



# Clean Energy and Sustainability Symposium: Australia-Colombia

21-22 March 2024 – Bogota

Life sciences and biotechnology are, according to the most widespread opinion, among the pioneering technologies with the most promising prospects for the coming decades.

*Comisión Europea, Life Sciences and Biotechnology – A Strategy for Europe, 2002.*

With the increase in population energy consumption also increases, generation of solid waste, pollution, food demand...

<https://xrboston.org/news/population-growth-and-overconsumption-earths-resources/>



Current World Population  
**8,098,525,429**

# WONDERFUL NATURE

Tomado de: Presentación Dra. Lucía Aterhotua - UdeA

# COLOMBIA



# SIB COLOMBIA

# 67.000

SPECIES IN COLOMBIA



**1er PAÍS**  
AVES Y ORQUÍDEAS



**2do PAÍS**  
PLANTAS, ANFIBIOS,  
MARIPOSAS Y PECES  
DULCEACUÍCOLAS



**3er PAÍS**  
PALMAS Y REPTILES



**6to PAÍS**  
MAMÍFEROS



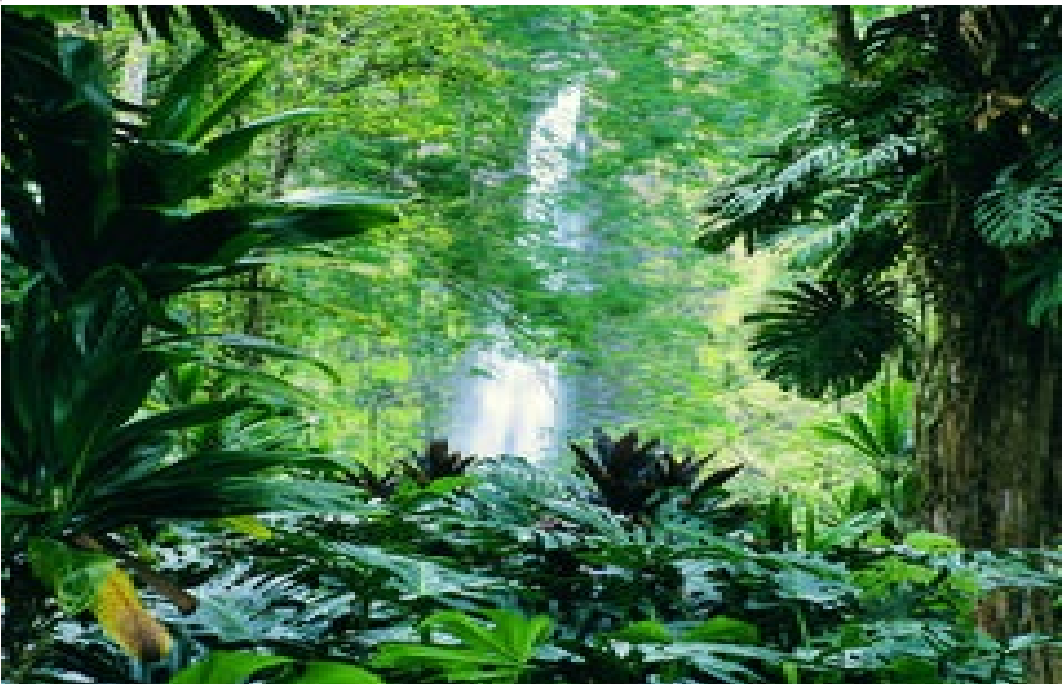
Analítica - Ciencia ciudadana

**BIODIVERSITY**



# EARTH'S MOST BIODIVERSE COUNTRIES

COUNTRY	Birds	Amphib	Mammals	Reptiles	Fish	Vascular plants	BioD Index	Rank	BioD index/ Land area	Rank
Brazil	17.6%	13.6%	11.8%	7.9%	13.7%	20.8%	<b>0.85</b>	<b>1</b>	0.10	
Colombia	18.3%	10.2%	8.1%	5.9%	6.2%	19.0%	<b>0.68</b>	<b>2</b>	0.57	
Indonesia	16.2%	4.6%	12.2%	7.1%	14.1%	10.9%	<b>0.65</b>	<b>3</b>	0.34	
China	12.5%	5.5%	10.0%	4.7%	10.1%	11.9%	<b>0.55</b>	<b>4</b>	0.06	
Mexico	10.9%	5.0%	9.5%	8.9%	7.9%	9.7%	<b>0.52</b>	<b>5</b>	0.26	
Peru	18.1%	7.6%	8.5%	4.7%	4.7%	6.3%	<b>0.50</b>	<b>6</b>	0.41	
Australia	7.1%	3.2%	6.4%	10.1%	14.7%	5.8%	<b>0.47</b>	<b>7</b>	0.06	
India	11.9%	5.2%	7.5%	6.7%	7.4%	6.9%	<b>0.46</b>	<b>8</b>	0.14	
Ecuador	16.0%	7.2%	6.8%	4.3%	3.3%	7.2%	<b>0.45</b>	<b>9</b>	1.59	21
Venezuela	13.7%	4.8%	6.6%	3.9%	5.2%	7.8%	<b>0.42</b>	<b>10</b>	0.45	
United States	8.5%	4.0%	8.0%	5.2%	9.3%	7.2%	<b>0.42</b>	<b>11</b>	0.04	
Bolivia	14.3%	3.2%	6.6%	3.0%	1.2%	6.4%	<b>0.35</b>	<b>12</b>	0.31	
South Africa	7.6%	1.7%	5.4%	4.4%	6.2%	8.7%	<b>0.34</b>	<b>13</b>	0.27	
DR Congo	10.9%	3.2%	7.8%	2.9%	4.5%	4.1%	<b>0.33</b>	<b>14</b>	0.14	
Malaysia	7.1%	3.5%	6.1%	4.7%	5.8%	5.7%	<b>0.33</b>	<b>15</b>	0.97	32
Viet Nam	8.3%	3.0%	5.2%	4.5%	7.3%	3.9%	<b>0.32</b>	<b>16</b>	0.97	33
