

# **Green Windows of Opportunities – Opportunities for Developing Countries - The cases of bio-based and hydrogen technologies -**

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**IDOS**

German Institute  
of Development  
and Sustainability

Innovation-based ***sustainable economic diversification*** can respond to ***shifts in consumption patterns*** towards lowering the environmental footprint, mainly of the middle classes in the Global North, but increasingly also in Developing Countries (growing South-South value chains).

Green windows of opportunity often open up in ***agribusiness value chains***; in manufacturing, green products provide mainly access points for some large emerging countries with established and well-performing innovation systems (e.g. China, Brazil).

Green manufacturing in developing countries may emerge in the form of ***international division of labour*** in “green industrial products”, e.g. electrolyzers for the green hydrogen economy.

Promising for developing countries are value chains, based on ***natural resource monopoly***, e.g. genpools in mega-diverse countries (Brazil) or extremely high solar radiation for producing clean energy and hydrogen (Namibia, Morocco).

# What are bio-based products?

“Bio-based products are wholly or partly derived from materials of biological origin, excluding materials embedded in geological formations and/or fossilized.” (European Biomass Industry Association)

The EU has declared the bio-based products sector to be a priority area with high potential for future growth, re-industrialisation, and addressing societal challenges. (European Commission)

Bio-based products offer important economic potentials, e.g. in the production of biogenic building materials, pharmaceuticals and high-quality speciality fabrics.

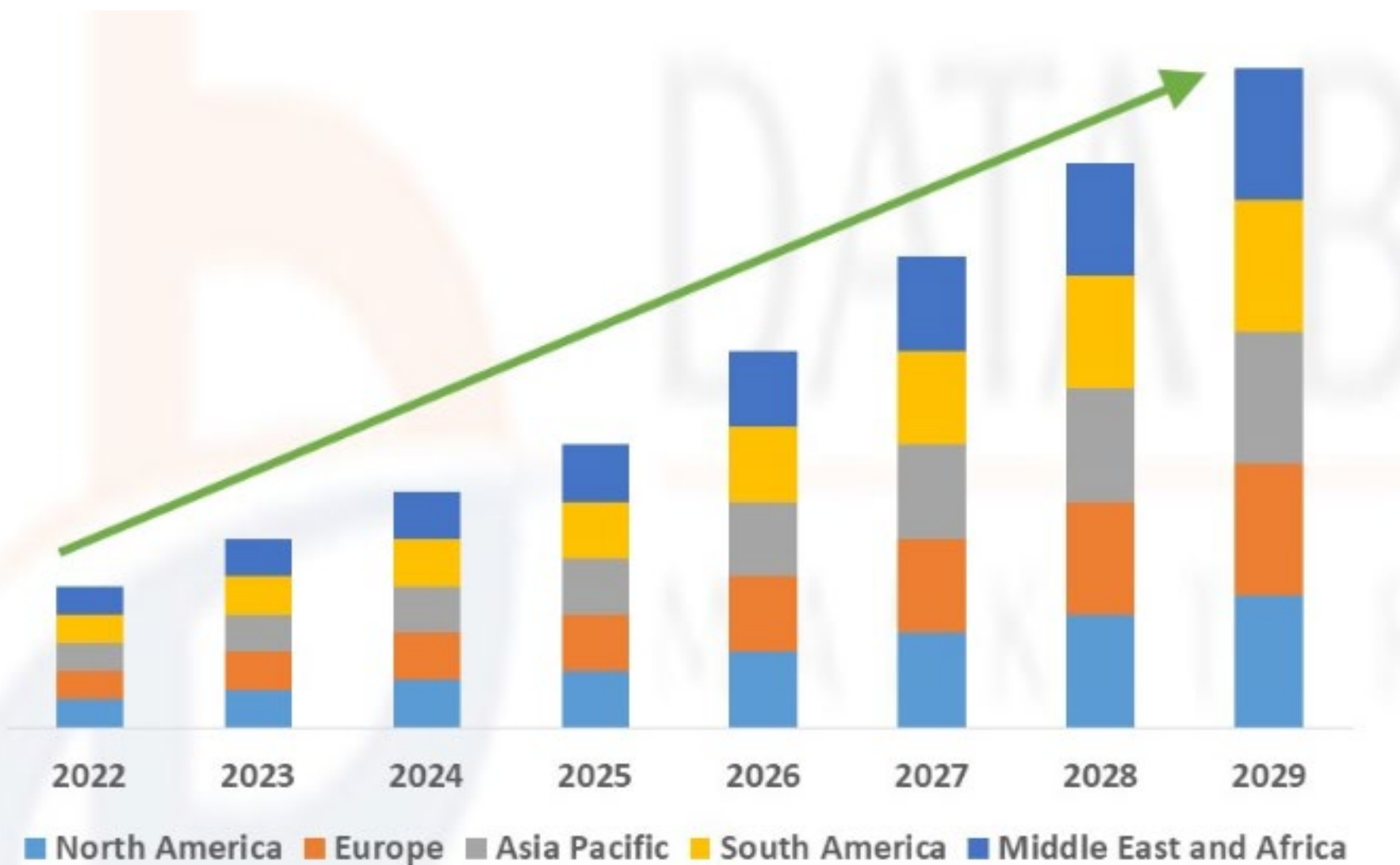
Example **medicine**: Global market of **1.1 trillion US\$**, about 35% of drugs have originated from natural products. (Calixto 2019)

