Technology and innovation in Colombian agriculture and food industry

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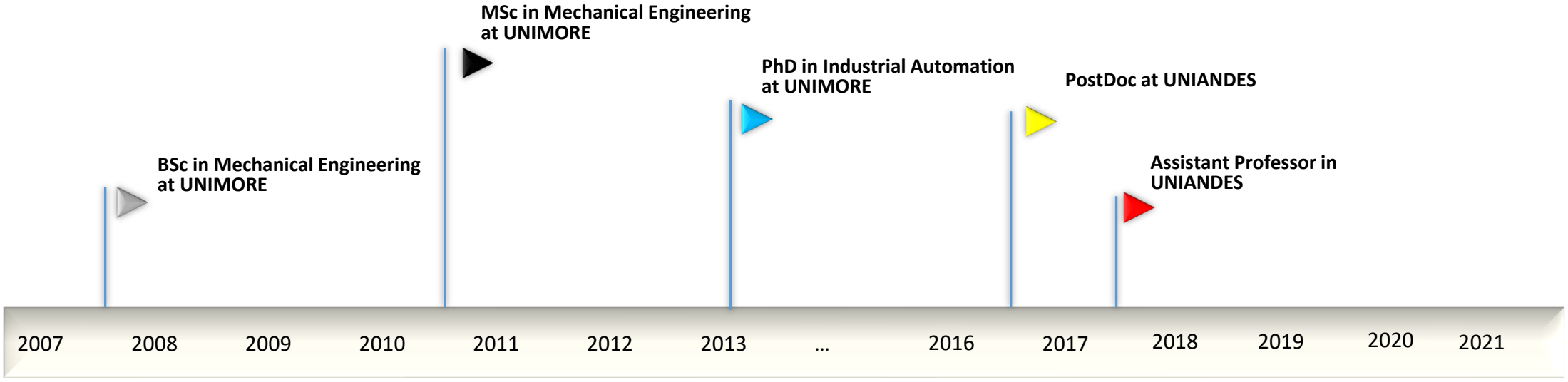
- Research areas:
  - Industrial Automation: integration of Industry 4.0 technologies to Controlled Environment Agriculture
  - Industrial Maintenance: integration of Industry 4.0 technologies to maintenance processes; i.e. smart retrofitting



Content

- The future of food and agriculture
- Technology and innovation
- Agriculture and food industry in Colombia
- Successful stories
- Uniandes

Universidad de los Andes
Colombia

The future of food and agriculture

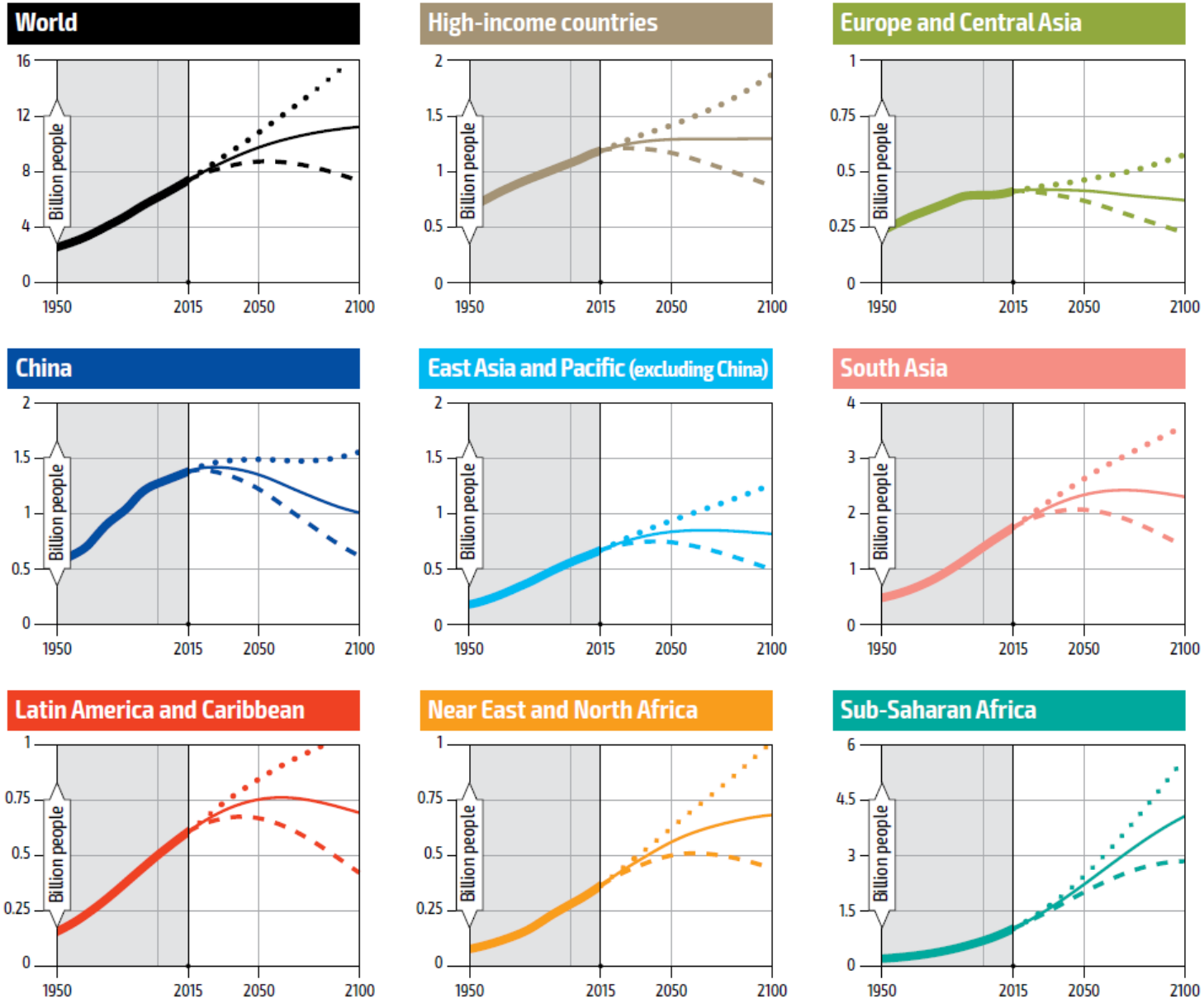
FAO: Food and Agriculture Organization of the United Nations. (2017). The future of food and agriculture: trends and challenges. https://www.fao.org/3/i6583e/i6583e.pdf

Major drivers of change in the 21st century

1. Population growth, urbanization and ageing
2. Global economic growth, investment and trade
3. Increasing competition for natural resources
4. Climate change
5. Agricultural productivity and innovation
6. Transboundary pests and diseases
7. Conflicts, crises and natural disasters
8. Poverty, inequality and food insecurity
9. Nutrition and health
10. Structural change and employment
11. Migration and agriculture
12. Changing food systems
13. Food losses and waste
14. Governance for food security and nutrition
15. Development finance

