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DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

URUGUAY

PROGRAM TO SUPPORT RESEARCH AND INNOVATION ON FOOD AND HEALTH

(UR-L1162)

LOAN PROPOSAL

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LINKS

REQUIRED

1. Multiyear execution plan
2. Monitoring and evaluation plan
3. Procurement plan

OPTIONAL

1. Economic analysis of the project
2. Program Operating Regulations (draft)
3. Case study: IMDEA Alimentos
4. Safeguard policy filter and safeguard screening form

ABBREVIATIONS

ANII	Agencia National de Investigation e Innovation [National Research and Innovation Agency]
CEINBIO	Centro de Investigaciones Biomédicas [Center for Biomedical Research]
NCDs	Noncommunicable diseases
D2C2	Dirección para el Desarrollo de la Ciencia y el Conocimiento [Science and Knowledge Development Division]
DDIP	Dirección de Descentralización e Inversión Pública [Decentralization and Public Investment Division]
FMP	Fundación Manuel Perez
GDP	Gross domestic product
IDB	Inter-American Development Bank.
INE	Instituto Nacional de Estadística [National Statistics Institute]
MEF	Ministerio de Economía y Finanzas [Ministry of Economy and Finance]
MEP	Monitoring and evaluation plan
OECD	Organisation for Economic Co-operation and Development
OPP	Oficina de Planeamiento y Presupuesto [Office on Planning and Budget]
R&D	Research and development
STI	Science, technology, and innovation
STPC	Secretaría de Transformación Productiva y Competitividad [Secretariat of Productive Transformation and Competitiveness]
TCR	Office of the Auditor General of the Republic
TFP	Total factor productivity
UCU	Universidad Católica del Uruguay
UdelaR	Universidad de la República
UTEC	Universidad Tecnológica
WHO	World Health Organization

PROJECT SUMMARY

URUGUAY
PROGRAM TO SUPPORT RESEARCH AND INNOVATION ON FOOD AND HEALTH
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<table>
<tr><th colspan="5">Financial Terms and Conditions</th></tr>
<tr><td colspan="3">Borrower:</td><td colspan="2">Flexible Financing Facility[a]</td></tr>
<tr><td colspan="3">Eastern Republic of Uruguay</td><td>Amortization period:</td><td>25 years</td></tr>
<tr><td colspan="3">Executing Agency:</td><td>Disbursement period:</td><td>5 years</td></tr>
<tr><td colspan="3" rowspan="2">Borrower, through the Secretariat of Productive Transformation and Competitiveness (STPC) and the Office on Planning and Budget (OPP)</td><td>Grace period:</td><td>5.5 years[b]</td></tr>
<tr><td>Interest rate:</td><td>LIBOR-based</td></tr>
<tr><td>Source</td><td>Amount (US$)</td><td>%</td><td>Credit fee:</td><td>[c]</td></tr>
<tr><td>IDB (Ordinary Capital):</td><td>6,000,000</td><td>75.5</td><td>Inspection and supervision fee:</td><td>[c]</td></tr>
<tr><td>Local:</td><td>1,950,000</td><td>24.5</td><td>Weighted average life:</td><td>15.25 years</td></tr>
<tr><td>Total:</td><td>7,950,000</td><td>100</td><td>Approval currency:</td><td>U.S. dollars</td></tr>
<tr><th colspan="5">Project at a Glance</th></tr>
<tr><td colspan="5">Project objective: The objective of the program is to contribute to the development of scientific and technological knowledge aimed at problem-solving and innovation in the area of food and human health. The specific objectives are: (i) to build capacity for scientific research, technology development, and specialized human resources in the area of food and human health; and (ii) to coordinate actions on research, training, and knowledge and technology transfer in the area of food and human health with institutions in the national science, technology, and innovation system and with the productive sector.</td></tr>
<tr><td colspan="5">Special contractual conditions precedent to the first disbursement of the loan: As special contractual conditions precedent to the first disbursement: (i) the OPP and STPC have signed an agreement with Fundación Manuel Pérez (FMP) and with Universidad de la República (UdelaR), with the participation of the School of Medicine and the Center for Biomedical Research (CEINBIO), to establish the roles and responsibilities for execution of the program's resources and activities; (ii) the OPP and STPC have approved the program Operating Regulations, based on a draft version previously agreed upon with the Bank; (iii) the FMP has engaged support services for managing the program; and (iv) the Ministry of Economy and Finance, the Ministry of Education and Culture, the Ministry of Public Health, and the OPP have signed an agreement for an effective period of at least 10 years with UdelaR to establish and launch, within CEINBIO, a division of food and human health dedicated to conducting research, training human resources, and providing advisory services for the productive sector (paragraph 3.9).</td></tr>
<tr><td colspan="5">Exceptions to Bank policies: None.</td></tr>
<tr><th colspan="5">Strategic alignment</th></tr>
<tr><td colspan="2">Challenges:[d]</td><td colspan="3">SI ☐ PI ☑ EI ☐</td></tr>
<tr><td colspan="2">Crosscutting themes:[e]</td><td colspan="3">GD ☐ CC ☐ IC ☑</td></tr>
</table>

[a] Under the terms of the Flexible Financing Facility (document FN-655-1), the borrower has the option of requesting changes to the amortization schedule, as well as currency, interest rate, and commodity conversions. The Bank will take operational and risk management considerations into account when weighing such requests.

[b] Under the flexible repayment options of the Flexible Financing Facility, changes to the grace period are permitted provided that they do not entail any extension of the original weighted average life of the loan or the last payment date as documented in the loan contract.

[c] The credit fee and inspection and supervision fee will be established periodically by the Board of Executive Directors as part of its review of the Bank's lending charges, in accordance with applicable policies.

[d] SI (Social Inclusion and Equality); PI (Productivity and Innovation); and EI (Economic Integration).

[e] GD (Gender Equality and Diversity); CC (Climate Change and Environmental Sustainability); and IC (Institutional Capacity and Rule of Law).

I. DESCRIPTION AND RESULTS MONITORING

A. Background, problem addressed, and rationale

1.1 **Economic and productive context.** The Uruguayan economy has been growing without interruption for more than a decade, with an average annual rate of 4.1% between 2003 and 2018, higher than the annual average since 1960 of 2.5%.[1] Exports and investment have been the drivers of this growth, with exports of goods and services expanding by an annual average of 6.1% and investment growing at an annual average of 5.6% between 2003 and 2018. Likewise, total factor productivity (TFP) grew by 0.6% annually during the same period.[2] However, in view of the less favorable international context, Uruguay's economic growth has slowed starting in 2015 (to 1.6% annually between 2015 and 2018), investment began to contract (by an annual average of -7.3%), and TFP growth slowed to 0.2% annually. Regarding the productive structure, the Uruguayan economy has few innovation-intensive sectors. The economic complexity index for exports has remained steady over time,[3] in contrast to what has happened in countries of accelerated convergence, like South Korea or Finland. Thus, boosting science, technology, and innovation (STI) can help improve productivity and productive diversification, contributing to the country's economic growth.

1.2 The national system of innovation[4] has been strengthened over the last decade. Uruguay has a modern legal and institutional framework, as well as a variety of programs supporting research and innovation. Investment in research and development (R&D) increased from US$100 million to US$288 million between 2007 and 2017, bolstered by public investment. Private investment's share of the total fell from 38% in 2005 to 24% in 2017.[5] However, R&D investment as a proportion of gross domestic product (GDP) remained stable at 0.49%, which is low compared to that of countries with similar characteristics.[6] During this period, progress was also made on training highly-specialized human resources: The country currently has 2,810 researchers,[7] and the number of full-time equivalent researchers increased by 66% between 2007 and 2018.[8] The increased R&D

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1 Central Bank of Uruguay (2019).

2 Country Development Challenges (IDB, 2019).

3 See: https://oec.world/en/rankings/country/eci/.

4 The national system of innovation is defined as "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies." (Freeman, 1995).

5 Data from the Prisma portal. Available at: www.prisma.org.uy; Baptista, B. 2016.

6 Uruguay invests three, four, and five times less in R&D than Estonia, New Zeeland, and Norway, respectively. Like in Uruguay, the public sector in these countries still invests more than the private sector in innovation; however, private investment has accompanied this public effort, something that has not happened in Uruguay (Main Science, Technology and Innovation Indicators, Organization for Economic Co-operation and Development (OECD), 2019).

7 There are 1,817 researchers registered with the National System of Researchers (www.sni.org.uy).

8 National Council on Innovation, Science, and Technology, 2017; Network of Science and Technology Indicators (NSTI), 2017; Prisma portal, 2019.

investment and growing number of researchers had an impact on the number of scientific publications, which doubled between 2009 and 2018.[9]

1.3 Despite improvements to scientific-technological capacities, weaknesses in applying them to the country's social and productive challenges persist. Over the last decade, innovation in Uruguayan companies has remained stable and skewed almost exclusively toward acquisition of machinery and equipment.[10] Such outcomes may be associated with the poor capacity of companies to absorb knowledge,[11] weaknesses in technology transfer processes, and scientific research that is not, relatively speaking, "mission oriented."[12] The incorporation of Uruguay's researchers into the workforce has also failed to facilitate the technology transfer process: 81% of researchers work in higher education, 14% in government, and only 1% in companies.[13] This means that the country's research capacity—concentrated in academia—is not being properly utilized in production and public administration, where it has the potential to contribute to development.