Example **cosmetics**: The global cosmetics market size was valued at **\$300 billion** in 2022 & is projected to grow from \$313.22 billion in 2023 to \$417.24 billion by 2030 (Fortune Business Insights 2022)

# Example Aloe Vera

The global aloe vera market size reached US\$ 770 Million in 2022. Looking forward, IMARC Group expects the market to reach US\$ 1,200 Million by 2028, exhibiting a growth rate (CAGR) of 7.5% during 2023-2028.

<https://www.imarcgroup.com/>



País	Toneladas			
	2014	2015	2016	2017*
México	100.000	120.000	150.000	160.500
Rep. Dominicana	48.000	50.010	51.100	52.500
Venezuela	45.000	46.000	48.000	51.000
EE.UU	4.500	6.000	8.000	9.735
Costa Rica	4.000	4.900	7.000	7.800
Argentina	1.000	1.100	1.300	1.500



**Figura 2.** Cultivo de Aloe Vera en Best Aloe, Costa Rica.

## Can a niche product like organic Aloe Vera contribute to sustainable economic diversification?

Costa Rican exports of processed Aloe Vera in 2019 (last data available) were 335.000 US\$, clearly a **niche**, comparing it e.g. with coffee (in the same year 274 Million US\$).

However, the strength of the Costa Rican economy rests on very diversified exports to reduce vulnerability to external shocks. The effect on the relatively weak regional economy in the country's North-West is important. Aloe Vera can sustainably be produced in semi-arid areas.

Integration of agricultural and industrial production (*next slide*) provides opportunities for technological learning and a **sustainable structural change**.

**However:** Also markets for sophisticated bio-based products may be very cost-sensitive, Costa Rica has started to import Aloe Vera leaves from Nicaragua, where salaries for farm workers are significantly lower.

# Vertically integrated company to extract the active ingredients



**NATURALOE is vertically integrated from plantation to finished goods, all in one location.**

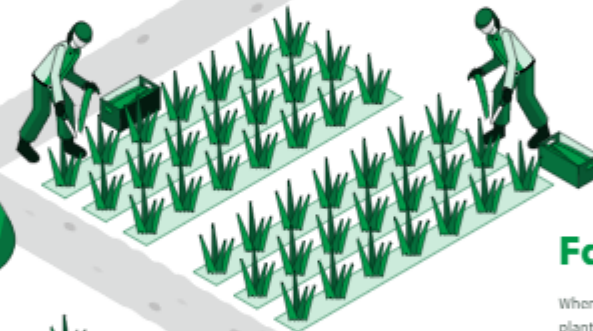
## Nursery

After many years of research using tissue culture reproduction technology, we've achieved growth of a new strain of aloe barbadensis plants containing a much higher concentration of full spectrum of high molecular weight Acemannan Polysaccharides.