Papua New Guinea	7.2%	4.9%	4.9%	2.7%	8.5%	4.3%	<b>0.32</b>	<b>17</b>	0.69	
Thailand	9.3%	1.9%	5.7%	4.2%	6.4%	4.3%	<b>0.32</b>	<b>18</b>	0.60	
Tanzania	10.6%	2.7%	6.5%	3.5%	5.3%	3.7%	<b>0.32</b>	<b>19</b>	0.34	
Argentina	10.0%	2.3%	6.8%	4.3%	3.0%	3.5%	<b>0.30</b>	<b>20</b>	0.10	
Cameroon	8.8%	2.9%	6.1%	2.8%	3.1%	3.1%	<b>0.27</b>	<b>21</b>	0.55	
Kenya	10.4%	1.5%	6.9%	2.7%	3.2%	2.4%	<b>0.27</b>	<b>22</b>	0.47	
Panama	8.8%	2.8%	4.5%	2.6%	4.2%	3.7%	<b>0.27</b>	<b>23</b>	3.45	9
Philippines	5.7%	1.5%	3.5%	2.0%	9.9%	3.3%	<b>0.26</b>	<b>24</b>	0.87	
Costa Rica	8.6%	2.7%	4.1%	2.6%	3.3%	4.5%	<b>0.26</b>	<b>25</b>	4.89	6
Myanmar	10.2%	1.2%	5.4%	3.0%	3.1%	2.6%	<b>0.25</b>	<b>26</b>	0.37	
Japan	4.4%	1.0%	2.6%	1.0%	12.1%	2.1%	<b>0.23</b>	<b>27</b>	0.62	
Angola	9.1%	1.3%	5.2%	2.4%	2.7%	1.9%	<b>0.23</b>	<b>28</b>	0.18	
Madagascar	2.5%	4.1%	4.2%	4.0%	3.5%	3.5%	<b>0.22</b>	<b>29</b>	0.36	
Mozambique	6.7%	1.2%	4.3%	2.2%	5.3%	2.1%	<b>0.22</b>	<b>30</b>	0.26	
Guatemala	7.1%	2.2%	4.0%	2.6%	2.7%	3.2%	<b>0.22</b>	<b>31</b>	1.93	18
Guyana	7.9%	1.8%	4.3%	1.8%	3.0%	2.4%	<b>0.21</b>	<b>32</b>	0.98	31
Uganda	9.9%	0.8%	5.8%	1.7%	0.8%	2.4%	<b>0.21</b>	<b>33</b>	0.87	
Guinea	6.3%	1.0%	4.1%	5.8%	3.0%	1.1%	<b>0.21</b>	<b>35</b>	0.86	
Nigeria	8.6%	1.5%	5.2%	1.9%	2.3%	1.7%	<b>0.21</b>	<b>34</b>	0.24	
Honduras	7.0%	1.6%	3.9%	2.6%	3.1%	2.1%	<b>0.20</b>	<b>36</b>	1.78	20
Nicaragua	6.8%	0.9%	3.7%	1.9%	3.2%	2.8%	<b>0.19</b>	<b>37</b>	1.46	22
Laos	6.9%	1.3%	3.9%	1.7%	1.7%	3.1%	<b>0.19</b>	<b>38</b>	0.76	
Congo	6.1%	1.0%	3.6%	3.3%	2.3%	2.2%	<b>0.19</b>	<b>39</b>	0.53	
Ethiopia	8.1%	0.9%	4.9%	2.3%	0.5%	2.4%	<b>0.19</b>	<b>40</b>	0.17	
Sudan	9.2%	0.2%	5.1%	1.8%	1.4%	1.2%	<b>0.19</b>	<b>41</b>	0.10	
French Guiana	7.1%	1.4%	3.8%	1.6%	2.9%	2.1%	<b>0.19</b>	<b>42</b>	2.26	15
Ghana	6.8%	1.1%	4.7%	1.8%	2.1%	1.4%	<b>0.18</b>	<b>43</b>	0.75	
Suriname	7.0%	1.5%	3.8%	0.6%	3.1%	1.9%	<b>0.18</b>	<b>44</b>	1.09	28
Gabon	6.1%	1.3%	3.3%	1.3%	2.3%	2.5%	<b>0.17</b>	<b>45</b>	0.64	
Ivory Coast	6.7%	1.1%	4.6%	1.5%	2.0%	1.4%	<b>0.17</b>	<b>46</b>	0.53	
Zambia	7.3%	1.2%	4.3%	1.8%	1.2%	1.8%	<b>0.17</b>	<b>47</b>	0.23	
Iran	4.7%	0.3%	3.4%	3.2%	1.9%	3.0%	<b>0.17</b>	<b>48</b>	0.10	
Nepal	8.1%	0.6%	3.3%	1.4%	0.9%	2.6%	<b>0.17</b>	<b>49</b>	1.16	27
Paraguay	6.9%	1.0%	3.0%	1.8%	0.8%	2.9%	<b>0.16</b>	<b>50</b>	0.39	