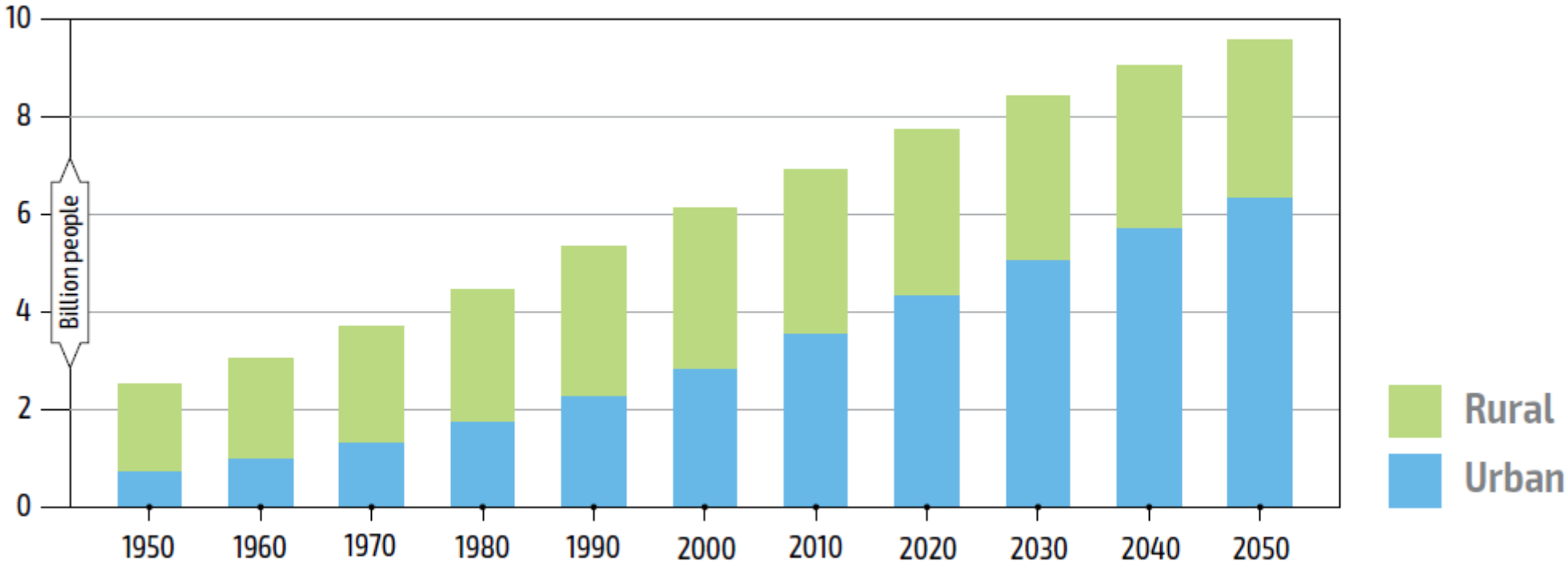
World population

- Global population growth is slowing but will increase in Africa and Asia



Global urban and rural populations

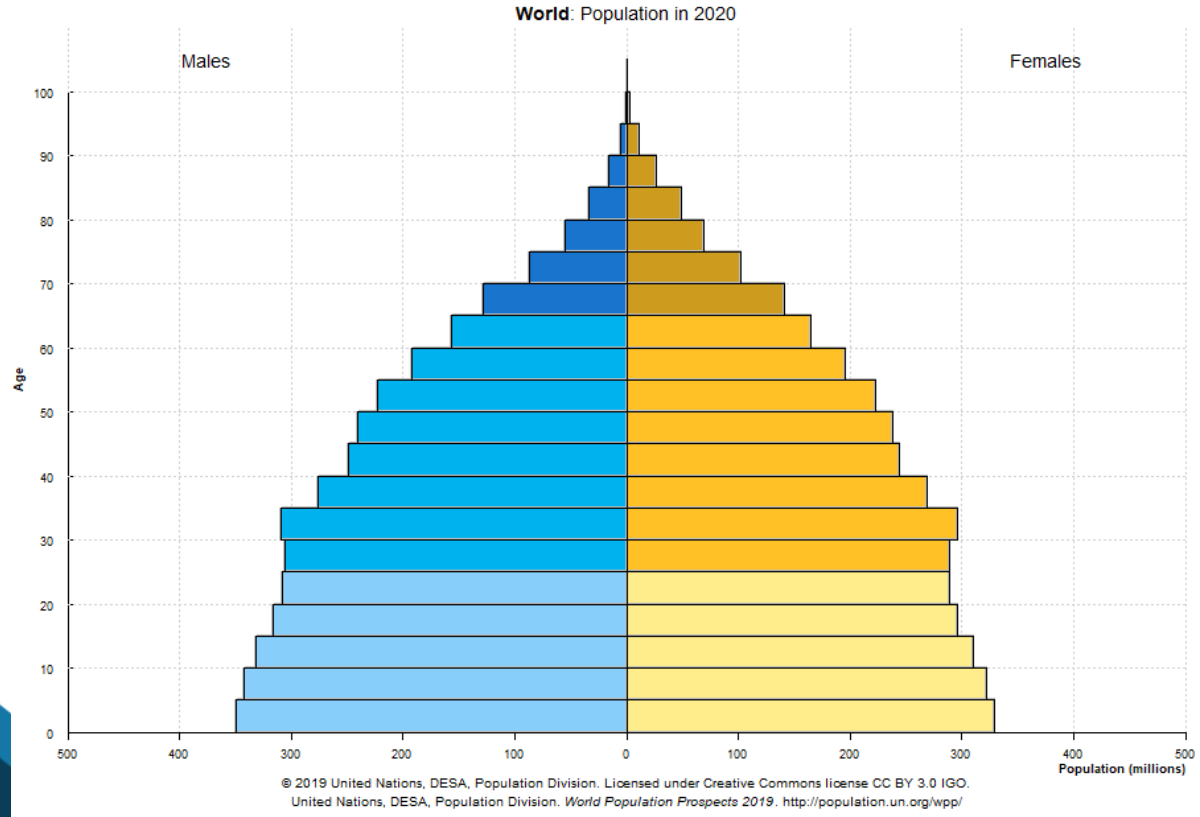
- By mid-century, two-thirds of the world's population will live in urban areas

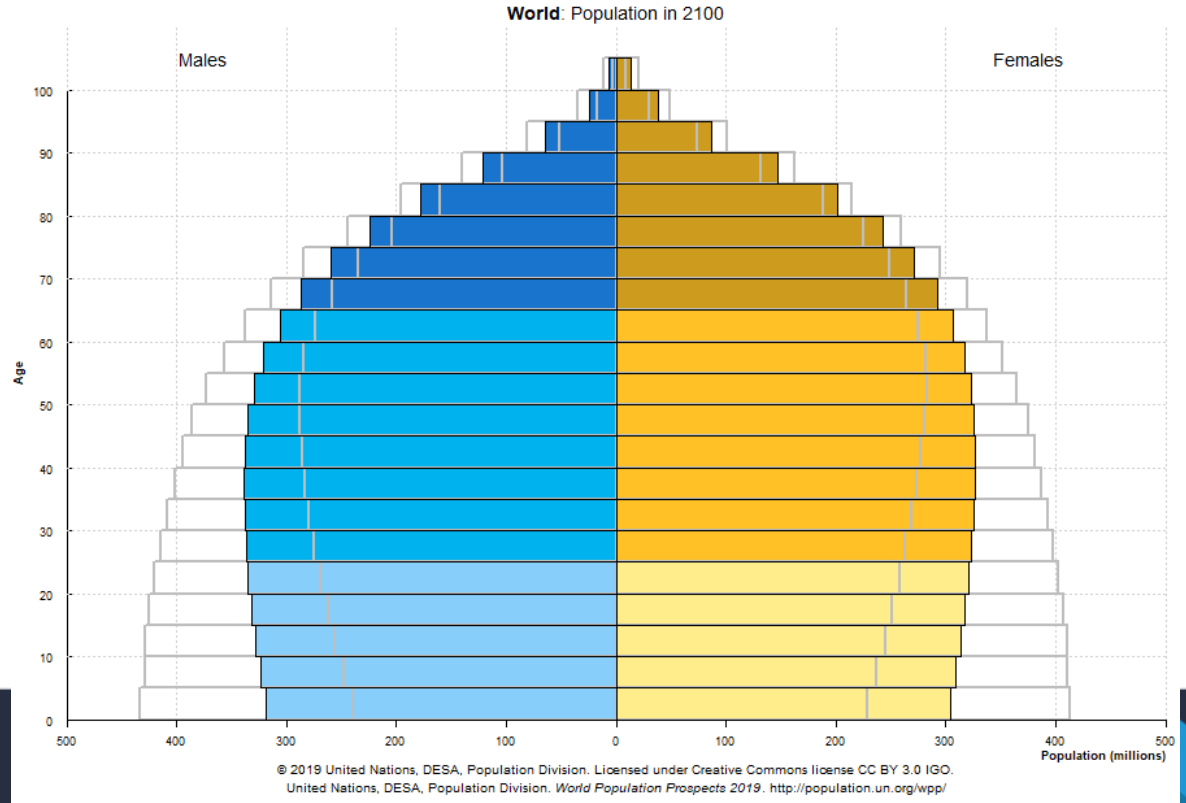


Aging

ONU: Department of Economic and Social Affairs Population Dynamics. World population prospects 2019: https://population.un.org/wpp/Graphs/DemographicProfiles/Pyramid/900