1.4 **The problem.** The problem that this program will address is the lack of specific scientific capacity and university-business coordination aimed at innovating in the healthy foods sector. This sector accounts for around 5% of GDP and 40% of exports.[14] Internationally, demand for these products is solid, especially for food with nutritional qualities and health benefits. For example, the global market for nutraceuticals stood at US$27.5 billion in 2018 and is expected to grow to US$42.3 billion by 2023.[15] These foods (functional foods,[16] nutraceuticals,[17] superfoods, etc.) help prevent noncommunicable, or chronic, diseases (NCDs), which are increasingly common owing to an aging population and changes in

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9 In 2018, there were 1,751 articles by authors affiliated with Uruguayan institutions (Scimago, 2019).

10 The proportion of innovative businesses has remained at an average of 31% between 1999 and 2015. During that period, 70% of total investment in innovation activities was in capital goods, with R&D investment accounting for less than 9% (Prisma, based on ANII-INE: Innovation Activities Surveys 1998-2000; 2001-2003; 2004-2006; 2007-2009; 2010-2012; and 2013-2015).

11 Most companies do not have science and technology professionals on staff, limiting their understanding of the potential role of STI in their businesses and how to take advantage of the country's resources in this area (National Research and Innovation Activities, ANII, multiple years).

12 Mission-oriented research aims to generate knowledge to address specific productive or social problems. In the United States, more than 90% of the national research budget can be considered mission-oriented, and that figure stands at 75% for OECD countries, while in Latin America and the Caribbean, it accounts for 42% of the national research budget, and in Uruguay, 45% (NSTI, 2018 and IDB, 2017).

13 In countries like Spain and Portugal, more than 30% of researchers work for businesses, while in countries like Canada, more than 50% do (NSTI, 2017; OECD, 2017).

14 Mauricio De Rosa, Martin Fossati, Gabriela Mordecki, and Adriana Peluffo. Description and recent development of the food and beverage production industry. Agreement between Ministry of Industry, Energy, and Mining and the Instituto de Economía, 2011.

15 See: www.mordorintelligence.com/industry-reports/nutraceutical-ingredients-market.

16 The main aspects that allow a food item to be considered functional are: (i) that it contains a variety of components (nutritional and non-nutritional) that benefit one or several bodily functions associated with health and wellness, reducing the risk of illness, or both; and (ii) the modulation effect takes place independent of the physiological effects of the nutrients it contains (Siró *et al.*, 2008).

17 A nutraceutical is defined as a food (or part of a food) that provides medical or health benefits, including by preventing or treating an illness (Brower, V. 1998).

modern diet and lifestyle.[18] NCDs are the primary cause of death in the majority of countries in the world (WHO, 2019), and Uruguay has the highest mortality rate from these diseases of all the countries of the Americas (821 people for every 100,000 residents, WHO, 2019). The following is a list, with descriptions, of the main weaknesses and challenges regarding scientific capacity and university-business coordination in the areas of human health and food.

1.5 **Scientific and technological capacities in food and human health.** Uruguay has research groups that work in a variety of scientific and technological fields associated with human health and food.[19] There are 123 research units on biological sciences; 48 on basic medicine; 42 on agriculture, silviculture, and fisheries; 36 on chemical sciences; 33 on health sciences; and 26 on agricultural biotechnology. Research on food and beverage engineering is relatively newer, with 9 units (D2C2, 2018). The structure of research in Uruguay by areas of knowledge is reflected in the country's bibliographic production indicators and how they compare with international patterns. Of particular significance is Uruguay's body of bibliographic production in biological sciences, general agriculture sciences, and basic medicine. Compared with international standards, Uruguay's bibliographic production is significantly lower in the areas of clinical medicine and engineering and technology, which include food and beverage engineering (Scimago, 2018). These results show that Uruguay has significant research capacity in most of the areas and sub-areas of knowledge needed to develop the field of food and human health science and technology, but that some areas still need strengthening.

1.6 **Interdisciplinary scientific research.** Developing knowledge in the area of food and human health requires not only strengthening each of the aforementioned disciplines but enhancing their capacities to interact. Analysis of the interdisciplinarity of research activities in Uruguay finds a very strong interrelationship between biological sciences and a variety of subareas relevant to developing this field: 27 units that do research in the biological sciences also do basic medicine research; 20 units on agricultural biotechnology; 13 units on health biotechnology; and another 13 units combine biological sciences research with research on agriculture, silviculture, and fisheries (D2C2, 2018). However, links are much weaker between basic medicine and agricultural biotechnology (only 4 research units in the country develop projects in both disciplines); between basic medicine and food and beverage engineering (2); and between agricultural biotechnology and food and beverage engineering (1). This means that the strategy to strengthen science and technology capacity with regard to food and human health must, in addition to improving the relevant areas of knowledge that are relatively weaker, address the challenge of fostering interdisciplinarity among the areas and subareas of knowledge.

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[18] Mayo Clinic Proc. 2015 http://dx.doi.org/10.1016/j.mayocp.2015.05.001; www.mayoclinicproceedings.org.

[19] The intersection between science and technology linked to human health and food involves multiple and varied areas, subareas, and disciplines, including medical and health science (basic medicine, clinical medicine, and health biotechnology), natural and hard sciences (especially the biological and chemical sciences), agricultural sciences (agricultural and food biotechnology, agriculture, and livestock and dairy production), and engineering and technology (food and beverage, nanotechnology).

1.7 **Specialized human resources.** There are around 300 researchers directly linked to the food sector, including researchers and postgraduate students.[20] These researchers can be divided into 68 research groups that work on issues related to food, with an average of four researchers per group. Research efforts in this area are thus highly fragmented. Fifty-six percent of the research groups focus on various aspects of processed food, while 34% work on the search for food ingredients and on authenticating their properties; 6% focus of the dairy sector; and 4% focus on detecting genetically modified organisms in different food matrices. Although most groups have the capacity to conduct research at different points of the value chain—from assessing and classifying raw material to obtaining product with distinctive characteristics—there is a lack of specialization in researching food and its link to health-illness processes.

1.8 **Academic training in food and human health** In Uruguay, training is available at the graduate and, in some cases also at the postgraduate level in all relevant areas of the field of food and human health science and technology. The training is available through the different schools of Universidad de la República (UdelaR), Universidad Tecnológica (UTEC), Universidad Católica del Uruguay (UCU), Universidad ORT, and Universidad de la Empresa.[21] However, there is no specific postgraduate training that links the different areas of knowledge and disciplines associated with the food and human health field so as to provide comprehensive training, both for academia and for the productive sector. One relevant precedent in this regard is the food engineering degree at UdelaR, which is offered jointly by four schools there: The schools of engineering, chemistry, agronomy, and veterinary science. This demonstrates recognition of the interdisciplinarity of the area of food and sets a precedent for interinstitutional coordination in the area of food and human health that could be strengthened.

1.9 **Linking universities with food and health companies.** Using science to develop healthy foods is a dual opportunity for Uruguay, inasmuch as there is growing international demand[22] and such products could contribute to reducing the cost of NCDs. However, there are weaknesses in the coordination between universities and the research centers run by businesses and society. Companies in the food industry have relatively few specialized professionals and technicians, they are not very innovative, and their innovation efforts skew towards the transformation of productive processes. Likewise, their main links to other agents in the National System of Researchers are commercial (for example, suppliers), and they associate to a lesser degree with universities and research institutions

[20] Uruguay XXI/ Basic Sciences Development Program, 2019.

[21] This includes degrees associated with the medical sciences and health— doctorate in medicine (UdelaR); undergraduate degree and Master's degree in nutrition (UdelaR); Master's degree in nutrition (UCU)—with natural and exact sciences— undergraduate degrees and doctorates in biological sciences, biochemistry, and chemistry (UdelaR); undergraduate degree in food analysis (UTEC); undergraduate degree in biotechnology engineering (ORT)—agricultural sciences— agricultural engineering (UdelaR, Universidad de la Empresa—and engineering and technology— Food engineering (UdelaR, UCU), undergraduate degree in dairy science and technology (UTEC), Master's degree in food industry technology and management (UCU) (MEC, 2017). Of the students who graduate with one of these degrees, 72% are women (MEC, 2017).

[22] KPMG (2015) estimated the global market for functional food would be US$250 billion in 2018, a five-fold increase over its size in 1999.