# NEED

- The bioeconomy proposes to Colombia and the world an economic model in which the production of goods and services is based on the sustainable use of natural resources.



R & D + I



# BIOECONOMY

Set of economic activities related to the invention, development, production and use of biological products and processes.

BIOMASS - ENERGY AND BIOPRODUCTS

Sustainable Process:

Ecologically correct

Economically viable

Socially fair



# **BIOPROSPECTING AS STRATEGY TO DEVELOP BIOPRODUCTS FROM NATURE**

Jorge W. Arboleda V. Ph.D.  
Professor  
UNIVERSIDAD DE MANIZALES  
UNIVERSIDAD DE ANTIOQUIA

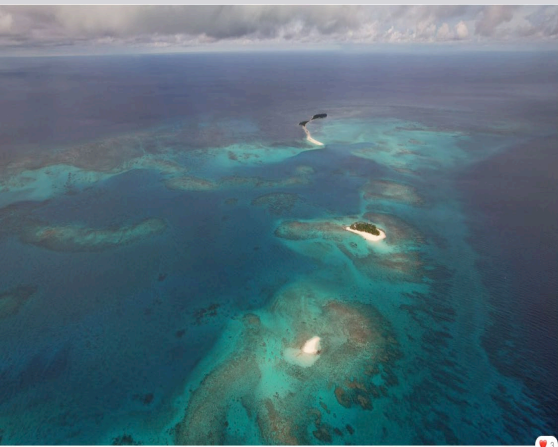


# RESEARCH PROJECTS

A person wearing white gloves is holding a small potted plant with soil. The background is blurred, showing what appears to be a laboratory or greenhouse setting. The text 'RESEARCH PROJECTS' is overlaid in the center in a large, white, sans-serif font.

