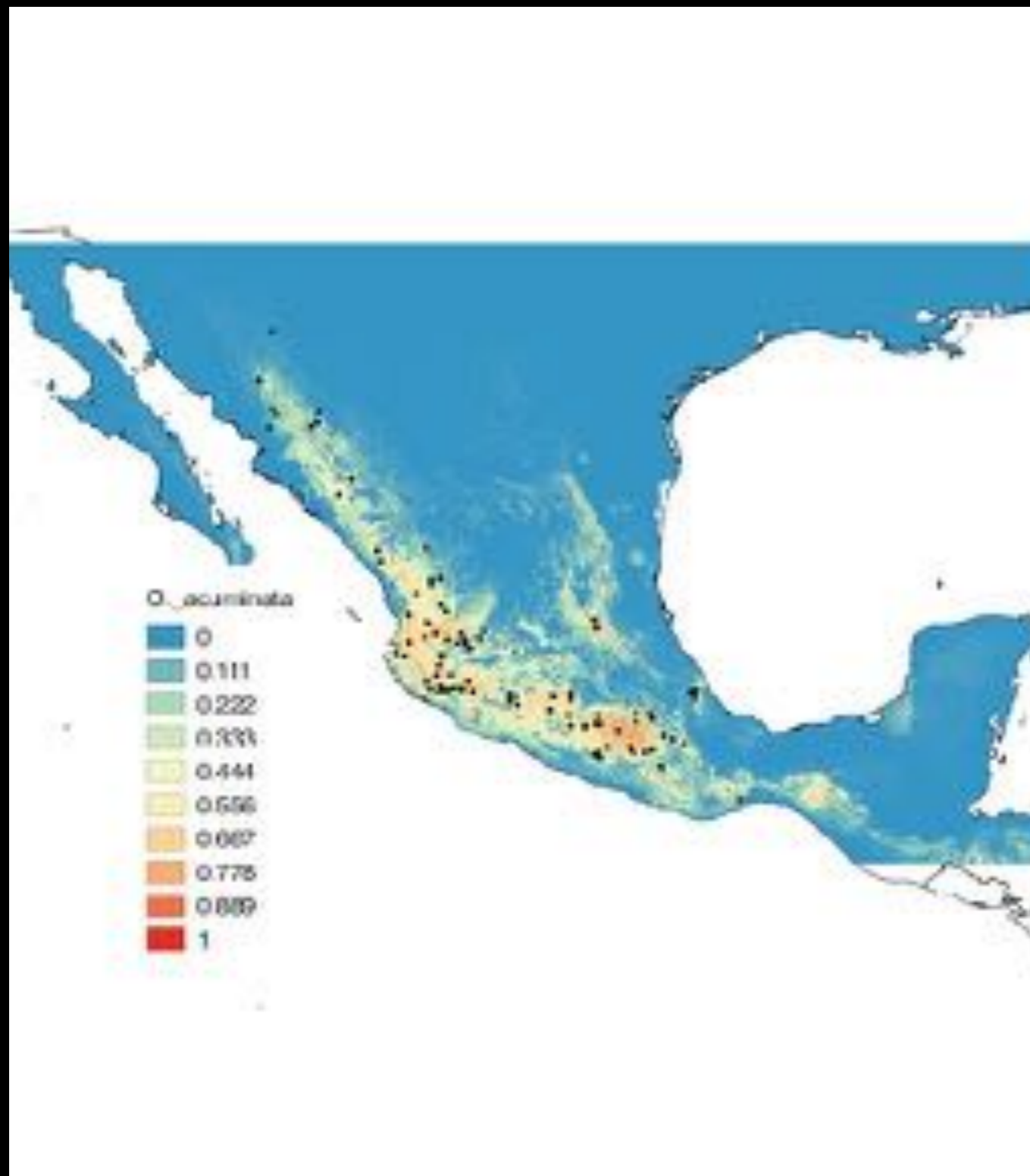
Where to grow *Otatea*  
*acuminata* in South America?