- Economic growth, the decrease in mortality and the increase in life expectancy will determine an aging of the world population



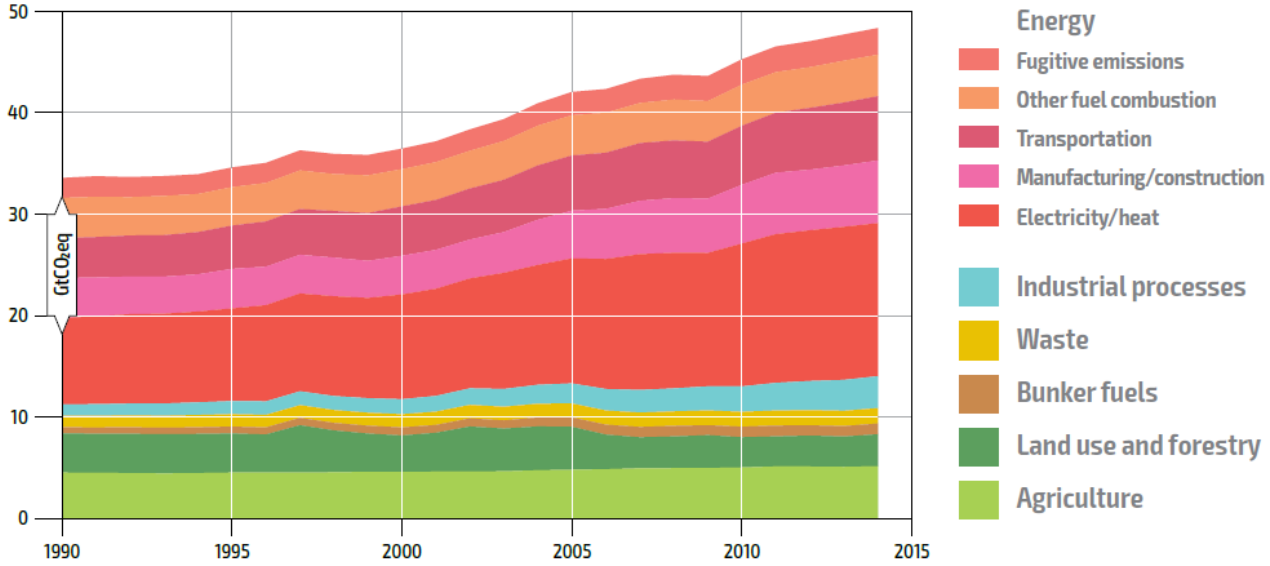


Binding natural resource constraints

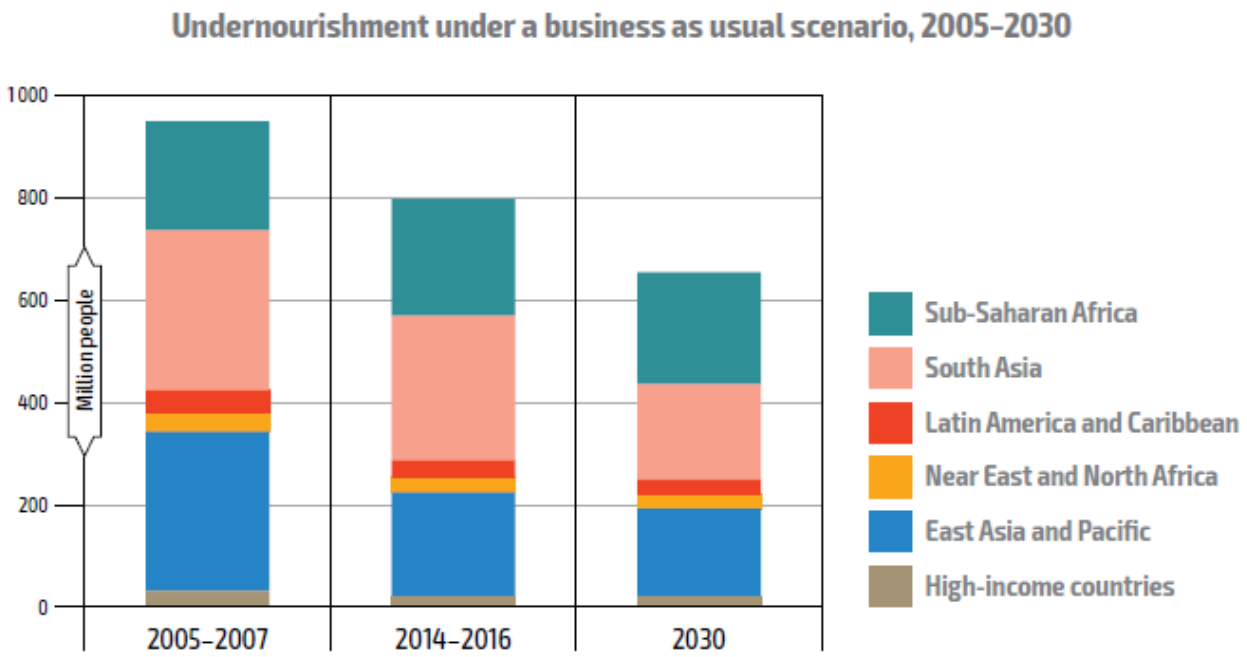
- Agricultural production more than tripled between 1960 and 2015, owing in part to productivity-enhancing Green Revolution technologies and a significant expansion in the use of land, water and other natural resources for agricultural purposes

Climate change

- The food and agriculture sectors contribute significantly to greenhouse gas emissions



Food security



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Technology and Innovation

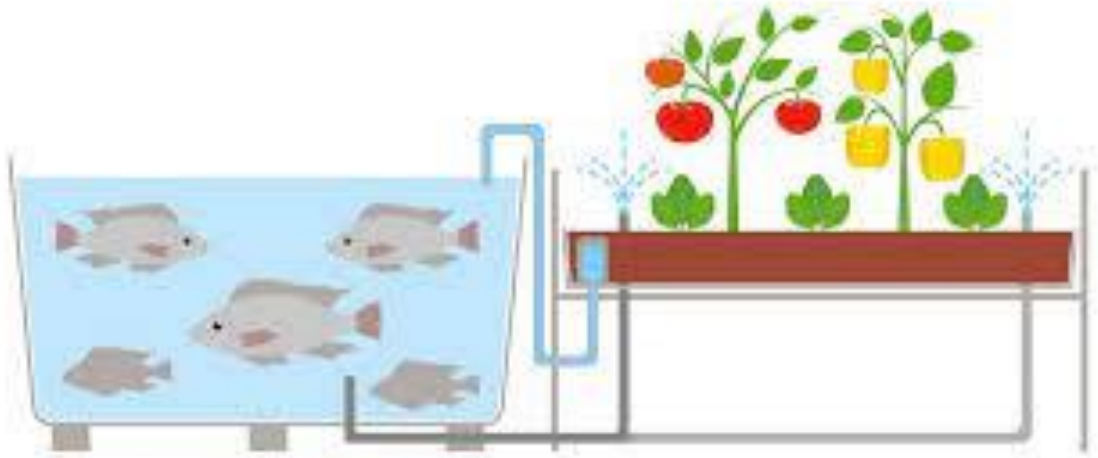
FAO: Food and Agriculture Organization of the United Nations. (2017). The future of food and agriculture: alternative pathways to 2050. https://www.fao.org/3/I8429EN/i8429en.pdf

... but producing more will be unavoidable, and the way forward is doing so with less.

Those working in food and agriculture must learn how to satisfy a growing demand under more significant resource constraints by improving land and water use, reducing GHG emissions, increasing efficiency in energy production and consumption, and restoring soils and forests. These are just some of the variety of strategic options to consider in search of sustainability.