W W W . B I O S . C O

- **From biodiversity to bioeconomy: Identification of biomolecules with biotechnological potential in sponges – 2022.**



# BIOPROSPECTING of metabolites for the Cosmetic Industry in the era of Computational Biology



**GastriBidens**  
(*Bidens pilosa* L.)



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con Extractos Naturales

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## Beauty & Personal Care Market Value Worldwide



**\$483B**

2020

**\$511B**

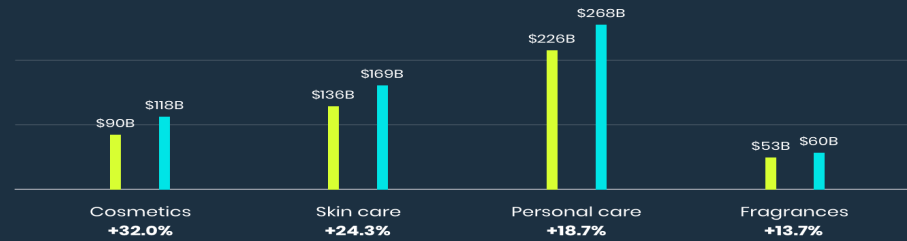
2021

**\$784.6B**

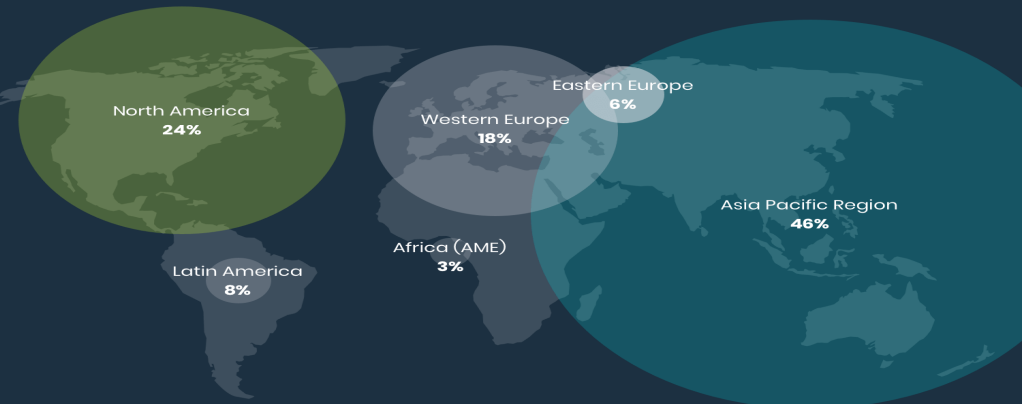
2025

## Segment Revenue & Growth Rate within the Beauty Industry

— 2019 — 2025



## Market Shares Worldwide



Sources: Reports Globe (2021), L'Oreal (2020) & Statista (2021)



## Main goal



**To establish a model for in vitro and in silico analysis of metabolism in plants for traditional use with potential production of important metabolites for the cosmetic industry.**



# Fitomedics – *Bidens pilosa*

- **Adjuvant pills for the treatment of gastritis**





# GastriBidens

(*Bidens pilosa* L.)