(B. Baptista, 2016). In addition, science and technology institutions are also weak in terms of coordination with the productive sector and in the knowledge transfer process. The technology transfer profession is not sufficiently developed in most of these institutions, and in many cases there are no organizational structures and/or they do not have the resources needed to pursue coordination and transfer activities. If these companies could coordinate better with the supply of knowledge and technology, it would help enhance the sophistication and increase the supply of healthy foods in the local market and for export. It would likewise help to address regulatory challenges[23] surrounding the reformulation of food into more healthy products. An interesting example in the case of Uruguay is the national chamber of commerce's *Impulsa Alimentos* program, which is promoting innovation by linking up companies with research centers.[24]

1.10 As far as potential demand for this program, according to the Innovation Activities Survey 2013-2015 (National Research and Innovation Agency (ANII) and National Statistics Institute (INE)), in Uruguay, there are at least 74 companies that manufacture food products (including beverages) that conduct their own internal R&D (40 have formal R&D units). Another 29 companies contract the R&D services of other institutions, partnering with universities, technology centers, and/or technology liaison and outreach centers (*unidades de vinculación tecnológica*). According to this survey, sector enterprises invested a total of US$4.5 million in R&D in 2015, more than 90% of which was invested by companies identified as "large."[25]

1.11 **Program rationale and strategy.** This program aims to develop an institutional and organizational model for research and innovation that, by taking advantage of existing local capacity, enhances interagency coordination, multidisciplinarity, and collaboration and interaction between companies and institutions in the area of food and health. This model will be developed under the auspices of the Center for Biomedical Research (CEINBIO)[26] of the Universidad de la República (UdelaR) School of Medicine based on the following rationale:

a. CEINBIO has a significant track record of 15 years of research in biochemistry and biomedicine, including in the area of food and the health-disease process. The center is comprised of more than 70 researchers, of which 45 are on-site and the rest located in related units. Several of the center's researchers are internationally renowned. However,

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[23] Decree 272/2018 establishes that all packaged products to which sodium, fat, or sugar has been added and in whose final formulation the amount of these ingredients exceeds established values must include a label on their packaging (National Science and Technology System, 2019).

[24] See www.impulsaindustria.com.uy. The proposed program will be coordinated with this initiative by the Uruguayan chamber of commerce.

[25] According to Decree 504/007, companies with 100 or more employees and/or annual sales—excluding value-added tax—that exceed the equivalent of 75 million indexed units (approximately US$8.6 million) are considered large.

[26] Established in 2004, CEINBIO is an R&D center in the Biochemistry Department of the UdelaR School of Medicine. Its activities are funded mainly by UdelaR, with supplementary funding from domestic and international R&D promotion agencies. See http://ceinbio.udelar.edu.uy.

because of resource restrictions, it has still not been able to form a critical mass of researchers to generate cutting-edge knowledge on food and health.

b. CEINBIO has laboratory and research space in the School of Medicine building (approximately 400 square meters). It also has the technological facilities for performing organic synthesis, analytical biochemistry, spectroscopy, mass spectrometry, electron paramagnetic resonance, cellular and molecular biology, and other processes. However, the space available limits the growth of the number of researchers. There is also a need to expand and update the mass spectrometry and microscope equipment.

c. CEINBIO collaborates with a variety of research centers and universities in the region, in Europe, and in the United States. More recently, the center has established contacts with the pharmaceutical and foods industries and provided advisory support on chemistry and the biology of free radicals and antioxidants, as well as functional analysis on the antioxidant properties of national products and foods. However, there are opportunities to strengthen both CEINBIO's international collaboration network and its own capacities for enhancing ties to the productive sector and the national health system.

1.12 **Alignment with national priorities.** In 2016, Law 1972 created the National System on Productive Transformation and Competitiveness, also called Transforma Uruguay.[27] The system has a Productive Transformation and Competitiveness Cabinet, which acts as an interministerial body for coordinating policies on production and competitiveness. It also has a Secretariat of Productive Transformation and Competitiveness (STPC), which operates under the Office on Planning and Budget (OPP) and is responsible for drafting and monitoring the National Plan on Productive Transformation and Competitiveness. The current plan covers 2017-2021 and was drafted in a process involving civil society, the public and private sectors, academia, and workers. The plan covers four fundamental areas—innovation, human and business capacity, business environment, and internationalization—and five sectors—information and communications technologies, creative industries, forestry, logistics, and food.[28] This program is in the framework of one of the national plan's strategic initiatives, under the innovation area and in the food sector.

1.13 The program is also aligned with Uruguay's national plans on STI and health. Capacity-building in scientific research, technological development, and innovation, as well as the formation of human resources at the postgraduate level in the areas of human health and agricultural and agribusiness production, are priorities of the National Science and Technology Strategic Plan (Ministry of Education and Culture, 2010). At the same time, reducing NCD risk factors through lifestyle improvements and healthier environments is included in Uruguay's 2020 National Health Objectives (Ministry of Public Health, 2015).

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[27] The Bank supported the launch of the National System on Productive Transformation and Competitiveness with technical cooperation ATN/KR-15415-UR, through which the system's information platform was developed.

[28] In addition to being relevant economically (in terms of production, jobs, exports), the sectors prioritized by the National Plan on Productive Transformation and Competitiveness are characterized by offering opportunities for development through enhanced use of STI.

1.14 **Bank experience and lessons learned.** The program incorporates lessons learned from several programs and initiatives in Uruguay and other countries of the region.[29] The lessons most relevant to the design were as follows: (i) governance mechanisms are key and must include government, academic, and industry stakeholders; (ii) to address complex production and social problems, it is crucial to build multisector and multidisciplinary R&D capacities; (iii) designing research agendas requires scientific rigor and mission orientation; (iv) transferring technology and knowledge to the market is essential for connecting technology centers with industry; and (v) long-term planning is crucial, both for building R&D capacity and for getting results. Additionally, other lessons can be drawn from the Innovation, Science, and Technology Sector Framework Document (document GN-2791-8), which looked at 15 Bank projects in 14 countries: (i) in the current context of accelerated technological change, it is crucial to prioritize investment in innovation; and (ii) it is essential to take advantage of the capacities of existing institutions in national innovation systems. These lessons were incorporated into the design of this project's components, monitoring and evaluation framework, and governance.

1.15 **International experience.** The program design took into account the experience of Instituto IMDEA Alimentación in Spain,[30] which researches and incorporates advances in molecular biology in food to make them effective tools for improving human health and generating value added for the food industry. IMDEA organizes its work around five R&D programs and three technology platforms. It has 72 researchers and an annual budget of close to €4 million, of which 26% comes from funding obtained by researchers, service sales, and industry R&D contracts. As of 2018, it had published 657 scientific papers, with an average impact factor (citations in peer-reviewed scientific journals) of 4.9. It has also secured two patents—which it has already licensed—applied for two more patents, and launched a technology-based spinoff. It should be highlighted that these results were obtained gradually. Its initial years were characterized by capacity building and the generation of knowledge and investigation methodologies, as well as the establishment of relationships with the productive sector. The patents, spinoff, and concrete collaborations with the productive sector came in subsequent years. This experience was taken into account when designing this program's work plan and targets.

1.16 **Coordination within the IDB Group.** The program will be coordinated with other operations financed by the Bank in Uruguay. The expectation is that the program's research and innovation efforts will be complemented by the research and innovation promotion efforts provided for under the Business Innovation and Entrepreneurship Programs I and II (4329/OC-UR and 4847/OC-UR) executed

[29] Some sector-specific investigation funds and public-private technology consortiums were financed through the Innovation Program for Productive Development (3315/OC-UR) and the Business Innovation and Entrepreneurship Project (4329/OC-UR), although at a smaller scale than this program. Another point of reference is the Instituto Pasteur Montevideo, which was created in 2006 and has had a successful track record of growth. In Argentina, multidisciplinary technology and R&D centers with characteristics similar to this program were supported through the Technological Innovation Program (2777/OC-AR and 3497/OC-AR), as in Chile through the *milenio* intiative (www.iniciativamilenio.cl).

[30] See: Case study IMDEA Alimentos – Spain; and https://www.food.imdea.org/.

by the ANII. The program also takes advantage of the capacities generated in Transforma Uruguay through technical cooperation operations ATN/KR-15415-UR, which strengthened the information platform, and ATN/KK-17076-UR, through which a cutting-edge biotechnology research center is being designed with support from the Seoul National University. Lastly, it will seek to coordinate CEINBIO's work with the agribusiness projects supported by IDB Invest and IDB Lab in Uruguay.[31]

1.17 **Strategic alignment.** The operation is aligned with the Update to the Institutional Strategy 2020-2023 (document AB-3008), specifically with the challenge of promoting productivity and innovation, as it will help promote knowledge generation and innovation activities among companies; and with the crosscutting area of enhancing institutional capacity and the rule of law by strengthening the STPC's monitoring and R&D capacities, as well as CEINBIO's technology transfer capacity. The operation contributes to the Corporate Results Framework 2016-2019 (document GN-2727-6) indicators of: (i) government agencies benefited by projects that strengthen technological and managerial tools to improve public service delivery; (ii) projects that support innovation ecosystems; and (iii) enterprises supported through innovation activities. It is likewise consistent with the Sector Framework Documents for Innovation, Science, and Technology (document GN-2791-8) (Dimension 1: Investment in innovation, science, and technology) and Food Security (document GN-2825-5) (Dimension 3: Food utilization); and it is aligned with the Sector Strategy on Institutions for Growth and Social Welfare (document GN-2587-2) on enhancing institutional capacities to implement innovation policies. The operation is also aligned with the IDB Group Country Strategy with Uruguay 2016-2020 (document GN-2836), under the priority area of promoting innovation and the strategic objective of promoting business innovation. The operation is included in the Update of the Annex III of the 2019 Operational Program Report (document GN-2948-2).

1.18 **Gender considerations.** Multiple indicators show no gender bias in the research and human resources training activities in the areas of food and human health. For example, according to RICYT data, as of 2017, 53.7% of researchers in medical sciences and health in Uruguay were women. Likewise, 61% of students entering Master's programs in Uruguay are women (Education Statistical Yearbook, 2017). Thus, this program will monitor the gender situation through indicators that show the number of women researchers participating in R&D projects and women students participating in the graduate courses offered (paragraph 1.27).