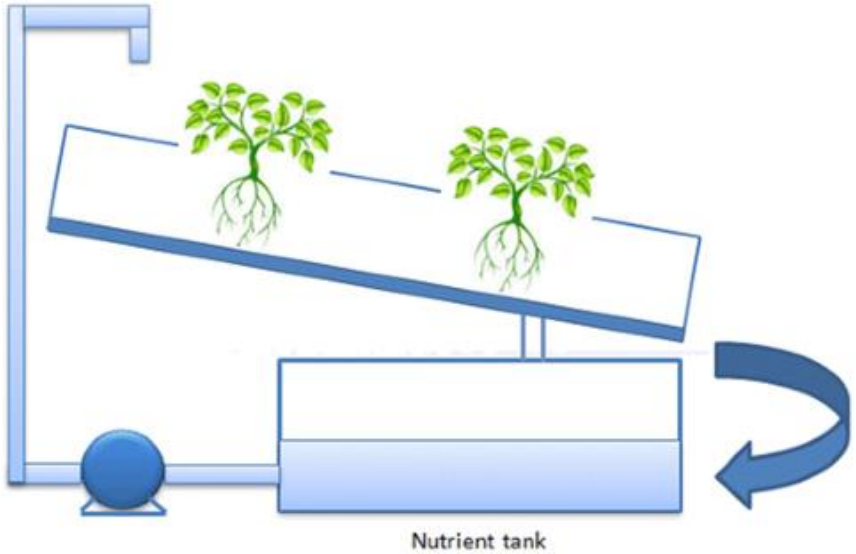
How to address the scarcity and reduced quality of land and water resources in a sustainable manner?

1) Sustainable agricultural intensification is key to saving land



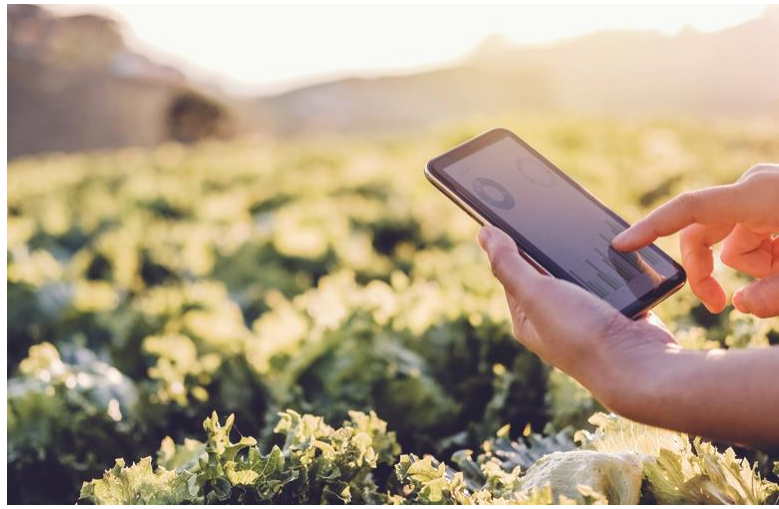
How to address the scarcity and reduced quality of land and water resources in a sustainable manner?

2) Avoiding further land degradation and encouraging land rehabilitation helps tackle land constraints



How to address the scarcity and reduced quality of land and water resources in a sustainable manner?

3) Using water more efficiently is increasingly becoming a must



How to address the scarcity and reduced quality of land and water resources in a sustainable manner?

4) Trading off agricultural yields and sustainability

How to address the scarcity and reduced quality of land and water resources in a sustainable manner?

5) Significant investments are needed: research and development of sustainable technologies and practices, infrastructure and human capital

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Colombia

Agriculture and food industry in Colombia

Colombia

- Fourth largest and most populated country in Latin America
- Listed as one of the world's “megadiverse” countries, hosting close to 10% of the planet's biodiversity
- Capacity to produce in 70% of the size of the territory (22.1 million hectares)
- The only South American country with access to two oceans and close to export markets

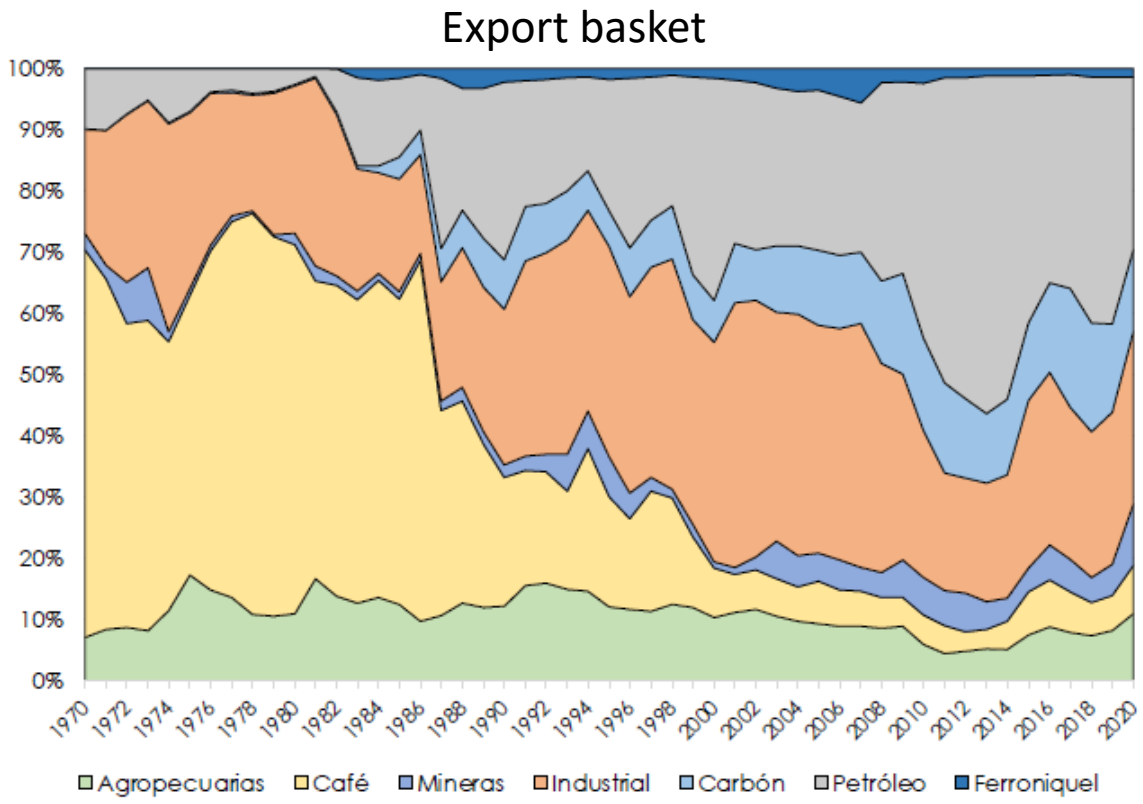
Agriculture

https://datos.bancomundial.org/indicador/NV.AGR.TOTL.ZS?end=2020&start=1960&view=chart

- In 2020, agriculture, forestry, and fishing apported to the 7.7% of the gross domestic product (GDP)

- This sector concentrates 60% of the labor force in rural areas and is considered an engine for the growth of national employment