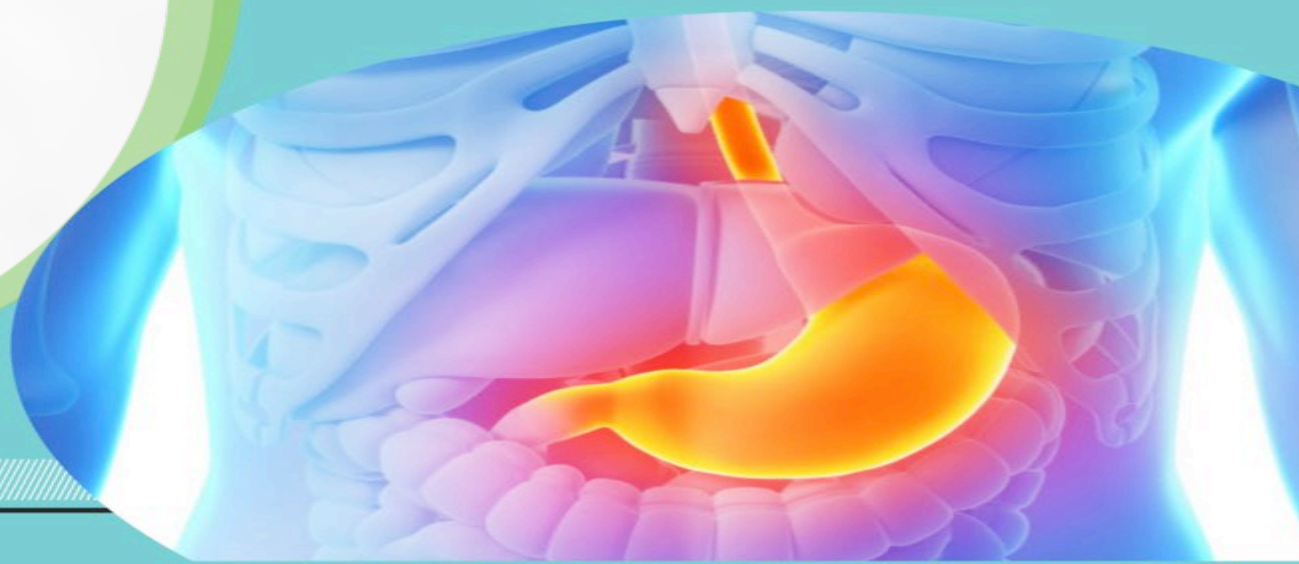
REGISTRO SANITARIO INVIMA: PFT2020-0002698

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Antiinflamatoria** en el  
Sistema Digestivo

- Gastritis y Dispepsia
- Helicobacter Pylori
- Enfermedad  
Úlcero Péptica



# STRATEGIC AREA

## BIOINTELLIGENT COLOMBIA

**Challenge:** Colombia becoming smart in understanding and sophisticating the use of its biodiversity.



**BIOFACTORIES**




# BIO FÁBRICAS

UNA OPORTUNIDAD DE DESARROLLO BIOECONÓMICO PARA CALDAS A TRAVÉS DE LA BIOTECNOLOGÍA





# MAIN GOAL

To strengthen competitiveness in the Caldas state through the utilization of its biodiversity, biotechnology, institutional coordination, and data science for the development of bioproducts under a bioeconomic model of biofactories

