

I. Basic Information for TC

▪ Country/Region:	REGIONAL
▪ TC Name:	Assessment of the Regulatory and Institutional framework for gene-editing via CRISPR-based technologies in Latin America and the Caribbean
▪ TC Number:	RG-T3431
▪ Team Leader/Members:	Lima, Eirivelthon Santos (CSD/RND) Team Leader; Munoz, Gonzalo P. (CSD/RND) Alternate Team Leader; Anta, Rafael (IFD/CTI); Balcazar V., Fernando (CSD/RND); Bustamante, Cesar Tulio (CSD/RND); Centeno Lappas, Monica Clara Angelica (LEG/SGO); Damiani Marti, Octavio Jorge (CSD/RND); Garcia Negro, Alvaro (CSD/RND); Grunwaldt, Alfred Hans (CSD/CCS); Lunstedt Tapia, Christian (CAN/CBO); Mattos, Juan De Dios (CSD/RND); Milewski, Joseph Christofer (CSD/RND); Penaranda, Gina (CAN/CBO); Rios Galvez, Ana R. (CSD/RND); Valle Porrua, Yolanda (CSD/CSD); Zeledon, John (ORP/GCM); Catalano, Fernando David
▪ Taxonomy:	Research and Dissemination
▪ Operation Supported by the TC:	
▪ Date of TC Abstract authorization:	11 Feb 2019.
▪ Beneficiary:	Farmers and consumers across the Latin America and the Caribbean in the following countries: Argentina, Bolivia, Brazil, Colombia, Honduras, Mexico, Paraguay, Peru, and Uruguay.
▪ Executing Agency and contact name:	Inter-American Development Bank
▪ Donors providing funding:	OC Strategic Development Program for Sustainability(SUS)
▪ IDB Funding Requested:	US\$600,000.00
▪ Local counterpart funding, if any:	
▪ Disbursement and execution period:	24 months
▪ Required start date:	August 2019
▪ Types of consultants:	Individual consultants; firms
▪ Prepared by Unit:	CSD/RND-Env, Rural Dev & Disaster Risk
▪ Unit of Disbursement Responsibility:	CAN/CBO-Country Office Bolivia
▪ TC included in Country Strategy (y/n):	N
▪ TC included in CPD (y/n):	N
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Productivity and innovation; Environmental sustainability

II. Objectives and Justification of the TC (see [link](#) to references)

2.1 **Objectives and expected results.** The primary objective of this TC is to provide contextualized guidance for national client agencies to bridge existing agricultural biotechnology policy to explicitly address gene-editing in regulatory updates and to develop an investment strategy in agriculture biotechnology for the region. We will create the first specialized report on gene-editing in agriculture for the LAC region, outlining explicit roadmaps with decision break points to guide agencies considering the socio-economic, competitiveness, and trade implications of regulatory updates. In addition, based on the lessons learned from the contextualized guidance for national agencies, we will develop an agriculture biotechnology investment strategy to decrease technological dependency and prepare countries from the region for the

gene editing¹ revolution. The expected outcome of the TC is to improve understanding of biological, legal and economic aspects of the technology called CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) applied to agriculture resources.