B. Objectives, components, and cost

1.19 The objective of the program is to contribute to the development of scientific and technological knowledge aimed at problem-solving and innovation in the area of food and human health. The specific objectives are: (i) to build capacity for scientific research, technology development, and specialized human resources in the area of food and human health; and (ii) to coordinate actions on research,

[31] IDB Invest has four agribusiness projects in implementation (https://www.idbinvest.org/es/projects), and IDB Lab has a project with the dairy sector (ATN/ME-16855-UR). To promote coordination between these projects and the program, the Bank will organize working meetings between the managers and technicians at the companies supported by IDB Invest and IDB Lab and the researchers at CEINBIO.

training, and knowledge and technology transfer in the area of food and human health with institutions in the national science, technology, and innovation system and with the productive sector. The program will include the following components:

1.20 **Component 1. Research, technology development, and training of specialized human resources (US$6.19 million).** This component will enhance CEINBIO's capacity to carry out scientific research and technology development activities and train advanced human resources in the area of food and human health. Financing will be provided for two subcomponents.

1.21 **Subcomponent 1.1. Enhanced infrastructure, equipment, and research capacity at CEINBIO (US$5.7 million).** This subcomponent will finance the following activities: (i) renovation of the UdelaR School of Medicine's existing building infrastructure (approximately 300 m^2) to house food and human health research activities, including spaces for platforms and equipment, lab countertops, and offices and common areas; (ii) the acquisition, installation, and commissioning of equipment (including a mass spectrometer, a latest-generation microscope, and other complementary equipment and items); and (iii) the formulation and implementation of R&D projects, including funding for hiring researchers and technical staff, purchasing inputs, and covering tickets and travel expenses. The areas and products in which the R&D projects will concentrate will be defined through the coordination and priorities established by the Strategic Committee (paragraph 3.6) and CEINBIO researchers. Preliminarily, the areas identified during program preparation include, among other things, cardiovascular health, brain aging, and inflammation and its relationship to food. Interest was also expressed in some sectors or products in which the knowledge and techniques developed through the program could be applied, including products from honey, *vitis vinifera* (tannat grapes), and olives. Other important export products like meat, dairy, and rice can also be looked at in the program, in coordination with institutions specializing in them, such as the National Institute on Agricultural Research and the National Meat Institute. The researchers funded by the program will need to have PhDs and at least three years of research experience in biomedical sciences, chemistry, biology, food engineering, etc.

1.22 **Subcomponent 1.2. Training of advanced human resources (US$490,000).** This subcomponent will support the design and implementation of a postgraduate degree (Master's) in food and human health, in which several of UdelaR's schools will participate, along with other institutions from outside the university with complementary capacities. The postgraduate degree will be designed by researchers hired by the program, with support from specialized external consultants. Regarding implementation of the postgraduate degree, it will be funded by the organization and include theoretical and practical courses and the participation of instructors from abroad.

1.23 **Component 2. Coordination and knowledge transfer (US$1.06 million).** This component will build capacity for CEINBIO's joint work with companies, institutions, and civil society organizations that are potential users of the knowledge and services generated by the program. Financing will be provided for the following activities: (i) the signing of agreements on collaboration and knowledge transfer with strategic partners and with enterprises and trade, public, and civil society organizations; (ii) the development and provision of science and technology

services to enterprises;[32] (iii) the holding of workshops for disseminating and exchanging information with the productive sector to stimulate and incentivize demand among companies and institutions for the technology services and for collaboration agreements for joint medium-term R&D projects with CEINBIO; and (iv) the holding of science and technology meetings to disseminate to the general public the scientific knowledge generated by the program. The expectation is that the researchers hired in the framework of Component 1 will dedicate about 20% of their time to coordination and knowledge transfer work, particularly on implementing the aforementioned agreements and providing science and technology services. Also, for executing this component, human resources will be secured with relevant experience in technology foresight and technology transfer in the healthy foods industry and in health and food research.

1.24 **Administration, monitoring, and evaluation (US$700,000).** Financing will be provided for the following support activities for program management: (i) specialized consultants in procurement, financial administration, and monitoring and evaluation; (ii) financial audits; (iii) midterm and final evaluations of the program; (iv) development and implementation of a communications plan; and (v) expenditures incurred by Fundación Manuel Pérez (FMP) associated with program execution and institutional strengthening (see paragraphs 3.3 and 3.4).

1.25 **Beneficiaries.** The program's direct beneficiary will be CEINBIO, which will receive resources to strengthen and expand its capacity. The program's end beneficiaries can be sorted into three groups: researchers, students, and companies. For the first group, the program will support an estimated 15 researchers. Regarding students, 10 students are expected to join the first cohort of the Master's program on food and human health. Lastly, it is estimated that at least three companies will be supported through medium-term research and innovation agreements (three years), along with another six companies with science and technology services.

C. Key results indicators

1.26 Taking into account international experience (see paragraph 1.15), the program is expected to generate positive impacts within a time horizon of 10 years with respect to the following indicators: (i) scientific publications on food and human health published by authors affiliated with Uruguayan institutions; (ii) students graduated from the food and human health postgraduate program; (iii) R&D investments leveraged in the productive sector; (iv) revenue generated from science and technology services provided to companies or other organizations; and (v) sales revenue generated by companies participating in knowledge transfer agreements.

1.27 In line with these impacts, a number of outcomes are expected, to be measured with the following indicators: (i) scientific publications produced in the framework of the program, per researcher per year; (ii) students enrolled in the postgraduate program on food and human health; (iii) products and technologies transferred to

[32] The program will serve enterprises of different sizes, mainly in the food sector and related sectors, for example by supporting the development of new methodologies for characterizing food for later use in the industry.

the productive sector; and (iv) science and technology services provided to the productive sector (see Annex II and the MEP).

1.28 **Economic evaluation.** A cost-benefit analysis was performed with a time horizon of 10 years. It found that the program has a positive net present value of US$2.9 million and an internal rate of return of 21.4%, higher than the discount rate used by the Bank of 12% annually. Consistent with the objectives set forth and the program impact and outcome indicators, the monetization of the main benefits derives from three sources: (i) the value of the knowledge generated by the scientific research (scientific papers of the researchers funded by the program); (ii) the increase in compensation for the professionals accumulating human capital through the food and human health Master's program; and (iii) the improvements to production and innovation efforts by food industry and pharmaceutical companies. These calculations are based on a conservative scenario in which externalities to other sectors are not taken into consideration. The results are robust to a sensitivity analysis of the program's main parameters. In a thousand-event simulation, for the entire program, the support of the net present value distribution falls entirely within the positive domain under all scenarios, consistent with an internal rate of return distribution situated to the right of the discount rate of 12%. The case is the same for a similar analysis carried out at the component level (economic analysis of the project).

II. Financing Structure and Main Risks

A. Financing instruments

2.1 This program is a special investment loan operation. This modality has been selected for the following reasons: (i) the program activities, costs, and expected results are fully defined; and (ii) a full and favorable technical, financial, and economic feasibility analysis of the program has been completed. The total cost of the program is US$7.95 million, of which US$6 million will be financed by the Bank from its Ordinary Capital resources and US$1.95 million will be financed with counterpart resources.

2.2 The disbursement period will be five years (see Table 2) based on the technical characteristics of the program, whereby infrastructure and equipment capacity will be strengthened and the team of researchers will be reinforced in an initial stage, and then research projects and dialogue, collaboration, and transfer processes with the productive sector will subsequently be pursued.

Table 1. Program cost (US$000)

Components	IDB	Local	Total	%
Component 1. Research, technology development, and training of specialized human resources	4,840	1,350	6,190	77.9
Subcomponent 1.1 Enhanced infrastructure, equipment, and research capacity at CEINBIO	4,350	1,350	5,700	71.7
Subcomponent 1.2 Training of advanced human resources	490	0	490	6.2
Component 2. Coordination and knowledge transfer	1,060	0	1,060	13.3
Administration, monitoring, and evaluation	100	600	700	8.8
Total	**6,000**	**1,950**	**7,950**	**100.0**

Table 2. Disbursement schedule (US$000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
IDB	1,440.5	1,440.5	1,202.0	988.5	928.5	6,000.0
%	24	24	20	16.5	15.5	100

B. Environmental risks

2.3 In accordance with the guidelines of the Environment and Safeguards Compliance Policy (OP-703), the program has been classified as a category "C" operation. The operation is not expected to finance civil works or infrastructure beyond minor renovations and remodeling of an existing building. Based on the nature of the program activities, which will largely consist of scientific research, human resources training, and business advisory services, no negative environmental or social impacts are expected.

C. Fiduciary risks

2.4 Based on an institutional capacity assessment of the OPP and the FMP, two fiduciary risks were identified, one medium and the other high. Although the OPP has demonstrated experience in managing Bank-financed projects, there is a medium risk of failure to coordinate work with the STPC and the FMP. This risk will be mitigated by hiring a professional who will work under the OPP to facilitate coordination with the STPC and the FMP.