Program Scientific Director:  
Jorge William Arboleda Valencia

Universidad de Antioquia  
Universidad de Manizales

Duration: 36 months

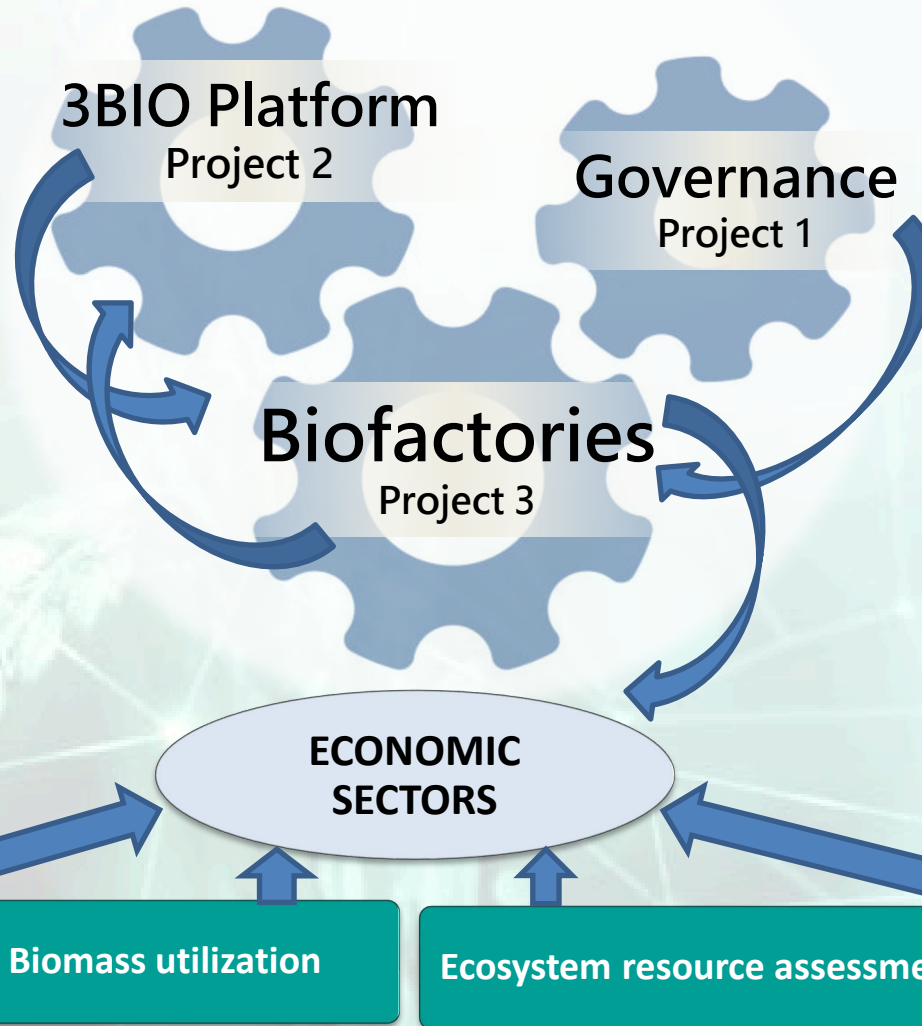




## CALDAS BIO



Misión de Sabios por Caldas



### STRATEGIC ALLIANCE

- Sistema Universitario de Manizales
- CINDE
- BIOS
- GOBERNACIÓN DE CALDAS
- INCUBAR
- COMPANIES
- FARMERS' ASSOCIATIONS

### ESTABLISHMENT OF BIOTECHNOLOGY-BASED COMPANIES

# Development of biotechnologically-based products for the productive chain of biofactories

## INITIATIVES

### Biofertilizer

- Production of a biofertilizer based on *Gluconacetobacter diazotrophicus* at the pilot plant level and its evaluation in promoting the growth of vegetable crops

UCM / UC

### Nanostructured materials

- Development of nanostructured materials from agro-industrial waste generated in coffee and rice production for the degradation of emerging contaminants

UAM

### *Sacha inchi* for the cosmetic industry

- Utilization of *Sacha inchi* for the development of a cosmetic product with natural and functional ingredients.



BIOS/UM

### Kocolatl II

- Utilization of cocoa waste for the generation of products in the agro-industrial sector

BIOS

### Agroclimatological modules

- Development and standardization of modules for the measurement of climatic variables with potential for the implementation of prediction models in productive chains and precision agriculture in the department of Caldas.