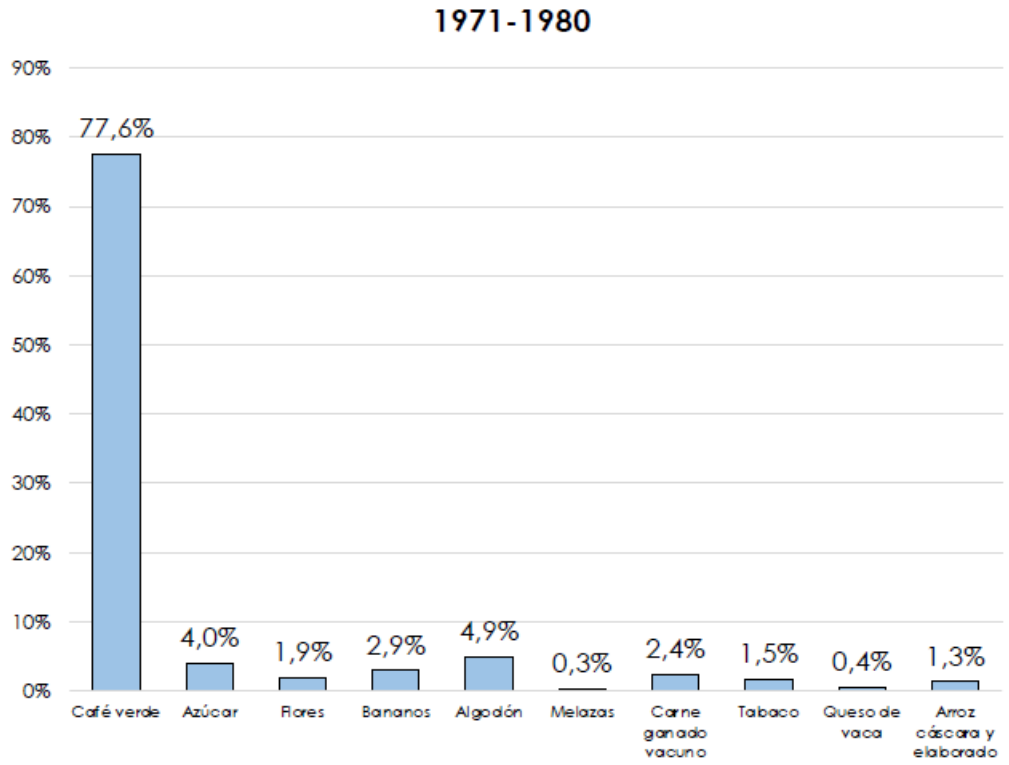
- Agricultural products represent about 20% of the country exports

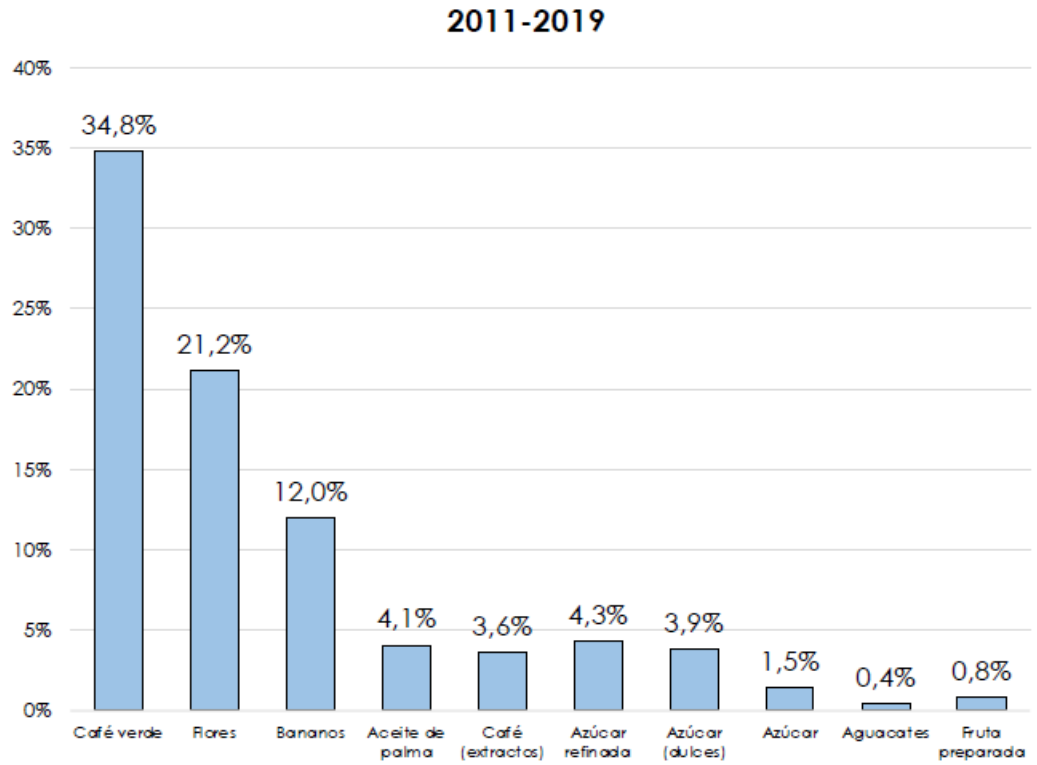


Export basket per product

https://www.fao.org/faostat/es/

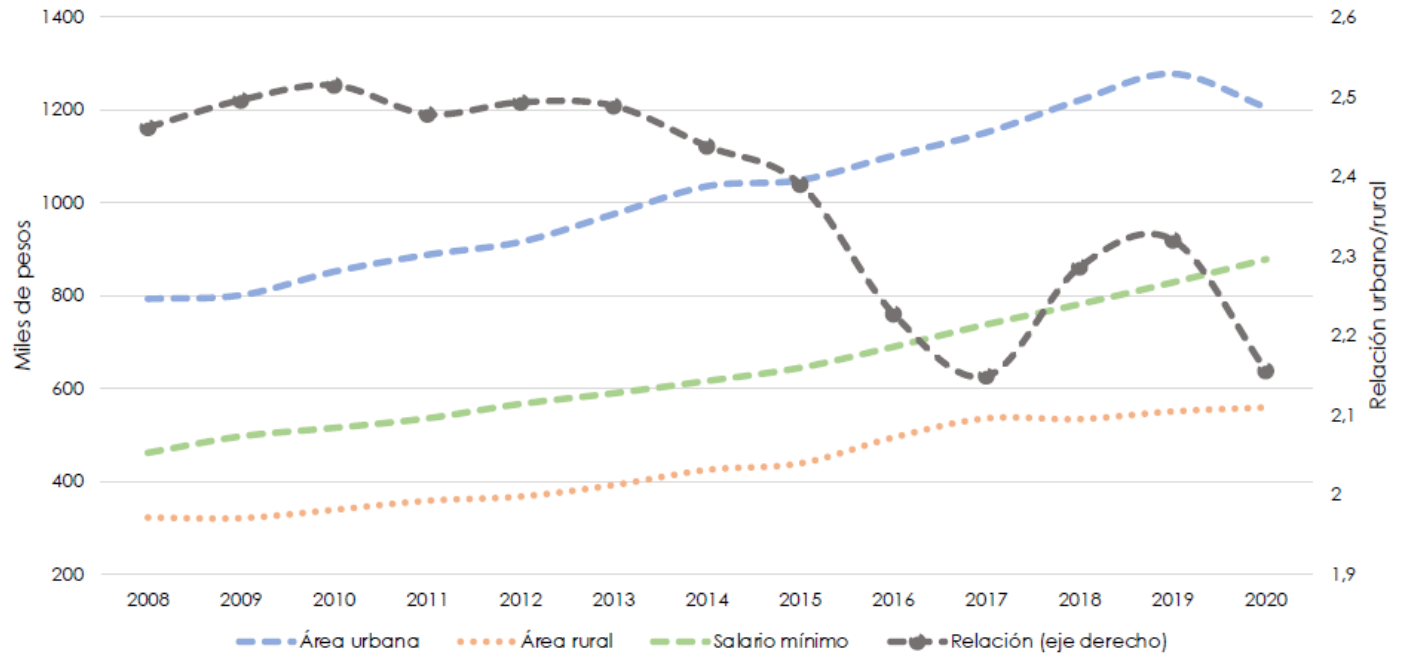
- Flowers: Colombia is positioned as the second exporter worldwide with USD 1.4 billion exported in 2018





Agriculture landscape

- The cases of competitive agribusiness are exceptions that differ greatly from the reality of small farmers, who are the majority of rural inhabitants in Colombia (<5ha)



Agriculture landscape

- They lack the resources and professional skills required to implement competitive agribusinesses that generate sufficient resources to ensure quality of life and the technological development of their business