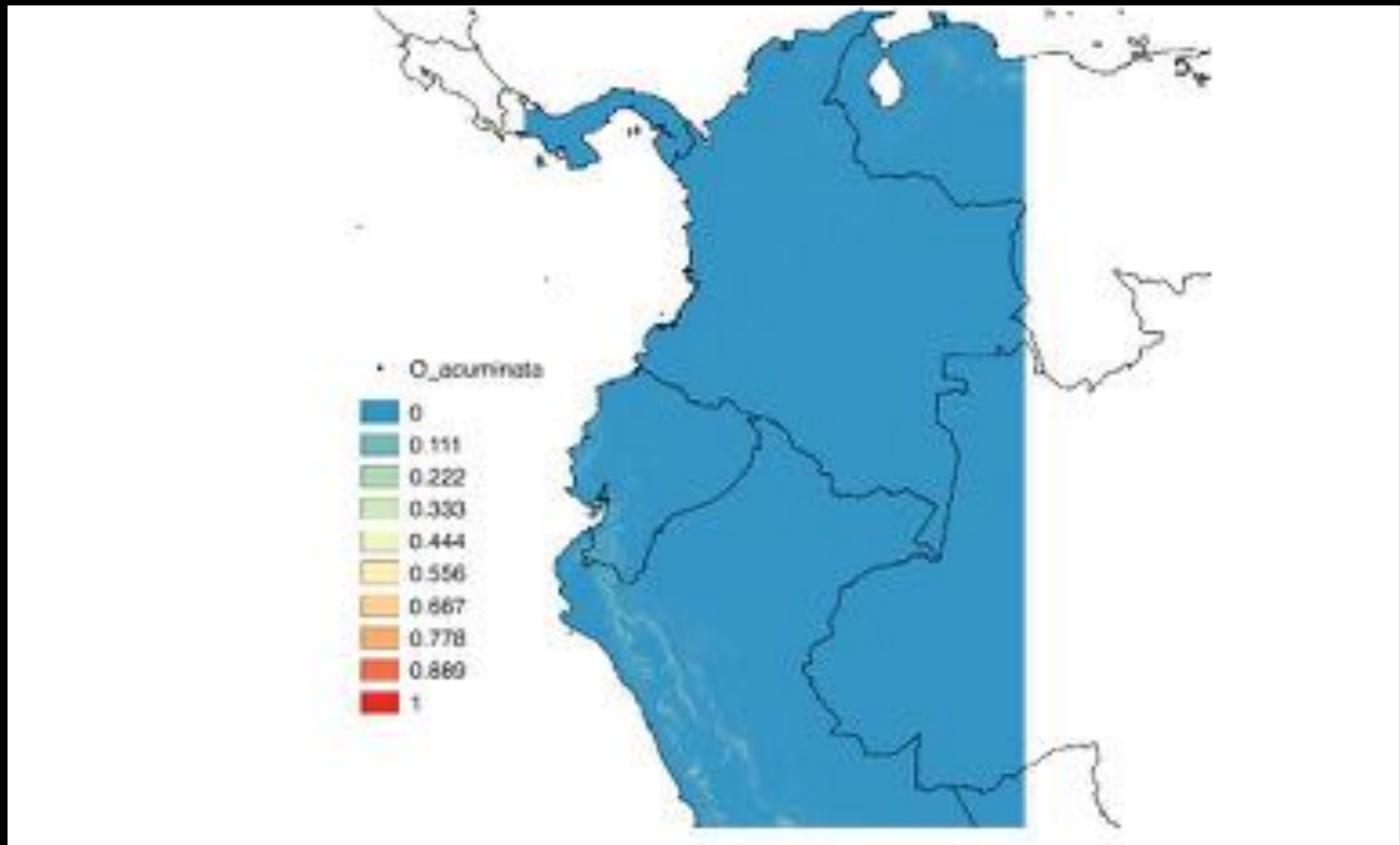
# *Otatea acuminata*

Herbaria records



Variable	Percent contribution	Permutation importance
topoWet	26	3.6
embergr:Q	16.5	5.2
aridityIndexThornthwaite	12.2	12.6
contin:ality	11	32.5
tri	8.9	11.8
PETColdestQuarter	8.7	5.3
PETseasonality	4.6	11.4
climaticMoist:reIndex	3.2	10.3
maxTempColdest	2.9	0.1
minTempWarmest	2.1	0.2
monthCountByTempIO	1.1	0
therm:cityIndex	1	1.7
growingDegDaysO	0.8	1
PETWettestQuarter	0.7	0.9
PETWarmestQuarter	0.1	1.2
PETDriestQuarter	0.1	1.8
growingDegDaysS	0	0.2
annualPET	0	0.2