- 2.2 **A breakthrough called CRISPR.** Breakthroughs in biotechnology, namely optimization of gene-editing via CRISPR-based technologies, have facilitated remarkable gains in precision, speed and cost-effectiveness of genome modification in agriculture (Shan *et al.*, 2013). Developers have widely claimed innovative gene-editing technologies can significantly increase the pace of crop and livestock genetic improvement to meet increasing productivity demands and future environmental challenges (Gao, 2018). CRISPR-Cas9 technology could be a major disrupter in Latin American and Caribbean (LAC) agricultural development through varietal improvement, tackling low productivity and providing a vehicle to expedite crop adaptation to climate change. As *Science* magazine's 2015 'Breakthrough of the Year', CRISPR's potential impact simply cannot be ignored by any agricultural development institution.
- 2.3 While gene-editing is not new, innovative tools are revolutionizing the field. CRISPR technology works as a 'search and replace' method that scans DNA and guides a protein such as Cas9 to cut at a specific target sequence. The resulting repair at the site can be designed to insert, alter, or simply remove (i.e. 'knock-out') portions of DNA to achieve some physical trait change. For example, Cornell's Alliance for Science highlights CRISPR use by researchers at Argentina's Instituto Nacional de Tecnología Agropecuaria to turn off a key gene that causes browning in potatoes. Researchers at the Centro Internacional de Agricultura Tropical have also used CRISPR to perform edits in rice and beans to resist disease and improve digestibility (Norero, 2018). CRISPR licensing with private and public entities is expanding gene-editing in global agriculture (Guerrini *et al.*, 2017).
- 2.4 First-generation GMO crops are *transgenic* end products containing foreign DNA, leading to the catch-all GMO colloquialism '*transgénicos*'. But gene-editing can produce organisms which are genetically edited but *contain no transgenes*. This changes key legal descriptive terminology and may alter risk perceptions among regulators and the public. If accepted as 'safer', lower development costs coupled with regulatory hurdles could allow greater non-profit institutional involvement. This could lead to targeting more diverse crops and traits prioritized by the poor, while also speeding innovation and dissemination. However, public confidence challenges may lead to conclusions that the social cost of reducing regulatory burden outweighs the opportunity costs of lost potential value to farmers and consumers.
- 2.5 **Bottleneck to overcome with the regulatory oversight.** The future of regulatory oversight of gene-edited products is particularly ambiguous throughout much of the LAC region, given key distinctions in the gene-editing process and composition of edited organisms compared to first-generation genetically modified organisms (GMOs). Guidance on the economic, political, and social ramifications of LAC national policy decisions is both critically needed and timely, given the immense potential of the technology and widespread desire to avoid tensions created with first-generation GMOs in agriculture. Most LAC countries have not yet ruled on regulatory paths or updated risk assessment pathways for gene-edited organisms. While eleven LAC

¹ Genome editing (also called gene editing) is a group of technologies that give scientists the ability to change an organism's DNA. These technologies allow genetic material to be added, removed, or altered at particular locations in the genome.

countries have some legal status for first-generation GMO crops (ISAAA, 2017), the existing GMO regulatory heterogeneity points to diverse pathways forward with gene-editing.

- 2.6 Among the few addressing it directly, Argentina (2015, via NR 173/2015) and Brazil (2018, via NR 16) will evaluate gene-edited products on a case-by-case basis and give regulatory exemption where there is no insertion of transgenes. In the background, the UN Convention on Biological Diversity (CBD) Conference of the Parties (COP) convened in Egypt in 2018 and deliberated on gene-editing and “living organisms developed through synthetic biology” (CBD, 2017). Historically, LAC countries have widely adopted terminology and governance of biotechnologies based on the Cartagena Protocol, so the UN CBD meeting and eventual guidance is highly consequential for the region. Thus, the TC timeline is also timely to guide translation of CBD COP meeting outcomes into potentially highly consequential policies. It is imperative to present a full array of ramifications of each path forward, considering governmental, academic, and private breeding programs, domestic large and small growers, consumers, and social trust.
- 2.7 Regulators in the US and EU have taken sharply different approaches to gene-editing oversight, with major potential consequences for competitiveness and trade trajectories. The US has determined that gene-edited organisms which do not pose a plant pest risk, have no traces of DNA from distant species, and which *could* arise spontaneously or from conventional mutagenesis, will not be regulated further (Waltz, 2016). However, the EU Court of Justice (ECJ) ruled that gene-edited products would be regulated like first-generation GMOs (Stokstad, 2018). This decision was criticized by many in Europe’s biotechnology industry and research community, but lauded by some environmental groups (ibid). The ECJ contended that although gene-editing alteration “does not occur naturally” and poses “similar” risks to transgenic methods. Researchers have found incongruent GMO policies negatively impact Southern Cone exports of key first-generation GMO crops, so lack of harmonization in next-generation biotechnologies may continue hindering regional trade (Smith and Katovich, 2016).
- 2.8 Biotechnology developers have called for a science-based regulatory approach which accommodates increased precision of CRISPR methods (Barrangou, 2018; Stokstad, 2018). This was echoed in WTO statements by Argentina, Brazil, Guatemala, Honduras, Paraguay, and the USA, among others (WTO, 2018). But prominent scholars have argued the importance of public trust and that the complexity in gene-editing terminology and differences between methods are inevitably confusing and “could be a significant barrier to informed decision-making about [GMO] crops and foods” among citizenry (Kuzma, 2018). Experts also note the public’s “interpretive flexibility” considering gene-edited products as ‘GMOs’ and non-science-based factors arising in policy making (Duensing *et al.*, 2018).
- 2.9 **Collaboration CSD/RND, IFD/CTI and BID-LAB.** This project will benefit from the project “Bioeconomy: Exploring the Potential of Emerging Biotechnologies for Driving Sustainable Economic Growth (RG-T3439)” prepared by IFD/CTI. It will also benefit from the on-going initiatives of the BID-LAB on issues related to “Smart Agriculture”.
- 2.10 **The countries selected to participate in the study².** For this regional study, during TC preparation we have designated the following target countries: Argentina, Bolivia,