Servicios públicos	Total	Cabeceras	Centros poblados y rural disperso
Energía eléctrica	98,2	99,9	92,9
Gas natural conectado a red pública	65,8	81,6	14,2
Acueducto	89,4	97,5	63,1
Alcantarillado	75,1	93,1	16,8
Recolección de basuras	82,6	98,4	31,4
Teléfono fijo	23,8	30,7	1,3
Ningún servicio	1,5	0,0	6,3
Tecnologías de la información y la comunicación			
Hogares con internet	56,5	66,6	23,9
Uso del internet	69,8	78,0	43,1
Uso del computador	34,0	40,8	11,9
Uso del celular	89,2	91,8	80,6

Fuente: elaboración propia, a partir de la Encuesta de Calidad de Vida (ECV) (2020)

Food industry

- Food processing represents nearly 33% of Colombia's manufacturing GDP (2019)

- The main processed foods produced are the following: beverages and tobacco, processed meat, milling and bakery, dairy, sugar and panela, processed fruits, oils and fats, coffee and cocoa by-products, and confectionery products

Universidad de los Andes
Colombia

Successful stories

Saenz Fety

https://saenzfety.com/

SÁENZ FETY
Pecuaria & Agro

- Specialized in vegetable and forage seeds, traveling the world to offer the best materials so that Colombia can produce more and better quality

- More than 7 hectares for research and innovation, and more than 500 varieties of vegetables and forages

Saenz Fety

https://www.facebook.com/saenzfety/videos/1476518876007220

Colombina

- About $ 600 million in annual sales
- Export to 70 countries
- Produce food in 14 countries

Llenamos el mundo de sabor.

Colombina

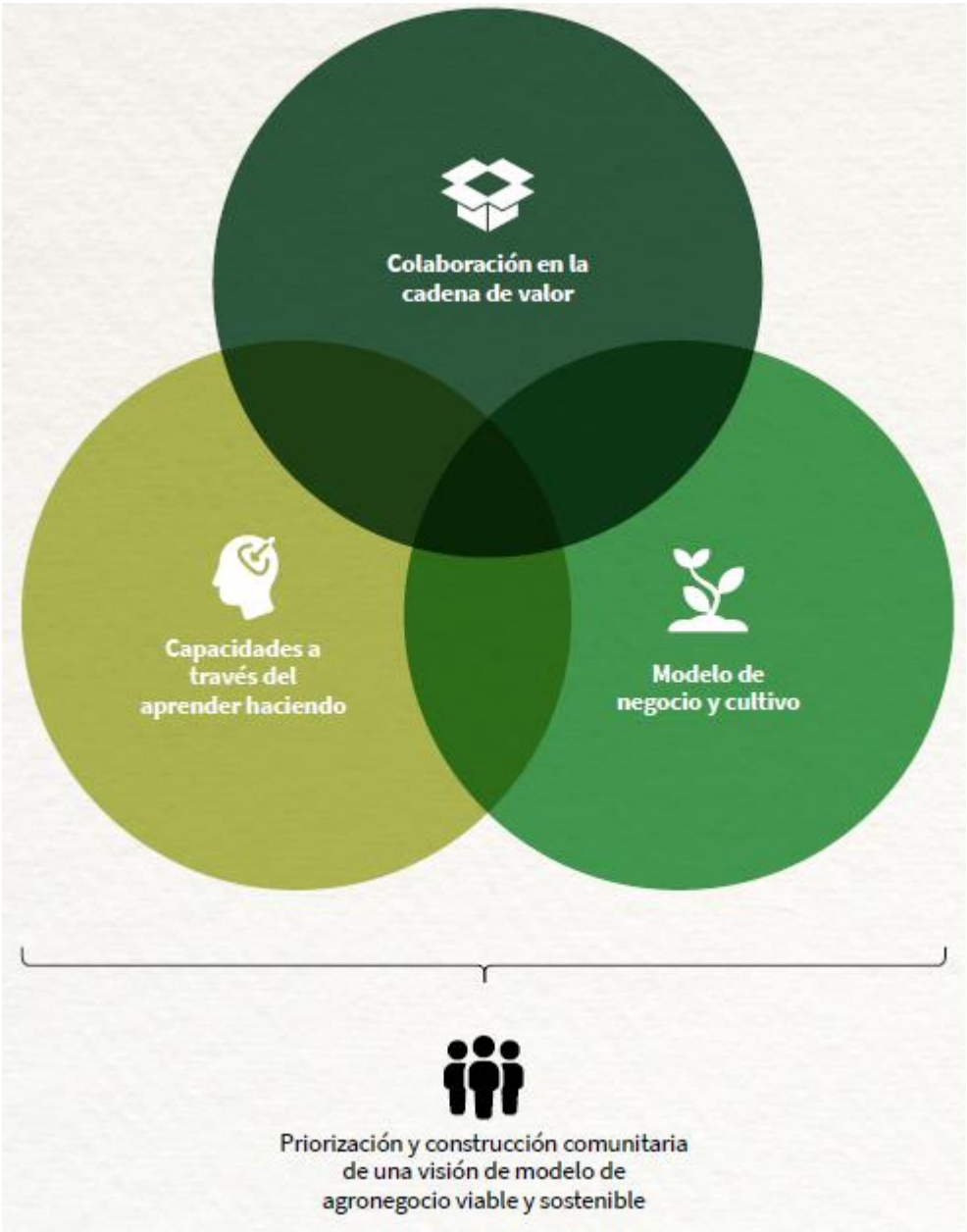
https://youtu.be/xDI7ImJfQN8

MAS Meta

http://www.masmeta.co/

- Adaptation to the agriculture domain of the methodology applied by the Faculty of Administration of the Universidad de los Andes to the productive transformation and the strengthening of value chains of SMEs

- Arises from the need to introduce a vision of sustainable agribusiness in the Colombian agricultural sector, which lacks sufficient business tools to operate under a market logic and satisfy demand with value-added products



Introducción: Oportunidades de negocio

- Oportunidades de mercado y Modelo de Agronegocios Sostenibles
- Participación en ferias comerciales

Fortalecimiento de las capacidades técnicas

- Establecimiento del cultivo
- Mantenimiento del cultivo
- Poscosecha

Fortalecimiento de las capacidades empresariales

- Definición de costos del cultivo
- Valor agregado y transformación
- Propuesta de valor
- Modelo de negocio

Fortalecimiento de la capacidad de colaboración

- Reglas de juego para la colaboración en cadena
- Metas y proyecciones para el modelo colectivo

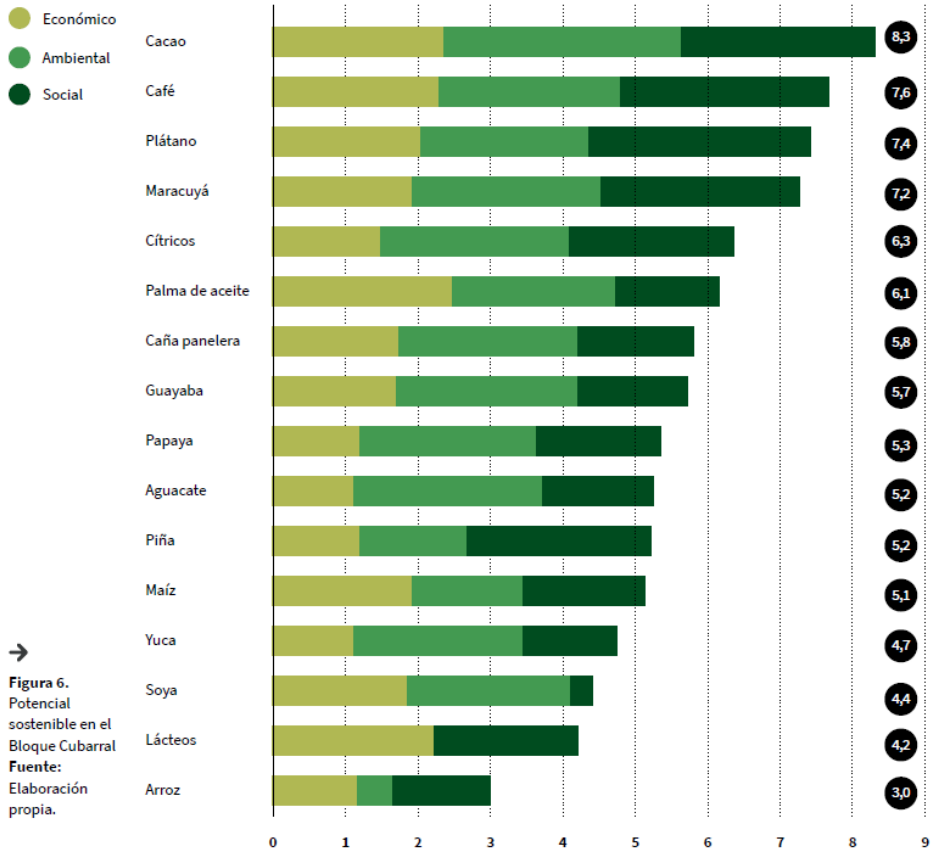


Figura 6. Potencial sostenible en el Bloque Cubarral
Fuente: Elaboración propia.