## Farm Operation

When the pups grow to the desired size, they are planted in the fields. The mature leaves are harvested by hand and delivered to the factory where we extract the Acemannan.



## Leaf Washing

Every morning we receive fresh leaves from our fields. The leaves are inspected and washed.



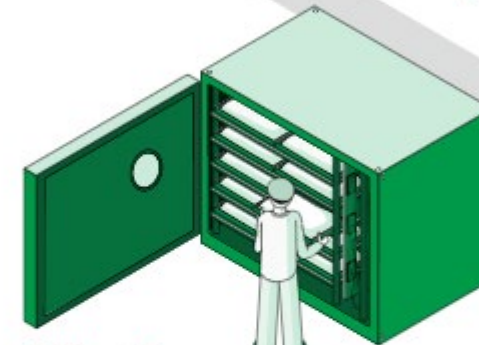
## Hand Filleting

After careful wash, we manually peel off the outer leaf to expose the inner gel, guaranteeing that any leaf that does not meet specs is rejected.



## Lyophilization

Then, through centrifugation, the stabilized Acemannan is separated from the ethanol, and dried using a cold freeze-drying process.



## Ethanolic Extraction

The aloe vera leaf is prepared, then homogenized. The complex carbohydrates are then extracted utilizing a super chilled ethanol bath, separating and stabilizing the Acemannan while removing the anthraquinones.



## Quality Assurance

The final products undergo laboratory tests to ensure its quality, once approved it is delivered to our customers.



Our top quality NaturManan® products enhance your formulations



### Animals

"Aloe Meal" - A dry powdered, high fiber and high complex carbohydrate content meal with primary removal of anthraquinones.



### Nutritional Supplement

Our products have been used successfully as Nutritional Supplement for over 30 years and are supported with numerous clinical studies and a proven track record.



### Pharmaceutical

Our unique Acemannan extract is an ideal product for the formulation of pharmaceutical, medical device products and skin care applications.

<https://www.naturalaloeostarica.com/>

# Green hydrogen: a new “mega-window of opportunity”



Since around 2020, “green hydrogen” is increasingly being seen as a powerful instrument against global warming. A ***new global geography of energy*** could emerge, as the hydrogen needed to decarbonize industry and transport in Europe, South Korea and Japan, will have to be largely imported from countries with huge potentials for renewable energy generation.

Germany expects more than ***2 Mio. tons*** of green hydrogen to be imported per year already in the 2030s, the European Union speaks of ***10 Mio. tons***.

This may open new windows of opportunities for developing countries to export green hydrogen and derivatives (e.g. ammonia, methanol).

However: high levels of ***technological and systemic uncertainties*** prevail, most developing countries’ green hydrogen strategies and roadmaps focus on ***dual strategies***, developing (first) the domestic usage of hydrogen and (later on) exploring opportunities to export.

What may be expected is that manufacturing of core components of the hydrogen economy may be ***outsourced*** from the OEM (in countries like Norway) to countries which provide lower labour costs.

- Strengthening capacities in Technology Foresight and Technology Assessment to enable national businesses to predict future developments in their respective fields and inform policymaking
- Strengthening market intelligence to enable national businesses to identify green windows of opportunity at an early stage
- Promoting FDI and their linkages with local businesses
- Strengthening research related to green technologies, university-industry linkages and international R&D cooperation
- Strengthening national quality infrastructure and preparing national businesses for sustainability certification on international markets



Thanks for your attention!