2.5 The second fiduciary risk, classified as high, is the risk of failing to execute the program in a timely manner due to: (i) a lack of experience among FMP personnel in executing operations financed by the Bank and in projects similar to this one; and (ii) the failure to consolidate internal control mechanisms and commission external institutional audits. To mitigate this risk, the program will strengthen the FMP team by adding two professionals with financial management and procurement experience in executing Bank-financed projects or similar projects. Also, for coordinating the work with the School of Medicine and CEINBIO, these institutes will formally appoint personnel who will work with the FMP. The program Operating Regulations will define the responsibilities and obligations of the organizations involved in execution, the coordination relationships, and the mechanisms for delivering resources and rendering accounts, as well as the profiles of the professionals to be contracted.

D. Other key issues and risks

2.6 **Development.** The following medium risks have been identified: (i) failure to achieve effective institutional and operational coordination between the academic actors involved in the program; to mitigate this risk, monitoring indicators will be included requiring that two thirds of the research projects carried out under the program be interinstitutional; also, a strategic committee will be created (see paragraph 3.6) whose functions will include facilitating institutional coordination; (ii) failure to develop a mechanism for collaboration and joint work with the productive sector; to mitigate this risk, CEINBIO's capacity will be strengthened with human resources specializing in technology transfer; (iii) actual demand from

the private sector is less than expected; to mitigate this risk, in addition to contracting human resources specializing in technology transfer, workshops and events will be held to raise awareness and encourage dissemination and exchange with the private sector throughout program execution, and a communications plan will be designed and implemented; (iv) failure to valorize scientific and technological knowledge in an effective and timely manner; to mitigate this risk, international good practices on valorizing and commercializing scientific and technological knowledge will be studied and adopted, e.g. the case of IMDEA Alimentación; and (v) delays in renovating the building and procuring and installing equipment, affecting development of the lines of research; to mitigate this risk, consultants will be contracted specializing in procurement and in the design and supervision of works.

2.7 **Sustainability.** The program includes measures of medium- and long-term sustainability in three dimensions. The first refers to the assurance of direct medium-term financing. Although the program will have IDB financing for five years, it is also taking place in the framework of a Collaboration Agreement between the Ministry of Economy and Finance, the Ministry of Education and Culture, the Ministry of Public Health, the OPP, and UdelaR, which will ensure its activities remain funded for a period of at least 10 years. This time horizon will allow it to achieve the expected impacts as far as scientific production, generation of highly-trained human resources, and productive development. The second dimension refers to the generation of financial resources as a result of the activities under the program that will enable a reduction of its financial burden in the medium and long term. Specifically, in the framework of the coordination and knowledge transfer component, revenue is expected to be generated from the sale of science, technology, and R&D services under contract. At the same time, postgraduate training activities will help generate revenue by training students from other countries in the region and from around the world. The third dimension contributing to the program's medium- and long-term sustainability is the fundraising that will occur through competitive mechanisms, specifically by applying for national policy-based funding aimed at promoting STI activities.

III. Implementation and Management Plan

A. Summary of implementation arrangements

3.1 **Borrower and executing agency:** The borrower, the Eastern Republic of Uruguay, will execute the program through the STPC and the OPP.

3.2 **Secretariat of Productive Transformation and Competitiveness.** The STPC will, in coordination with the OPP, supervise the strategic orientation of the program (including development of the expected impacts, outcomes, and outputs), facilitate coordination with the productive sector, and participate in the identification of priority issues for R&D projects.

3.3 **Office on Planning and Budget.** The OPP, through the project coordination unit (PCU)[33] of the Decentralization and Public Investment Division (DDIP), will be

[33] The DDIP project coordination unit has experience executing Bank-financed projects.

responsible for managing the project, including its fiduciary aspects. The PCU will be in charge of: (i) maintaining formal communication with the Bank; (ii) substantiating use of the resources, presenting disbursement requests to the Bank, through the Ministry of Economy and Finance (MEF); (iii) requesting no objections for contracts; (iv) handling external audits; (v) coordinating monitoring and evaluation activities; and (vi) coordinating with the other entities participating in program execution, including the STPC, the FMP, and CEINBIO at the School of Medicine.

3.4 **Fundación Manuel Pérez.** To fulfill its responsibilities in the framework of the program, the PCU will entrust the FMP[34] with the following tasks: (i) administration of the proceeds; (ii) contracting and procurement of the works, goods, and services; (iii) preparation of the work plan; (iv) preparation of the progress reports; (v) preparation of documentation supporting use of the proceeds and requests to the Bank for disbursement; (vi) contracting of the evaluations; (vii) coordination with CEINBIO on the technical aspects of the contracting and procurement of works, goods, and services, and the transfer thereof; and (viii) coordination with CEINBIO on transferring the proceeds for contracting the research staff, as provided for in Subcomponent 1.1, among other tasks. The FMP will engage program management support services in the areas of procurement, financial management, and monitoring.

3.5 **Center for Biomedical Research.** The UdelaR School of Medicine's CEINBIO will take technical responsibility for the scientific research activities, advanced human resources training, and coordination and transfer of knowledge to the productive sector.[35] CEINBIO will be in charge of hiring research staff, using the proceeds that will be transferred to the School of Medicine by the OPP through the FMP. It must also provide the FMP with the information and documentation it needs to draft the program's plan and operating reports, as well as the justification of the use of Bank proceeds, in accordance with the loan contract. It will also be responsible for receiving, operating, and maintaining the works and equipment financed with program resources.

3.6 **Strategic coordination of the program.** The program also provides for the establishment of a Strategic Committee, comprised of the Ministry of Public Health, Ministry of Education and Culture, and Ministry of Economy and Finance, as well as by the UdelaR School of Medicine. The committee members will help define the national health problems and productive development priorities, in the framework of which the Scientific Division of CEINBIO will define the program's scientific and planning activities. The members appointed by the UdelaR School of Medicine will be eminent researchers, and the appointments will reflect the plurality of disciplines represented in the program's activities. The National Secretariat of Science and Technology and the STPC will be invited to participate in this committee.

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[34] The FMP is a public foundation at UdelaR created in 1988. Its purpose is to promote research in the disciplines comprising the School of Medicine's course of studies, collaborating on the administration and execution of university project funds. The foundation has experience executing Bank-financed technical cooperation projects.

[35] The STPC will be the main entity in charge of communicating strategic guidance to CEINBIO, as far as the needs and opportunities of the private sector.

3.7 **Advisory group from the productive sector.** Also, with support from the STPC, an advisory group will be set up with representatives from the productive sector (directors and/or experts from food and pharmaceutical companies) with the aim of providing input to CEINBIO on the food and pharmaceutical industries' research and technology needs.

3.8 **Program Operating Regulations.** The Operating Regulations will describe in detail the operation's execution mechanisms, including the roles and responsibilities of each of the entities participating in program implementation and the aspects of the operation involving coordination between them, among other issues.

3.9 **Conditions precedent to the first disbursement of the financing: As special contractual conditions precedent to the first disbursement: (i) the OPP and STPC have signed an agreement with the FMP and UdelaR, with the participation of the School of Medicine and CEINBIO, to establish the roles and responsibilities for execution of the program's resources and activities; (ii) the OPP and STPC have approved the program Operating Regulations, based on a draft version previously agreed upon with the Bank; (iii) the FMP has engaged support services for managing the program; and (iv) the Ministry of Economy and Finance, the Ministry of Education and Culture, the Ministry of Public Health, and the OPP have signed an agreement for an effective period of at least 10 years with UdelaR to establish and launch, within CEINBIO, a division of food and human health dedicated to conducting research, training human resources, and providing advisory services for the productive sector.** The first condition is based on the need to guarantee to the beneficiary the availability of the proceeds of the financing. The second contractual condition seeks to ensure effective implementation of the program pursuant to the terms agreed upon with the Bank. The third condition addresses the need to strengthen FMP's financial and procurement capacity for effective program implementation (paragraph 3.4). Lastly, the fourth condition will contribute to the program's sustainability once execution has concluded.

3.10 **Procurement.** Procurement funded with the proceeds from the loan will be carried out in accordance with the policies currently governing procurement of works and goods and the selection and contracting of consulting services. Annex III includes the guidelines for financial management and procurement execution.

3.11 **Direct contracting.** Pursuant to the policies set out in document GN-2349-9, direct contracting will be used for specialized, high-tech equipment in accordance with paragraph 3.6 (b) ("to be compatible with existing equipment") and paragraph 3.6 (c) ("the required equipment is proprietary") for a value of US$1,000,000. The purchases expected are an AB SCIEX mass spectrometer (US$600,000) and a NIKON microscope (US$400,000). This equipment will make it possible to: (i) achieve substantial progress in scientific disciplines that are emerging in the region; (ii) offer technologies currently lacking in the country, both in educational and science and technology areas and in productive areas; and (iii) establish new cooperation projects with other national and international researchers. Evaluation and selection of the teams will be the responsibility of CEINBIO expert scientists, under the supervision of the Bank's technical team.

3.12 **Retroactive financing and recognition of local contribution.** The Bank may provide retroactive financing from the proceeds of the loan for up to US$300,000 (5% of the proposed loan amount) and recognize, from the local contribution, up to US$90,000 (4.6% of the estimated amount of the local contribution) for eligible expenditures incurred by the borrower prior to the loan approval date for program planning and management activities, as well as for building renovation and the launch of R&D activities, provided that requirements substantially analogous to those established in the loan contract have been met. The expenditures will have been incurred subsequent to 25 September 2019, the project profile approval date, but under no circumstance include expenditures incurred more than 18 months prior to the loan approval date.