Marketing

Asociación	Marca y producto	Descripción identidad visual	Antes	Ahora
Aspra	Montellano (Café tostado)	Los cafeteros de Aspra, ubicados en Villavicencio, transmiten su identidad como agricultores y procesadores de un café con los sabores únicos que les brindan las riquezas naturales de su entorno		
Anuc	El Cacaotal (Chocolate de mesa)	Detrás de esta marca se encuentra el trabajo de mujeres emprendedoras ubicadas en el municipio de Acacías, quienes transforman cacaos de excelente calidad producidos por los agricultores de Asociación Nacional de Usuarios Campesinos del municipio		
Acacireño	Agropac (Chocolate de mesa)	A través de este producto, la asociación Agropac invita al consumidor a maravillarse con el paisaje del piedemonte llanero. Sus productos encierran la magia de los ríos, suelos y montañas del municipio de Acacías, cuya riqueza da forma a los sueños de esta asociación de emprendedores		

Technical training

Impact


Cadena de CAFÉ
La cadena de café está compuesta por
6 Asociaciones
de
45 Productores
que trabajan en
30 Fincas
y en
3 Plantas
La extensión de los cultivos abarca
67 Hectáreas
que promueven la producción y comercialización de
pergamino seco
café verde
tostado
molido
Impactos
Acompañamiento en procesos de tostión y molienda, alcanzando perfiles de 84 puntos en taza.
Aumento promedio de 23 puntos porcentuales en el cumplimiento de normatividad Invima.
Firma de contrato con La Tienda Ecopetrol para la comercialización de café tostado y molido.
CULTIVO
• Análisis de suelos y perfil sensorial 30
• Entrega de kits para mejorar poscocecha 30
• Establecimiento fincas piloto referentes en la región 3
PROCESAMIENTO
• Diseño ideal de plantas con visitas de acompañamiento 3
• Certificaciones SENA en manejo de alimentos 12
• Entrega de equipos de medición y maquinaria 9
COMERCIALIZACIÓN
• Registros de marca 1
• Rediseño de empaques 3
• Presencia en espacios comerciales 2
HABILIDADES GERENCIALES
Productores certificados en:
• Diseño de modelos de agronegocios sostenibles 21
• Formulación e implementación de proyectos 15
• Programa de habilidades gerenciales 10

Universidad de los Andes
Colombia

Uniandes

Universidad de los Andes
Facultad de Ingeniería

OUR UNIVERSITY

1948

Establishment of the first non-profit secular institution in Colombia

1950

Shared Undergraduate Programs in Engineering with universities from the United States (Illinois and Pittsburgh)

1960

Complete Undergraduate Programs at Uniandes. Ford foundation: US$500.000 (faculty members) + US$1'000.000 (facilities and laboratories)

1970

Initial phase of the master programs

2020

234th QS World University Ranking

4th QS LatAm University Rankings

It is the **only** private institution in Colombia certified nationally for 10 years

First in Colombia and eighth best university in Latin America

According to the Best Global Universities ranking of US News & World Report

Universidad de los Andes
Facultad de Ingeniería

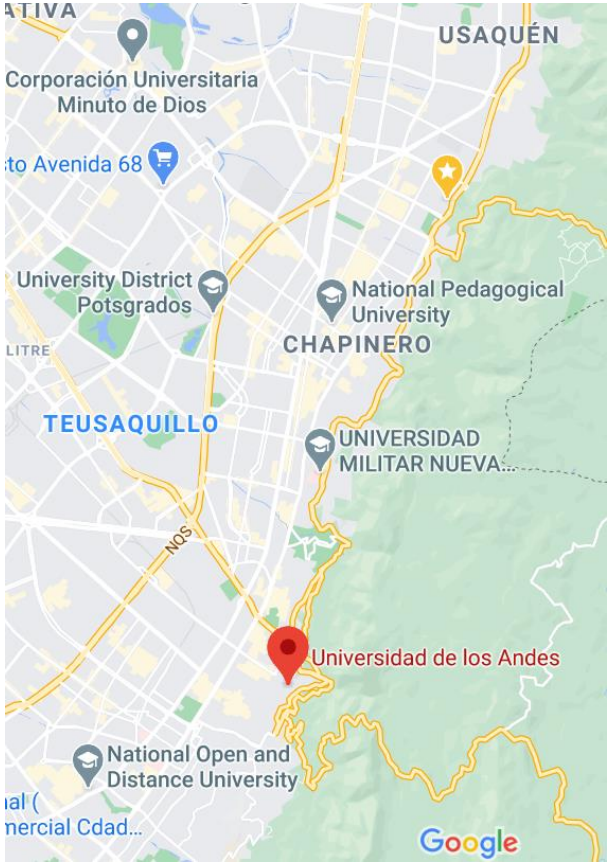
QS WORLD **UNIANDES** RANKING

TOP 10 **QS LATIN AMERICA 2020** RANKING

1. Pontificia Universidad Católica de Chile
2. Universidad de Sao Paulo (USP)
3. Tecnológico de Monterrey (ITESM)
4. **Universidad de los Andes Colombia**
5. Universidade Estadual de Campinas (Unicamp)
6. Universidad Nacional Autónoma de México (UNAM)
7. Universidad de Chile
8. Universidad de Buenos Aires
9. Universidade Federal do Rio de Janeiro
10. Universidad Nacional de Colombia