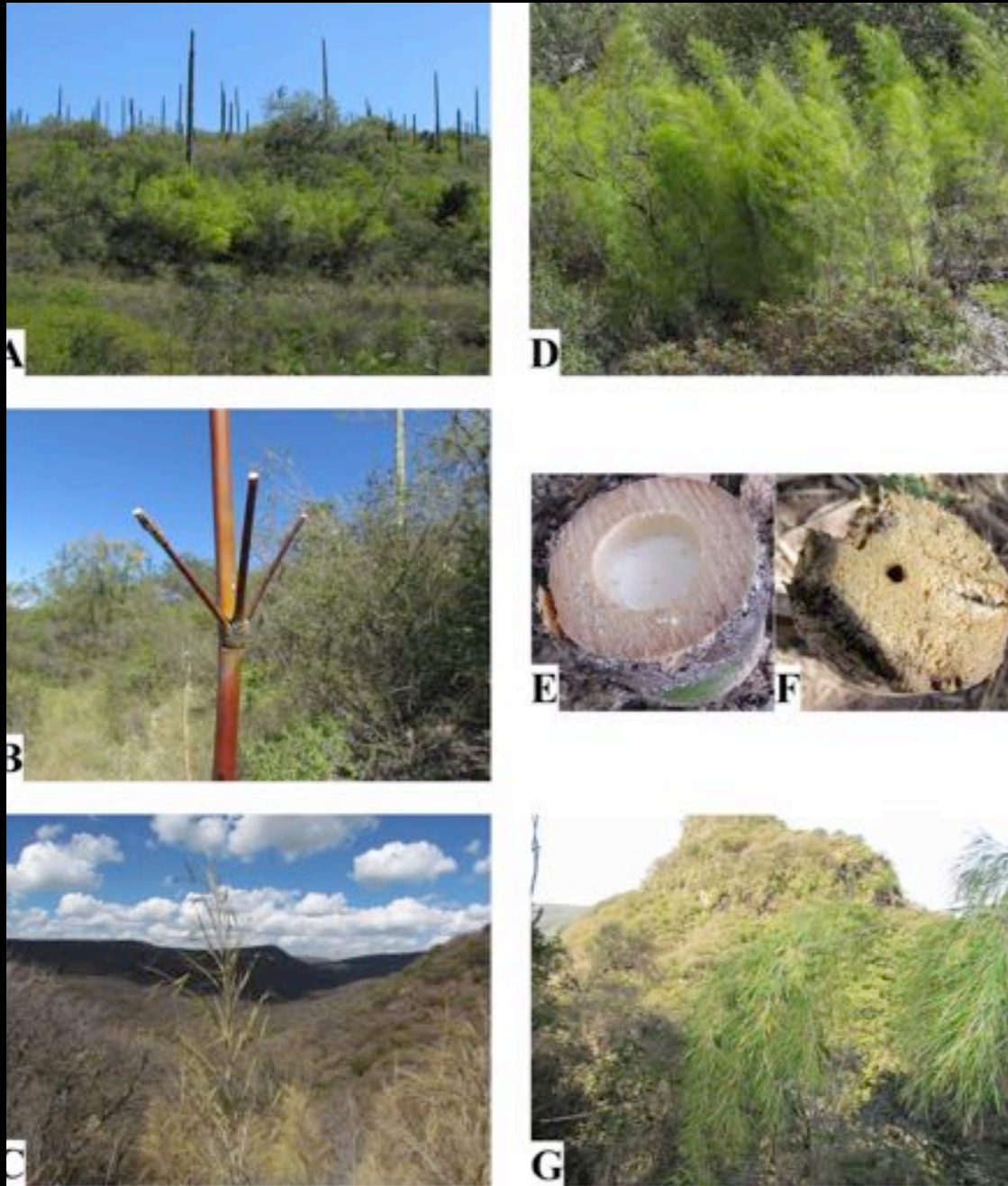




Climatic variables of *O. acuminata* from Mexico projected on South America

We can grow *Guadua angustifolia*  
in Mexico, but it will take more  
time to obtain commercial size