3.13 **Disbursements.** The main modality of disbursements will be "advances" based on real liquidity needs. These advances will preferably be made semiannually, once at least 70% of the amount advanced has been substantiated. Pursuant to the Financial Management Guidelines (OP-273-12), this percentage is justified by the need to streamline the disbursement process, given the time taken by the controls of the Office of the Auditor General (TCR), as well as of the OPP and the FMP. As documentation, the forms justifying the expenditures and the financial planning worksheet will need to be presented. Review of the documentation will be performed ex post. All disbursement requests, as well as the respective accounting, will be channeled through the MEF.

3.14 **Audit.** Within 120 days of the end of the fiscal year, the OPP will present the Bank annually with the program's audited financial statements, pursuant to Financial Management Guidelines (OP-273-12). The audited financial statements at the close of the program will be presented within 120 days after the date of the last disbursement. Audit of these financial statements will be performed by the TCR or by an independent auditing firm acceptable to the Bank.

B. Summary of arrangements for results monitoring

3.15 **Monitoring.** Coordination of program monitoring will be handled by the OPP, with support from the FMP and CEINBIO. Every six months, the OPP will present reports to the Strategic Committee for the program (paragraph 3.6) and reports to the Bank showing its achievements based on the established intermediate outcome and output indicators (see Results Matrix and the MEP). The reports corresponding to the second half of each year will include an annual work plan, as well as a review of targets for the remainder of the program.

3.16 **Evaluation.** Throughout the program, the OPP will perform a midterm evaluation and a final evaluation of the program, pursuant to the guidelines established in the MEP. The final evaluation will focus on attribution of the outcome indicators described in the Results Matrix. Some of the questions the evaluation will seek to answer are: Was the intervention effective at promoting the generation of scientific and technological knowledge on food and human health among the researchers associated with the program? Was the intervention effective at promoting the effective transfer of products and technologies to the productive sector? To answer these questions, a variety of identification strategies and evaluation methodologies will be used, including quasi-experimental methods, reflexive evaluations, and case studies.

Development Effectiveness Matrix		
Summary	UR-L1162	
I. Corporate and Country Priorities		
1. IDB Development Objectives		
Development Challenges & Cross-cutting Themes	-Productivity and Innovation -Institutional Capacity and the Rule of Law	
Country Development Results Indicators	-Government agencies benefited by projects that strengthen technological and managerial tools to improve public service delivery (#)* -Projects supporting innovation ecosystems (#)* -Companies supported in innovation activities (#)*	
2. Country Development Objectives		
Country Strategy Results Matrix	GN-2836	To promote business innovation.
Country Program Results Matrix	GN-2948-2	The intervention is included in the 2019 Operational Program.
Relevance of this project to country development challenges (If not aligned to country strategy or country program)		
II. Development Outcomes - Evaluability		Evaluable
3. Evidence-based Assessment & Solution		9.4
3.1 Program Diagnosis		2.4
3.2 Proposed Interventions or Solutions		4.0
3.3 Results Matrix Quality		3.0
4. Ex ante Economic Analysis		10.0
4.1 Program has an ERR/NPV, or key outcomes identified for CEA		3.0
4.2 Identified and Quantified Benefits and Costs		3.0
4.3 Reasonable Assumptions		1.0
4.4 Sensitivity Analysis		2.0
4.5 Consistency with results matrix		1.0
5. Monitoring and Evaluation		10.0
5.1 Monitoring Mechanisms		2.5
5.2 Evaluation Plan		7.5
III. Risks & Mitigation Monitoring Matrix		
Overall risks rate = magnitude of risks*likelihood		Medium
Identified risks have been rated for magnitude and likelihood		Yes
Mitigation measures have been identified for major risks		Yes
Mitigation measures have indicators for tracking their implementation		Yes
Environmental & social risk classification		C
IV. IDB`s Role - Additionality		
The project relies on the use of country systems		
Fiduciary (VPC/FMP Criteria)	Yes	Financial Management: Budget, Treasury, Accounting and Reporting, External Control. Procurement: Information System.
Non-Fiduciary	Yes	Strategic Planning National System, Monitoring and Evaluation National System.
The IDB's involvement promotes additional improvements of the intended beneficiaries and/or public sector entity in the following dimensions:		
Additional (to project preparation) technical assistance was provided to the public sector entity prior to approval to increase the likelihood of success of the project		

Note: (*) Indicates contribution to the corresponding CRF's Country Development Results Indicator.

After a decade of uninterrupted growth at an average rate of 4.1% between 2003-2018, economic growth in Uruguay has begun to decelerate. During the same period total factor productivity grew at an annual rate of 0.6%, declining to a rate of 0.2% in the most recent years. Related to this, investment has begun to decline at a rate of 7.3% per year on average. Gains in innovation during the period of growth were biased toward the acquisition of equipment and machinery (instead of the innovation in goods or production processes). Despite the national system of innovation having been strengthened by a growing investment in research and development (R&D), which increased until 2017 with highly specialized researchers; there persists a weakness in the scarce technological adoption and in the lack of research oriented by mission with the potential of propelling the economy. Within the food industry, which has potential in Uruguay, the program will seek to address the lack of scientific capacity and the lack of linkages between firms and universities oriented at promoting innovation in the sector. Currently there do not exist critical interdisciplinary efforts nor the adequate infrastructure that would allow for a translation of knowledge gained to new technologies and products being adopted by the food industry. At the international level there exists a growing demand for such super nutritious foods with their associated health benefits. For Uruguay this represents an opportunity at two levels given a strong international demand for such products and the fact that it is the country in the American continent with the highest mortality rate due to non-transmissible chronic illnesses that super foods can help prevent. In this context, the specific objectives of the program are: (i) to increase the capacity for scientific research, technological development, and specialized human resources in the space of foods and human health; and (ii) to promote actions aimed at generating research, development, knowledge and technology transfer in the foods and human health space with institutions within the national network of innovation and with the productive sector. To promote its objectives the program will finance: infrastructure, laboratories, and equipment for CEINBIO; specific R&D programs in the food industry and human health space; the design of a new graduate degree in foods and human health with UDELAR; and it will also promote the provision of scientific-technological services to private sector firms. Expected results include an increase in the scientific publications in this area; specific knowledge-transfer and the adoption of new products by the sector; the formation of students in the new specialized graduate program; and in the long-run it is also expected that investment in R&D in the sector will increase and that there will be an increase in the sales of those firms that participate in the technology-transfer collaboration efforts. The cost benefit analysis shows the program is of net benefit to society. At closure, an impact evaluation will be conducted using differences-in-differences with propensity score matching to measure the increase in scientific publications in the space. This will be complemented by case studies of the occurrence of technology transfer with participating private sector firms.

RESULTS MATRIX

Project objective:	The objective of the program is to contribute to the development of scientific and technological knowledge aimed at problem-solving and innovation in the area of food and human health. The specific objectives are: (i) to build capacity for scientific research, technology development, and specialized human resources in the area of food and human health; and (ii) to coordinate actions on research, training, and knowledge and technology transfer in the area of food and human health with institutions in the national science, technology, and innovation system and with the productive sector.

EXPECTED IMPACT

Indicators	Unit of measure	Baseline	Year Baseline	Final target (2029[1])	Means of verification	Comments
IMPACT 1: To build capacity for scientific research and technology development in the area of food and human health.						
1.1 Scientific publications on food and human health published by authors affiliated with institutions in Uruguay	Number	162	2019	186	Scopus (database of scientific publications)	See MEP.
1.2 Students graduated from the food and human health postgraduate program	Number	0	Year the postgraduate program starts	5	Record of students graduated (UdelaR) Education Statistical Yearbook	See MEP.

[1] In view of the program's technical characteristics, evaluation of the program's impact will be conducted in year 10, even though the IDB financing is for five years. The expectation is that the infrastructure and science and technology equipment capacities will first be enhanced; additions to the team of researchers will be made; and, based on these capacities, implementation of research projects, training and dialogue activities, collaboration, and transfer to the productive sector will be undertaken. Given the timing of the processes involved, and considering the history of other initiatives similar to this program (for example, the experience of IMDEA Alimentación in Spain), the first impacts are not expected until year 10. This definition is also being used because, although the program will have IDB financing for five years, a cooperation agreement will be in place between the Executive Branch and UDELAR ensuring financing for at least 10 years.

Indicators	Unit of measure	Baseline	Year Baseline	Final target (2029[1])	Means of verification	Comments
IMPACT 2: To coordinate actions on research, training, and knowledge and technology transfer in the area of food and human health with the national science, technology, and innovation system and with the productive sector.						
2.1 R&D investments leveraged in the private sector	US$	TBD	Year prior to transfer activities	BL*1.05	Business survey	See MEP.
2.2 Revenue generated from science and technology services provided to companies and other organizations	US$	0	Year prior to transfer activities	US$90,000	Official report of the execution unit to the IDB	See MEP.
2.3 Sales revenue generated by companies participating in knowledge transfer agreements	US$	TBD	Year prior to transfer activities	BL*(1.05)	Business survey	See MEP.