UM

# Management of NATIONAL strategic alliances

103  
Allies

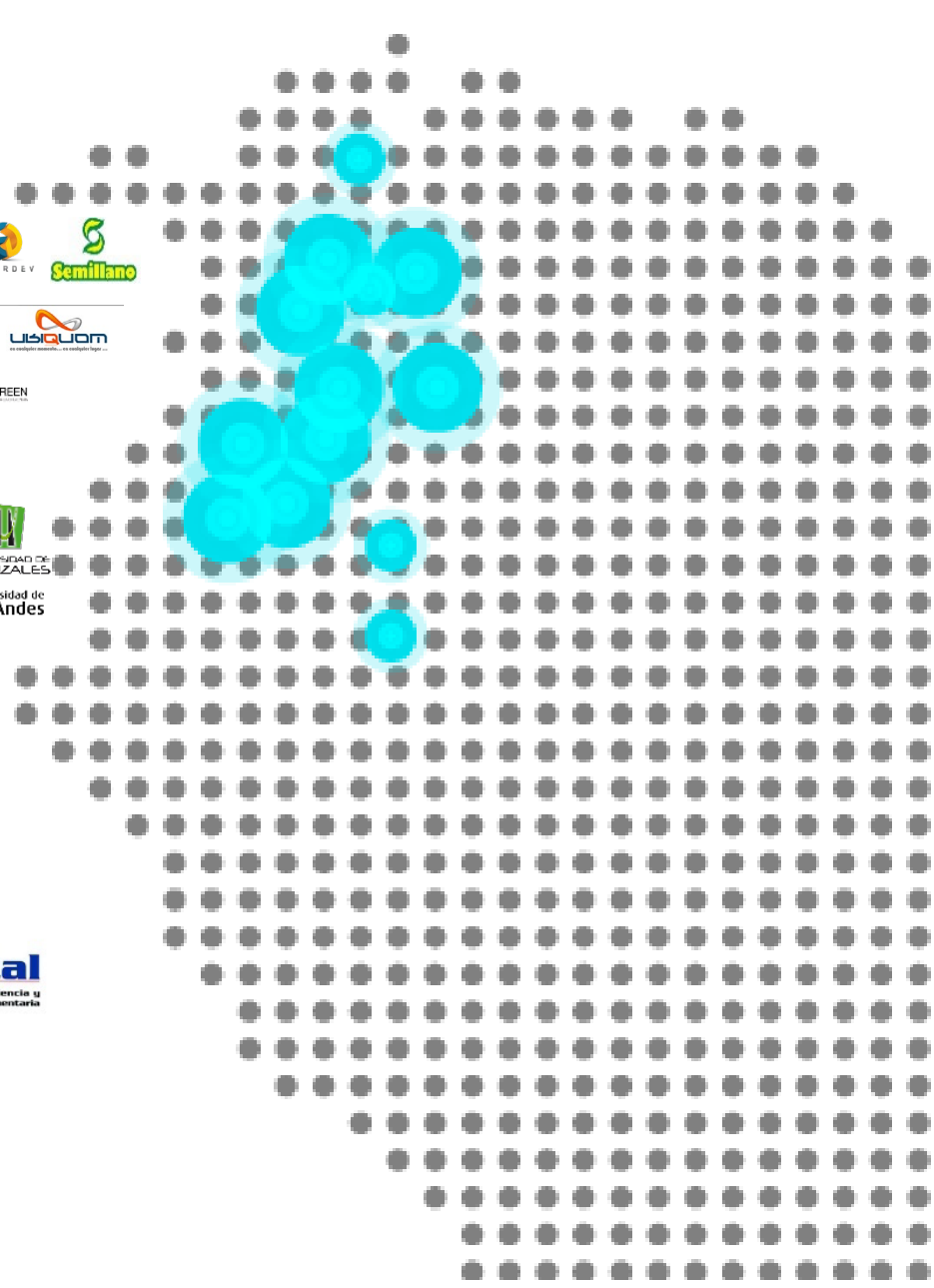
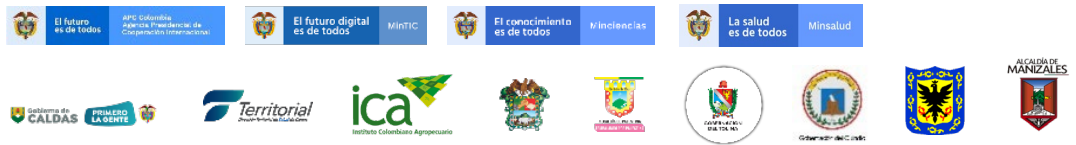
41  
Empresas