² It is still pending the letter of No Objection from Bolivia. The activities in the Components I, II, III, and IV will be implemented in Bolivia once the letter of No Objection is delivered to the Bank.

Brazil, Colombia, Honduras, Mexico, Paraguay, Peru, and Uruguay. These countries were incorporated through the following selection criteria: regional diversity, diverse engagement with first-generation biotechnology, diversity in research and evaluation capacity levels, and diversity in engagement with next-generation gene editing regulations. Argentina and Brazil represent large Southern Cone economies with proactive gene editing regulations from which regional lessons could be drawn. Paraguay and Uruguay represent smaller Southern Cone economies with wide planting of biotech crops, though Paraguay has more developed explicit gene editing policies. Bolivia and Colombia represent Andean economies with limited biotech crop approval, though only Colombia has begun to explicitly address gene editing in regulatory updates. Peru represents in Andean economy with no previous biotech crop experience and the end of their biotech moratorium provides an opportunity to address gene editing within ongoing reforms. Mexico and Honduras represent North and Central American economies with varying levels of capacity and restrictions on biotech crop planting, both with no clear direction on how gene editing may be addressed.

- 2.11 **Strategic alignment.** This project is aligned with the Update to the Institutional Strategy (UIS) 2016-2019 and it will contribute to the Corporative Results Framework 2016-2019 through the following development challenges: (i) productivity and innovation, given that the TC will be generating and disseminating knowledge about biotechnology applied to the agriculture sector; (ii) climate change and environmental sustainability, given that the TC will generate and disseminate knowledge about a technological breakthrough important for agriculture adaptation to climate change and environmental sustainability. The proposed TC is, also, aligned with the Sector Framework for Agriculture and Natural Resources Management (GN-2709-5) supporting activities related to the modernization of agricultural innovation and Climate Change (GN2835-8) through activities related to mainstreaming climate consideration across sectors and Innovation, Science, and Technology (GN-2791-8) via engagement with borrowing countries in assigning priority to Science, Technology and Innovation (STI) investment and policy institutional reforms in the context of regional policy dialogue and sector work. Finally, the TC supports the objective of promoting initiatives that helps the agriculture sector to transition to the use of more sustainable practices and technologies as it is established in the Ordinary Capital Strategic Development Program for Sustainability (GN-2819-1).

III. Description of activities/components and budget

- 3.1 **Component I. Implications of Regulatory Developments for LAC Agricultural Biotechnology Policy.** This component will: (i) assess the baseline agricultural biotechnology legal framework of the participating LAC countries; (ii) detail institutional arrangements for production and regulation of agricultural biotechnologies, including the steps, costs, and timeline from application to approval of commercial products; (iii) outline the implications of baseline international agreements (e.g. Cartagena Protocol on Biosafety) relevant for biotechnology and gene editing; (iv) detail limited LAC regional gene-editing resolution updates in place or under active consideration; (v) detail the protocol for the current CRISPR licensing landscape, specifically the licensing procedures necessary for LAC Small and Medium Sized Enterprises (SMEs), as well as clarifying the steps by which developments from non-profit LAC institution using CRISPR intellectual property suites may reasonably lead to commercial products; (vi) map current agricultural biotechnology regulatory trends and tendencies from non-regional trade partners such as USA, EU, Japan, and China and the implications for baseline LAC frameworks; (vii) review major policy tendencies in the

international arena (e.g. the UN CBD 2018 meeting) to help countries understand the evolving international policy environment; (viii) based on trends/reforms identified, provide anticipatory recommendations to improve regulatory and institutional frameworks in LAC, with particular emphasis on trade implications.

