

LETTER TO EDITOR / CARTA AL EDITOR

Bioeconomy in Ecuador. Bioeconomía en Ecuador.

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In recent years the Ecuadorian economy has been based on exporting raw materials and agricultural products with little added value (USD \$ 24,064 billion in 2014) and importing services and products with high added value (USD \$ 24,188 billion in 2014)¹. These conditions can make the economy vulnerable to climatic factors that affect the production of resources or foreign market dynamics¹. Like other countries of Latin America, Ecuador is interested in moving away from a primary-export model and extractivism to reduce the number of importations and increase exportation of products with high added value. Ecuador's environment minister expressed that bioeconomics would play a fundamental role in Ecuador's production and development when appointed in 2017². Thus, two axes or main currents of bioeconomy emerge such as the direct use of biodiversity and biotechnology^{3, 4}. The direct use of biodiversity is a short and medium term axis which seeks to use and commercialize natural resources in a sustainable manner. The government has pledged to take steps to mitigate and adapt to the effects of climate change, which heavily influences the bioeconomic resources of the country. In the 2017 plan for mitigation of climate change, these policies were presented for biomass conservation, environmentally friendly transportation, and new and renewable energy⁵. These policies were backed by an investment of \$1.680.000.000 to enact and promote these measures. These measures were implemented through prioritizing areas to act in order to invigorate Ecuador's bioeconomy including 1) enhancing knowledge and institutional capacity, 2) sustainability in agriculture and aquaculture, 3) management and protection of biodiversity, 4) sustainable management of water, 5) adaptation of climate change, 6) clean and sustainable energy, and 7) sustainable transports.

Therefore, bioeconomy implies the sustainable use of renewable biological resources for the production of food, energy and industrial goods⁶. This is why Ecuador considers bioeconomy as a strategic activity that in a few years could come to represent 20% of GDP⁷. The recognition by its constitution that nature is subject that has its own rights and not an object with the only objective of providing profits to human beings combined with economic measures demonstrates the expectations of the role of bioeconomy in the future in Ecuador. Article 71 of the Ecuadorian Constitution establishes that nature or Pacha Mama has the right to have its existence fully respected and the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes⁸. In addition, in article 414 the Ecuadorian State undertakes to adopt appropriate and transversal measures for the mitigation of climate change⁸. Nevertheless, the introduction of these articles in the Constitution does not mean limiting the actions of the State to prohibit and conserve but to promote the generation of a framework of policies that convert the vast biodiversity into a competitive advantage that boost the economy of the country. Like other Latin America countries, the model to generate links between natural resources and scientific and technologi-

cal knowledge is expected to satisfy Ecuador's needs based on sustainability and respect for nature⁹. For example, there is a project called "Bijaoplatos desechables 100% biodegradables" which consists of using bijao and banana leaves to produce disposable dishes of rapid degradation used for food expedition¹⁰. According to the Ministry of the Environment, Ecuador has 24 of the 27 marine and coastal ecosystems recognized worldwide, which is why it launched the project "Red de Areas Marinas y Costeras Protegidas" (Red AMCP) in order to improve conservation and the sustainable use of the country's marine and coastal resources, recognizing the potential relevance of marine biodiversity for the bioeconomy¹¹. Biotechnology is part of the medium and long-term axis which seeks to produce products with a greater added value for national consumption and exportation. For example, the use of tagua for the production of nanocellulose gel with potential uses in environmental remediation and tissue reconstruction¹². Another example is the company BiodiverseSource to commercialize cellulose from Ecuador with unique properties not available from other suppliers in the world. These are just some of the various projects currently underway in the country. The different universities, as well as different research centers in the country are aware of the opportunities that Ecuador's natural wealth gives but the success of these initiatives depends on the collaboration and mutual support of the public, private and community sectors.

In conclusion, Ecuador is moving away from a primary-export model and extractivism by invigorating and prioritizing the bioeconomy. There are several policies that the government has created and funded to make this happen. This way generating a link between natural resources and scientific and technological knowledge that can satisfy Ecuador's needs while respecting nature.

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