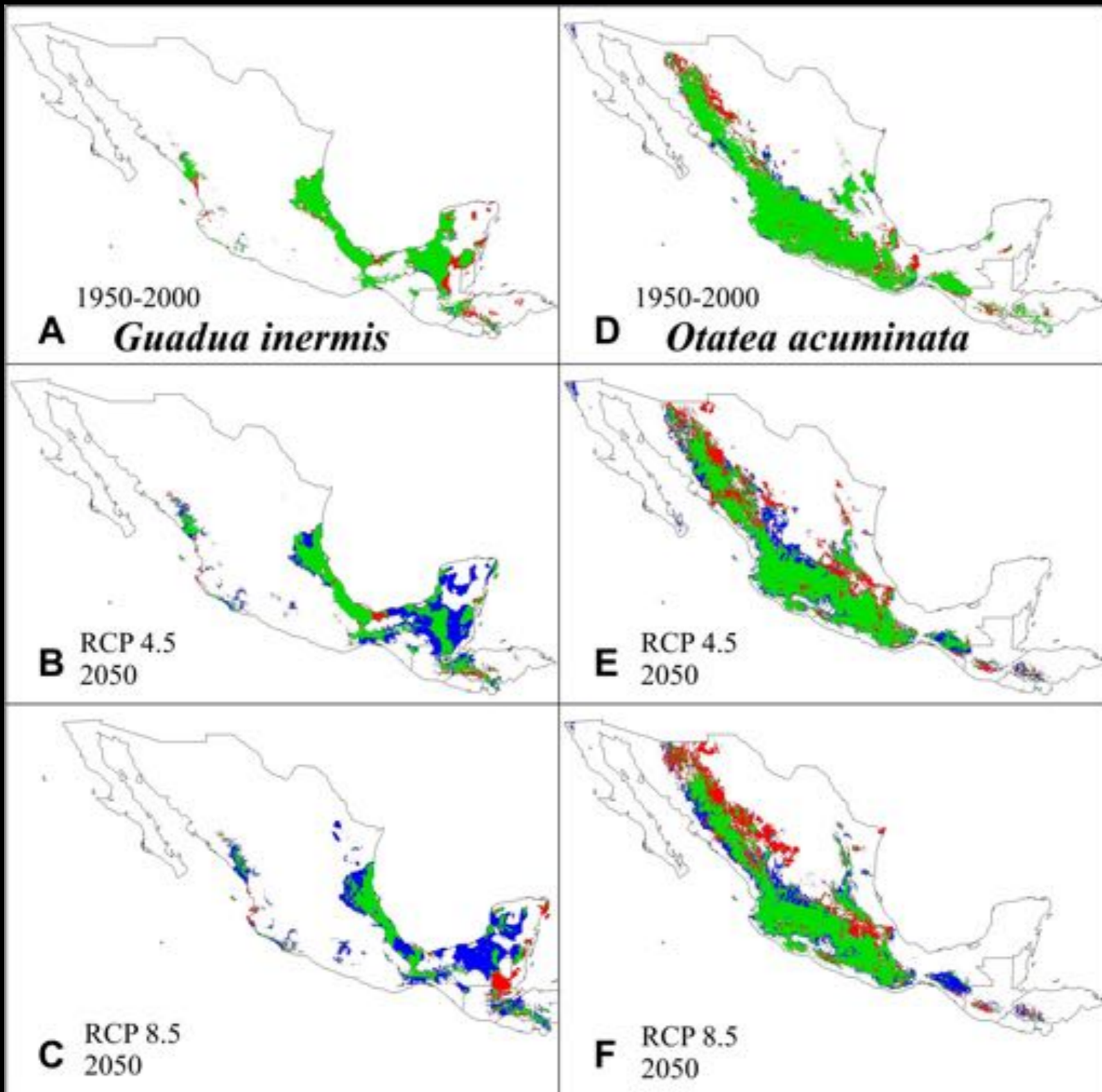
***Otatea acuminata*** and  
***Guadua inermis*** will survive  
climate change



*Otatea acuminata*



*Guadua inermis*



**Lost 9.5-42.3%**

**14.2-22.3%**

**A new unexplored market:**  
**native bamboos for**  
**horticulture**



*Les invitamos al:*  
**I SIMPOSIO  
INTERNACIONAL  
DE BAMBÚ,  
COSTA RICA**

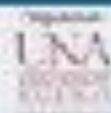
**6, 7 Y 8 NOVIEMBRE 2018**

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