3.2 Component II. Influence of Gene-Editing Characteristics on Future Policy Direction and Scenario Analysis of Country-Crop Gene-editing Case Studies.

This component will conduct in-depth key informant interviews for at least four identified LAC regional states, drawing from biotechnology developers, private and public breeders, relevant policymakers, and consumer groups and NGOs. Key informant interviews will serve to evaluate (i) which gene-edited agricultural products, with which attributes, would likely still be covered by current regulations; (ii) which products, with which attributes, may be able to meet less stringent regulations; (iii) identify key concerns and uncertainties about gene editing technologies and characteristics which may impact regulatory updates in relevant countries; (iv) identify and detail case studies of at least two (2) emerging or prospective gene-edited crop or livestock varieties, in at least (2) countries with diverse existing policies, to conduct economic and policy scenario analysis to provide tangible illustrations of the consequences of various policy directions. This will be executed utilizing key informant interviews and relevant data to provide decision makers with key qualitative and, to the extent possible, quantitative analysis of economic, trade, and social consequences of various regulatory pathways which are tailored to specific country contexts.

3.3 Component III. Agriculture Biotechnology Investment Strategy. This component will: (i) synthesize major findings from components 1 and 2, considering baseline policy environments and tendencies; (ii) categorize major gene-editing developments by LAC entities from the public sector, SMEs, and large LAC-based private entities; and (iii) analyze key specific country- and regional-level concerns about gene-editing technical and policy constraints. Team field experts will then (iv) identify the key capacity deficits in research, development, regulation, and policy formulation surrounding next-generation biotechnology and (v) propose specific investment biotechnology strategy for the region.

3.4 Component IV. Media Analytics and Knowledge Dissemination. This component will: (i) produce a knowledge product that details findings in Components 1-3³; (ii) Submit core findings for publication in peer-reviewed journal(s) and accompanying summary blog posts for broad consumption; (iii) construct short, tailored policy briefs for national agencies, developed for each component; (iv) communicate explicit strategic recommendations for an investment strategy in agriculture biotechnology; and (v) organize an initial project orientation workshop; an interim stakeholder workshop to present results from Component 1 and preliminary results from Component 2; and a final regional workshop to present complete results for a mixed audience of policy makers, scientists, and civil society⁴.

3.5 Indicative Budget. The estimated total costs for the project is US\$600,000 financed by the Ordinary Capital Strategic Development Program for Sustainability (SUS). The Table 1 presents the estimated cost of the project.

³ All knowledge products prepared with resources from the TC for the Bank are sole and exclusive property of the Bank and as such the Bank has exclusive title, rights (including copyright) and interest in the Works.

⁴ The specific location of the workshops will be defined during the execution of the CT in close coordination with the participating countries.

Table 1. Indicative Budget (US\$)