Location

Bogotá



Universidad de los Andes

Mario Laserna Building

Main Accommodation

UNIANDES
IN FIGURES

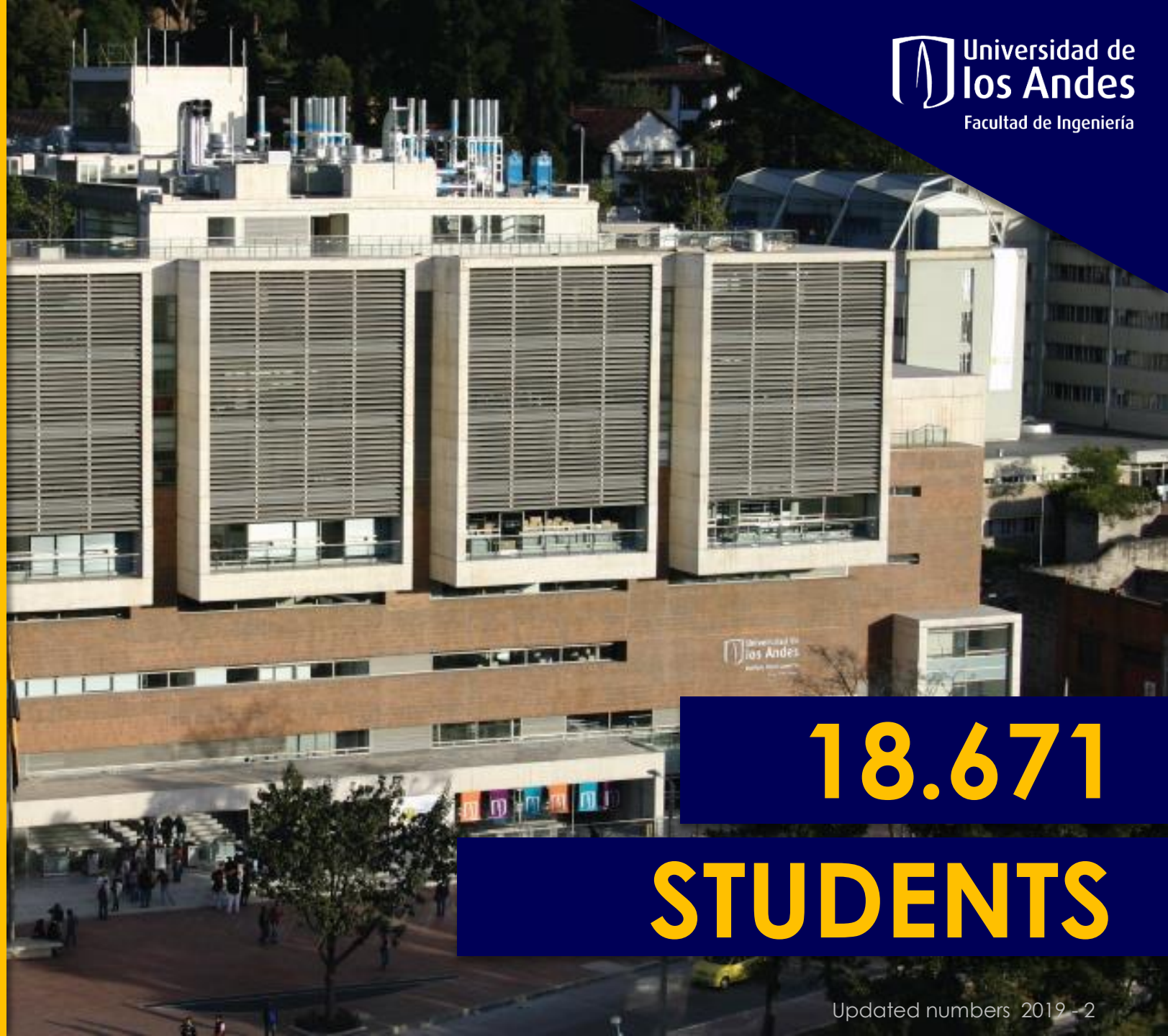
44 UNDERGRADUATE **PROGRAMS**

76 MASTER'S **PROGRAMS**

17 PhD **PROGRAMS**

33 POSTGRADUATE **DIPLOMAS**

756 **FACULTY MEMBERS** **(FULL TIME EQUIVALENT)**



Universidad de los Andes
Facultad de Ingeniería

18.671

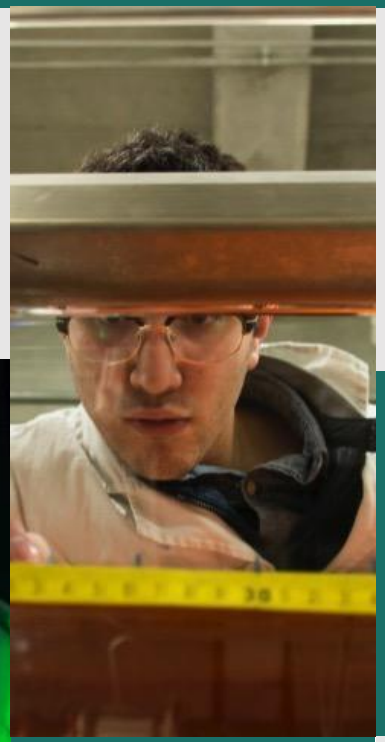
STUDENTS

Updated numbers 2019 - 2

ENGINEERING DEPARTMENTS

Industrial Engineering

10
PROGRAMS



Electrical and Electronic Engineering

Chemical Engineering and Foods

Civil and Environmental Engineering

18
MASTER PROGRAMS

Biomedical Engineering

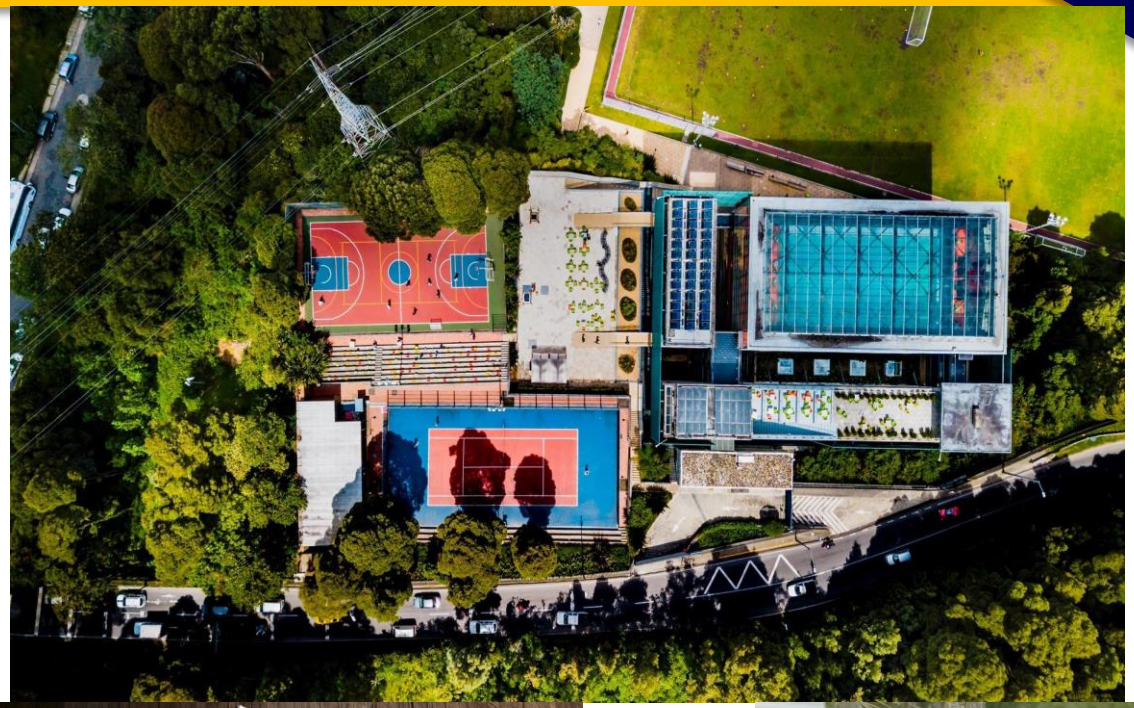
2
DOCTORATE PROGRAMS

Mechanical Engineering

Computer and Systems

UNIANDES CAMPUS

Universidad de los Andes
Facultad de Ingeniería



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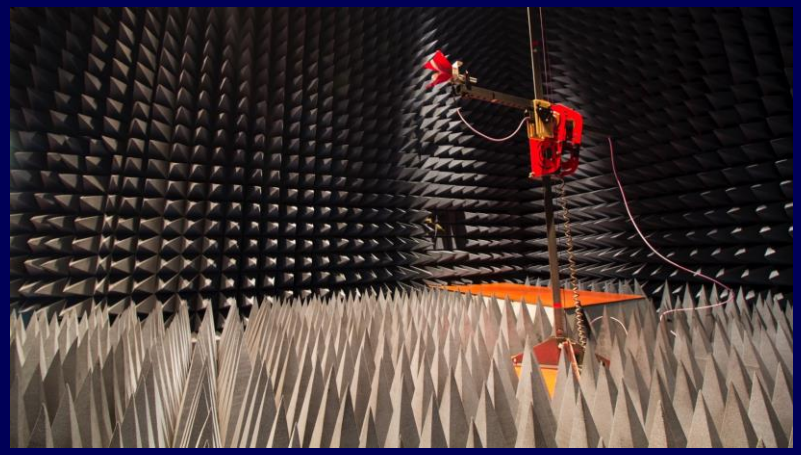

5.000 m^2

54 laboratories

754 workplaces

24 research groups

FACILITIES

Figures updated to 2019 - 2