EXPECTED OUTCOMES

Indicators	Unit of measure	Baseline	Year Baseline	Final target (2024)	Means of verification	Comments
OUTCOME 1: To build capacity for scientific research, technology development, and specialized human resources in the area of food and human health.						
1.1 Scientific publications produced in the framework of the program, per researcher per year	Number	0	2019	2.3	Official report of the execution unit to the IDB	See MEP.
1.2 Students enrolled in the postgraduate program on food and human health	Number	0	2019	10	Official report of the execution unit to the IDB. Education Statistical Yearbook	See MEP.
Milestone 1. Women students enrolled in the postgraduate program on food and human health	Percentage	0	2019	50%	Record of students enrolled (UdelaR). Education Statistical Yearbook	There is no evidence of gender bias in training in the fields of food or human health. Still, this indicator will be reviewed at the end of the program.

Indicators	Unit of measure	Baseline	Year Baseline	Final target (2024)	Means of verification	Comments
OUTCOME 2: To coordinate actions on research, training, and knowledge and technology transfer in the area of food and human health with the national science, technology, and innovation system and with the productive sector.						
2.1 Products and technologies transferred to the productive sector	Number	0	2019	3	Official report of the execution unit to the IDB	See MEP.
2.2 Science and technology services provided	Number	0	2019	6	Official report of the execution unit to the IDB	See MEP.

OUTPUTS

Outputs	Unit of measure	Baseline	Year Baseline	Year 2020	Year 2021	Year 2022	Year 2023	Year 2024	Final target	Means of verification	Comments
Component 1: Research, technology development, and training of specialized human resources.											
Subcomponent 1.1: Enhanced infrastructure, equipment, and research capacity at CEINBIO.											
1.1 Building infrastructure renovated	Building remodeled	0	2019	0	1	0	0	0	1	Official report of the execution unit to the IDB	See MEP.
1.2 Science and technology equipment installed and operating	Equipment installed and operating	0	2019	0	0	1	0	0	1	Official report of the execution unit to the IDB	See MEP.
1.3 R&D projects planned and implemented	Projects planned and implemented	0	2019	0	0	3	0	0	3	Official report of the execution unit to the IDB	See MEP.

Outputs	Unit of measure	Baseline	Year Baseline	Year 2020	Year 2021	Year 2022	Year 2023	Year 2024	Final target	Means of verification	Comments
Milestone 1: Interinstitutional R&D projects planned and under implementation	Projects planned and under implementation	0	2019	0	0	2	0	0	2	Official report of the execution unit to the IDB	See MEP.
Milestone 2: Interdisciplinary R&D projects planned and under implementation	Interdisciplinary projects planned and under implementation	0	2019	0	0	2	0	0	2	Official report of the execution unit to the IDB	See MEP.
Milestone 3: R&D projects in collaboration with companies or on demand planned and under implementation	Collaborative projects planned and under implementation	0	2019	0	0	0	0	1	1	Official report of the execution unit to the IDB	See MEP.
Milestone 4: Women researchers participating in R&D projects implemented in the framework of the program	Percentage of women out of total researchers	0	2019	0	0	50%	50%	50%	50%	Official report of the execution unit to the IDB	There is no evidence of gender bias in research in the fields of food or human health. Still, this indicator will be reviewed during program execution.
Subcomponent 1.2. Training of advanced human resources.											
1.4 Postgraduate program on food and human health approved	Postgraduate program approved	0	2019	0	0	1	0	0	1	Postgraduate program on food and human health with certificate of approval from the competent national authority	See MEP.
1.5 Postgraduate courses offered	Courses offered	0	2019	0	0	0	2	2	4	Course registry records (UdelaR management system)	See MEP.

Outputs	Unit of measure	Baseline	Year Baseline	Year 2020	Year 2021	Year 2022	Year 2023	Year 2024	Final target	Means of verification	Comments
Component 2: Coordination and knowledge transfer.											
2.1 Agreements in place with companies or organizations on collaboration and knowledge transfer	Agreements in place	0	2019	0	0	1	1	1	3	Knowledge transfer agreements (or equivalent evidentiary documentation thereof) between the program and client companies or organizations	See MEP.
2.2 Science and technology services offered	Services offered	0	2019	0	0	1	1	0	2	Reports on science and technology development services prepared by CEINBIO and reported to the IDB by the execution unit.	See MEP.
2.3 Workshops for dissemination and exchange with the productive sector held	Workshops held	0	2019	0	1	1	1	1	4	Schedule of events organized by CEINBIO in the framework of the program and records of attendees	See MEP.
2.4 Science and technology meetings held	Meetings held	0	2019	0	1	1	1	1	4	Schedule of events organized by CEINBIO in the framework of the program and records of attendees	See MEP.

FIDUCIARY AGREEMENTS AND REQUIREMENTS

Country:	Uruguay
Project number:	UR-L1162
Name:	Program to Support Research and Innovation on Food and Health
Executing agency:	The borrower, through the Secretariat of Productive Transformation and Competitiveness (STPC) and the Office on Planning and Budget (OPP)
Prepared by:	Abel Cuba and Emilie Chapuis (FMP/CUR)

I. EXECUTIVE SUMMARY

1.1 This operation is for US$7.95 million, of which US$6 million will be financed by the Bank and US$1.95 million by the local counterpart.

1.2 The STPC will, in coordination with the OPP, supervise the strategic orientation of the program; facilitate coordination with the productive sector; and participate in the identification of priority issues for R&D projects. The PCU in the Decentralization and Public Investment Division (DDIP)—under the OPP—has an organizational and administrative structure that will be responsible for managing the program. The OPP and the STPC will sign an interinstitutional agreement with the FMP[1] and the UdelaR School of Medicine's CEINBIO for program execution. The OPP will maintain the relationship with the Bank, with monitoring by the FMP.

1.3 The Fiduciary Agreements and Requirements are based on the findings of an institutional capacity assessment conducted in September 2019 using the methodology described in the Institutional Capacity Assessment System, which found the level of fiduciary risk to be medium.

II. FIDUCIARY CONTEXT OF THE EXECUTING AGENCY

2.1 The PCU in the DDIP has significant experience executing Bank finance programs. Its performance has been satisfactory, demonstrated in fiduciary terms by the annual audits conducted by the Auditor General's Office of the Republic (TCR), which issued unqualified reports. The FMP, created under Law 17,163, was established by UdelaR's Central Board of Directors in February 1988, with the objective of supporting the School of Medicine's research activities by managing the resources provided to it the framework of projects for such purposes. The FMP

[1] The FMP was established by UdelaR's Central Board of Directors. Pursuant to its mandate, it can receive funds and manage them in the framework of projects related to promotion and to scientific and medical R&D.

has experience executing projects sporadically, and therefore its structure is limited in size.

2.2 Following is a description of the systems to be used for program execution:

(i) Budget. The country budget system will be used. The resources for this operation will be recorded under the budget allocated annually in accordance with the MEF and that includes the proceeds from the financing and the local counterpart.

(ii) Treasury. To manage the program resources, a special account will be opened in the program's name in the Central Bank of Uruguay (BCU), under the treasury single account (TSA).

(iii) Accounting and financial reports. The FMP's institutional accounting system will be used, with the OPP conducting regular monitoring reviews.

(iv) Internal control. The transfer of resources from the OPP to the FMP will be subject to intervention by the TCR. The accountability mechanisms will be defined in the program Operating Regulations.

(v) External control. The annual audits of the program may be conducted by the TCR or by an independent audit firm. International Auditing Standards will be used in either case.

III. FIDUCIARY RISK EVALUATION AND MITIGATION

3.1 Based on an institutional capacity assessment of the OPP and the FMP, two fiduciary risks were identified, one medium and the other high. Although the OPP has demonstrated experience in managing Bank-financed projects, there is a medium risk of failure to coordinate work with the STPC and the FMP. This risk will be mitigated by hiring a professional who will work under the OPP to facilitate coordination with the STPC and the FMP.

3.2 The second fiduciary risk, classified as high, is the risk of failing to execute the program in a timely manner due to: (i) a lack of experience among FMP personnel in executing operations financed by the Bank and in projects similar to this one; and (ii) the failure to consolidate internal control mechanisms and commission external institutional audits. To mitigate this risk, the program will strengthen the FMP team by adding two professionals with financial management and procurement experience in executing Bank-financed projects or similar projects. Also, for coordinating the work with the School of Medicine and CEINBIO, these institutes will formally appoint personnel who will work with the FMP. The program Operating Regulations will define the responsibilities and obligations of the organizations involved in execution, the coordination relationships, and the mechanisms for delivering resources and rendering accounts, as well as the profiles of the professionals to be contracted.

IV. Considerations for the Special Provisions of Contracts

4.1 **Exchange rate.** The exchange rate for converting payments made in local currency to the currency of the loan will be the one used for pesofication, with the exchange method set forth in article 4.10(b)(i) of the General Conditions of the loan contract.

4.2 **Audited financial statements.** Audited financial statements will be presented within 120 days after the end of each year. The terms of reference will be agreed upon with the Bank, and the auditing firm will be acceptable to the Bank, with the deadline for presenting the report set forth in article 7.03 of the General Conditions of the loan contract.

V. Agreements and Requirements for Procurement Execution

5.1 The Bank procurement policies currently governing procurement of goods and works, as well as the selection and contracting of consulting services, will be applicable to procurement activities under this operation. As long as the Bank has validated the country public procurement system for use by the Bank in financial operations, the executing agency will be able to carry out procurement and contracting financed with the proceeds from the loan using those systems or subsystems, in accordance with the terms of Bank validation and the validated applicable legislation and processes. The Borrower and Executing Agency will be notified in writing of the terms of this valuation by the Bank.