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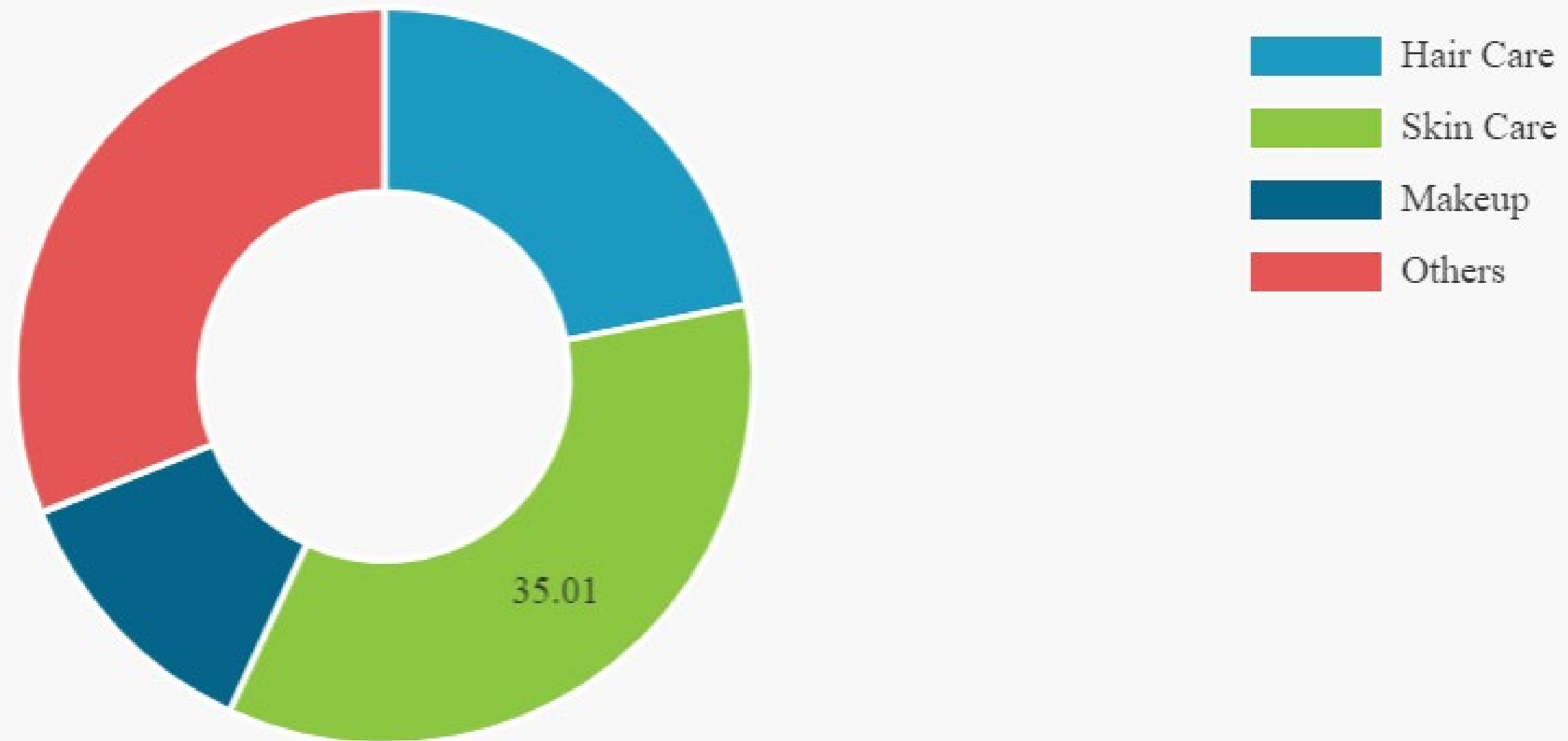
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## Global Cosmetics Market Share, By Category, 2022



[www.fortunebusinessinsights.com](http://www.fortunebusinessinsights.com)