34  
Universidades

6  
ONG'S

9  
CI- CDT

13  
Gobierno



# Management of INTERNATIONAL strategic alliances

43

Allies

17

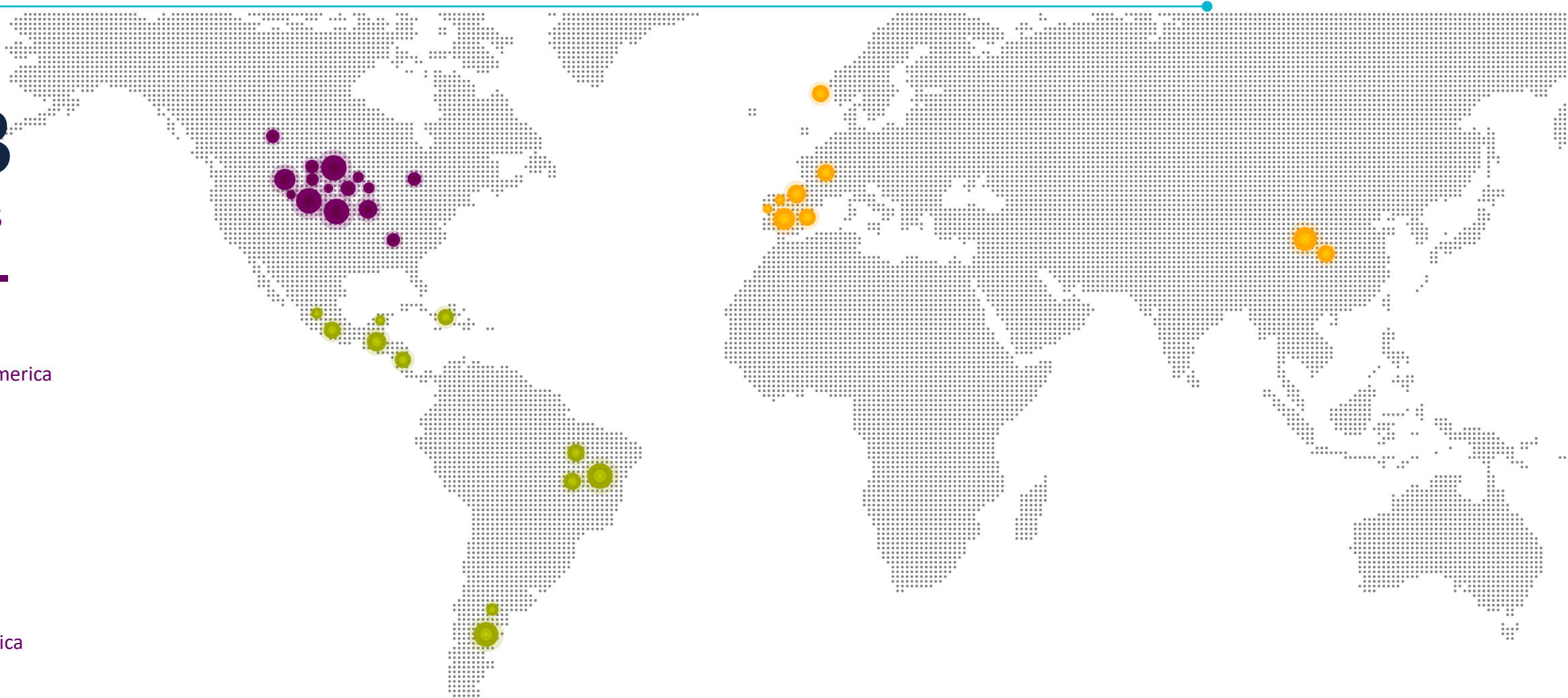
Norte America

13

Europa

13

Suramerica





# Colombia as strategic partner

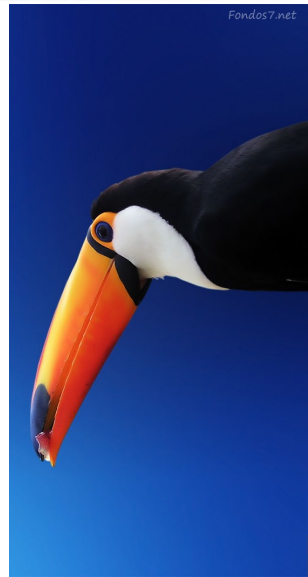
- Great Biodiversity
- Coffee tradition
- Research expertise
- Networking
- Innovation opportunities
- Knowledge applied
- Bioeconomy experience





**COLOMBIA: THE RISK IS THAT  
YOU WANT TO STAY  
FOREVER...**

*Thanks!!*



# COLOR BY NATURE

Picture: Jhon Jairo Granada

## CONTACT US

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