5.2 All procurement will be included in the procurement plan, which will, at minimum, cover an initial period of 18 months and be updated annually thereafter. This procurement plan will be registered, approved, and published in the Electronic Procurement Plan System prior to beginning procurement. Once registered, it will be updated annually or when necessary in the event of substantial changes to the original plan.

5.3 The justification of an expenditure—that is, the scope of its terms of reference, technical specifications, and budget—will be the responsibility of the project sector specialist and will always require no objection prior to the start of the procurement and pursuant to the project team leader's standards.

5.4 The thresholds applicable to competitive bidding processes in Uruguay are as follows:

Table 1. Competitive bidding

	ICB		NCB		Shopping		ISL
	Public works	Goods and nonconsulting services	Public works	Goods and nonconsulting services	Public works	Goods and nonconsulting services	Consultancy
US$	≥ 5,000,000	≥ 500,000	≤5,000,000	≤ 500,000	≤ 250,000	≤ 50,000	≥ 200,000

5.5 The procurements expected in the framework of this operation is included in the procurement plan. The corresponding supervision modality for each process will be defined in the operation's updated and approved procurement plan. Changes to the supervision modality will be agreed upon through an update to the published procurement plan.

Table 2. Procurement.

Procurement description	Estimated cost of the contract	Procurement method	Procurement review	Source		Estimated date	Technical review by the project team leader	Comments
				IDB %	Local %			
Infrastructure remodeling	$600,000	CB	Ex ante	75.5	24.5	H1-2020	Ex ante	Works
Mass spectrometer	$600,000	DC	Ex ante	75.5	24.5	H1-2020	Ex ante	Goods and services
Microscope	$400,000	DC	Ex ante	75.5	24.5	H1-2020	Ex ante	Goods and services
Researchers – R&D project	$3,000,000	IC	Ex ante	75.5	24.5	H1-2020	Ex ante	Individual consultancy

5.6 **Retroactive financing.** The Bank may provide retroactive financing from the proceeds of the loan for up to US$300,000 (5% of the proposed loan amount) and recognize, from the local contribution, up to US$90,000 (4.6% of the estimated amount of the local contribution) for eligible expenditures incurred by the borrower prior to the loan approval date for program planning and management activities, as well as for building renovation and the launch of R&D activities, provided that requirements substantially analogous to those established in the loan contract have been met. The expenditures will have been incurred subsequent to 25 September 2019, the project profile approval date, but under no circumstance include expenditures incurred more than 18 months prior to the loan approval date.

5.7 **Direct contracting.** The procurement plan includes two procurements of specialized, high-tech equipment for a value of US$1,000,000, pursuant to paragraph 3.6 (b) ("to be compatible with existing equipment") and paragraph 3.6 (c) ("the required equipment is proprietary") of document GN-2349-9. The project envisages the purchase of an AB SCIEX mass spectrometer (US$600,000) and a NIKON microscope (US$400,000). The fundamental purpose of this procurement is to strengthen and consolidate the scientific and technological capacities of the research groups that are part of the beneficiary institutions by: (i) enabling substantial progress in scientific disciplines that are emerging in the region; (ii) offering technologies currently lacking in the country, both in educational and science and technology areas and in productive areas; and (iii) establishing new cooperation projects with other national and international researchers. Evaluation and selection for the purchase of this equipment is the responsibility of a committee of expert scientists that is conducting a careful analysis, including not only the scientific merit of these projects but also the characteristics of the equipment the institutions currently have and their lines of future research, all under the

supervision of the Bank's technical team. The risk of these purchases is therefore low because: (i) the goods to be procured are not common but rather highly specialized equipment for conducting specific research in the framework of the program; (ii) the technical area has thoroughly justified the reasons making this equipment unique and necessary for the work to be done; and (iii) all the equipment is goods to be procured from countries eligible for the Bank, registered by the manufacturers, sold by the manufacturers to the program; and/or through the country's exclusive authorized distributor, in keeping with the requirements of the Bank's procurement policies.

5.8 **Procurement oversight.** The procurement activities will be subject to ex post review, except in those cases in which ex ante supervision is justified, which will be explicitly identified as such in the procurement plan. Ex post reviews will be conducted every 12 months, in accordance with the project supervision plan. The following table identifies the thresholds applicable to the foregoing:[2]

Table 3 Ex post review threshold (US$)

Works	Goods	Consulting services
< 5,000,000	< 500,000	< 200,000

5.9 **Records and archives.** For the drafting and archiving of project reports, the formats and procedures to be used are those agreed upon and set forth in the program Operating Regulations and in keeping with applicable policy requirements.

VI. Financial Management Agreements and Requirements

A. Programming and budget

6.1 OPP follows the budget rules establishing how the five-year budget sent to the Executive Branch is to be drafted and presented. The budget is then consolidated by the MEF before 31 July, of the first year of the administration. Annual budget reprogramming and expansions are prepared by the Executive Branch for presentation with the Accountability Report and the Budget Execution Report. The program budget is handled through the line item "Miscellaneous Loans" (subparagraph 24, Executing Unit), where Bank financing and local counterpart from general revenue will be recognized.

6.2 The project's budget is managed through Uruguay's country system (Financial Information System – SIIF), in this case by the OPP, through the PCU in the DDIP.

B. Accounting and information systems

6.3 In the framework of an Institutional Agreement to be signed by the OPP and UdelaR, the program's accounting will be performed by the FMP through its institutional accounting system. To do so, a new database will be set up that is to be exclusively and independently used for the program. Periodically, whenever a

[2] The thresholds established for ex post review are applied on the basis of the executing agency's fiduciary execution capacity and may be modified by the Bank to the extent that this capacity changes.

request is made to the Bank for justification of payments, the OPP will check against the financial reports produced by the program's accounting.

6.4 Accounting for the program will be carried out using International Accounting Standards. Specific ledger accounts will be set up that are directly associated with program components and the outputs used for program monitoring.

6.5 The program's financial statements to be audited annually will be the following: (i) statement of cash received and disbursements made; and (ii) statement of cumulative investments. Both will be accompanied by the corresponding notes.

C. Disbursements and cash flow

6.6 The project resources will be managed through the TSA, for which the National Treasury will, at the OPP's request, set up a special BCU account. This account will receive the funds disbursed by the Bank. However, because it is a nominative account (payments cannot be made from it), the FMP will, in the framework of the OPP-UdelaR institutional agreement, open a specific bank account for the project in order to make the corresponding payments.

6.7 The FMP will periodically transfer funds to the School of Medicine to contract researchers and technical staff (Subcomponent 1.1). Accountability reports for this activity will be monthly, the procedure for which will be established in the program Operating Regulations.

6.8 The main modality of disbursements will be "advances" based on real liquidity needs. These advances will preferably be made semiannually, once at least 70% of the amount advanced has been substantiated. The documentation required will include the accountability forms and the financial planning worksheet. Pursuant to the Financial Management Guidelines (OP-273-12), this percentage is justified by the need to streamline the disbursement process, given the time taken by the controls of the Auditor General's Office, as well as of the OPP and the FMP. The e-Disbursements system will be used for processing of disbursement requests. The exchange rate for converting payments made in local currency to the currency of the loan will be the one used for pesofication. All disbursement requests, as well as the respective accounting, will be channeled through the OPP.

D. Internal control and audit

6.9 The OPP will be responsible for timely monitoring of the FMP's fiduciary activities. In accordance with the provisions of the Amended Text on Accounting and Financial Administration (TOCAF), the TCR will intervene in the transfers that the OPP makes to the FMP.

6.10 For the FMP's administration, procedures will be set forth for transfers, accountability, and preparation of the reports that will form part of the program Operating Regulations. Additionally, in order to guarantee compliance with those procedures, the FMP team will be strengthened with the addition of two part-time professionals specializing in procurement and financial management, respectively; and, for monitoring and follow-up on the program, a monitoring professional will be engaged to work as part of the OPP's PCU team. All these professionals will have prior experience and knowledge on managing Bank-financed or similar projects.

E. External control and reporting

6.11 The OPP will present annual financial auditing and internal program control reports to the Bank before 30 April of the subsequent year. Likewise, the financial audit report at the close of the project must be presented within 120 days after the date of the last disbursement. The engagement of the auditing firm and respective terms of reference will follow the Financial Management Guidelines (OP-273-12).

6.12 The costs of the audit can be covered with resources from the loan. The audit may be conducted by the TCR or by an independent audit firm.

F. Financial oversight plan

6.13 The financial oversight plan includes participation in the follow-up sessions to the program's risk matrix and review of the annual audit report that could entail conducting site visits to update knowledge of internal systems.

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-___/19

Uruguay. Loan ____/OC-UR to the Eastern Republic of Uruguay
Program to Support Research and Innovation on Food and Health

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Eastern Republic of Uruguay, as borrower, for the purpose of granting it a financing aimed at cooperating in the execution of the Program to Support Research and Innovation on Food and Health. Such financing will be in the amount of up to US$6,000,000 from the resources of the Bank's Ordinary Capital, and will be subject to the Financial Terms and Conditions and the Special Contractual Conditions of the Project Summary of the Loan Proposal.

(Adopted on ___ _____ 2019)

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