Activity/Component	Description	IDB	Total
Component 1			
Act. 1: Detailing current LAC & International regulatory structures	Literature review, document gathering, and key informant interviews to establish the baseline policy environment	61,218	61,218
Act. 2: Outline current CRISPR licensing landscape and protocols in agriculture	Licenser consultation, review of legal documentation, and discussion with key informants to elucidate necessary processes	46,718	46,718
Act. 3: Identifying trends and tendencies in gene editing among trade partners and international bodies	Lit. Review, Document Gathering, and Key informant interviews with relevant agencies to provide LAC clients with key market and policy intelligence	81,168	81,168
Component 2			
Act. 4: Elaboration of gene editing characteristics and uncertainties impacting regulatory decisions	Interviews conducted with diverse policy backgrounds, with synthesis and findings elaborated by country.	89,413	89,413
Act. 5: Identification of capacity for research and evaluation and Bank investment recommendations	Identification of diverse crop-country cases, qualitative and quantitative data collection, and scenario analysis under varying policies	67,125	67,125
Component 3			
Act. 6: Synthesis of findings and identification of capacity constraints for research and evaluation	Synthesizing and drawing lessons from Component 1 & 2 findings, interviews with key public and private sectoral actors to identify accomplishments and constraints.	43,215	43,215
Act. 7: Elaboration of investment strategy	Development of an investment strategy for agricultural biotechnology	32,411	32,411
Component 4			
Act. 8: Construction of written final outputs from Components 1-3	Finalization of findings in report chapters and tailored policy briefs	76,025	76,025
Act. 9: Construction and website content and policy briefs for Comp. 1-3 outputs	Iterative updating of an IDB-hosted website portal to facilitate timely access to TC results; ≥2 policy briefs for each Comp 1-3.	9,900	9,900
Act. 10: Media Analytics Workshop Dissemination	Pre-launch kick-off orientation, interim stakeholder workshop to present results from Comp.1 and 2, and a regional workshop to present complete results.	92,807	92,807
TOTAL		600,000	600,000

IV. Executing agency and execution structure

- 4.1 The proposed TC aims to deepening the Bank's and client's knowledge and/or capacity on issues related biotechnology legal framework in the region. Given the nature of the proposed TC, research and dissemination, the execution of the TC will be carried out by the Bank (GN-2629-1) through the Environment, Rural Development, and Disaster Risk Management Division (CSD/RND). The Country Office of the Bank in Bolivia (CAN/CBO) will be responsible for management, planning, control and supervision of the financial resources assigned to the proposed operation. The technical oversight, monitoring and support throughout the project duration, which includes among other things planning and coordinating the execution of the operation, reviewing project deliverables to confirm completeness, and assuring quality compliance with established project standards, will be carried out by the project's team (CSD/RND, IFC/CTI, and BID-LAB). To further improve quality control and buy-in, a

working group with several representatives from each beneficiary region will also be identified to preview TC outputs and provide feedback and advice for the execution of the operation. The designated focal points of the TC are: (i) Eirivelthon Lima (RND/CBO) and Gonzalo Muñoz (CSD/RND). The period for TC execution and disbursement is 24 months. The execution of the proposed TC requires the hiring of individual consultants, firms, and/or institutions with a wide array of interdisciplinary expertise in agricultural biotechnology and public policy. The Procurement Plan has included all activities to be executed in the operation ([Annex IV](#)) and they will be executed in accordance with the Bank's procurement methods: (a) hiring of individual consultants according to the policy AM-650; (b) hiring of consulting firms/institutions according to the policies GN-2765-1 and OP1155-4; and (c) hiring of logistic services and other services different from consultancies according to policy GN-2303-20.

V. Exceptions to Bank policy

- 5.1 We do not anticipate any exceptions to Bank policy.

VI. Major issues

- 6.1 Main risks include: timeliness of output dissemination to ensure broad relevancy in decision making, ability to generalize findings across the diverse region and resistance within countries to accept outside perspectives. To address timeliness of dissemination, there will be a staggered release of TC output materials beginning with draft findings of Component 1. Early communication of Component 1 findings provide valuable synthesis of regional and international policy trends and tendencies, as well as key CRISPR licensing guidance, which is immediately useful to TC beneficiaries regardless of progress in gene-editing legislation. Iterative communication of draft Component 2 findings will also ensure the earliest possible release of results for policy consideration. Risk mitigation measures also include forcing a geographically diverse sample of focus countries in Components 1-3 for key informant interviews and case studies and providing country-specific outputs wherever possible. The present TC will provide publicly available information with the breadth and credible rigor to form an evidence base in policy debates. Further, constant engagement between beneficiary countries through working groups, and the IDB supervisory team will ensure focus, buy-in, and relevance to core client interests.

VII. Environmental and Social Strategy

- 7.1 The activities financed by this TC are analytical and will not have any environmental and/or social negative impacts. The classification of the TC is "C" (Ver [SPF](#) and [SSF](#)).

[Request from the Client - RG-T3431](#)

[Results Matrix - RG-T3431](#)

[Terms of Reference - RG-T3431](#)

[Procurement Plan - RG-T3431](#)

VIII. Required Annexes: