

Appendices

Appendix 1: list of Acronyms

- CBA: Cost-Benefit Analysis
- CNPq: National Council for Scientific and Technological Development
- Embrapii: Brazilian Company of Research and Industrial Innovation
- EU: Embrapii Unit
- FAPESP: São Paulo Research Foundation
- FINEP: Funding Agency for Studies and Projects
- FONTAR: Argentine Technological Fund
- GDP: Gross Domestic Product
- GII: Global Innovation Index
- IBGE: National Institute for Geography and Statistics
- IOA: Input-Output Analysis
- IP: intellectual property
- MCTI: Ministry of Science, Technology and Innovation
- OECD: Organisation for Economic Co-operation and Development
- PINTEC: national innovation survey
- PIPE: Innovative Research in Small Business
- PITE: Research Partnership for Technological Innovation
- QCA: Qualitative Comparative Analysis
- R&D: Research and Development
- RO: research organisation
- SMEs: Small and medium-sized enterprises
- ToC: Theory of Change
- TRL: Technology Readiness Level
- UIC: university-industry collaboration
- WIPO: World Intellectual Property Organization

Appendix 2: list of reviewed publications on Embrapii model

	Reference	Focus	Scope	Approach	
1	SANTOS, J. S. DOS; FUCK, M. P. Trajetórias da inovação no Brasil: o papel da Embrapii. <i>Revista Espacios</i> , v. 37, n. 36, p. 5–17, 2016.	Innovation Model	Incentive	To analyze Embrapii's potential contribution to the Brazilian Innovation System.	Documentary and/or bibliographic review
2	MARTINS, L. C. A Embrapii e a necessidade de investimento em inovação. p. 33, [s.d.]. (Trabalho de conclusão de curso de especialização)	Innovation Model	Incentive	To verify the performance of Embrapii with a view to improving national technology applied to industry sectors.	Documentary and/or bibliographic review
3	GUIMARÃES, J. A.; OLIVEIRA, J. F. G. DE. Building trust in innovation: The case of Embrapii. Em: REYNOLDS, E. B.; SCHNEIDER, B. R.; ZYLBERBERG, E. (Eds.).	Innovation Model	Incentive	Evaluate Embrapii's experience and draw lessons from its main results and characteristics	Documentary and/or bibliographic review
4	GORDON, J. L.; STALLIVIERI, F. Embrapii: um novo modelo de apoio técnico e financeiro à inovação no Brasil. <i>Revista Brasileira de Inovação</i> , v. 18, n. 2, p. 331–362, 3 out. 2019.	Innovation Model	Incentive	To present the characteristics of Embrapii's operating model and the results achieved in stimulating the R&D activity of firms in cooperation with ICTs in Brazil, from September 2014 to June 2018.	Documentary and/or bibliographic review
5	COSTA, M. F. DA; CAMPOS, A. L. S. DE; DUQUE, T. O. Os Polos Embrapii IF e a caracterização das relações universidade-empresa-governo. . Em: III SIMPÓSIO INTERNACIONAL DE GEOGRAFIA DO CONHECIMENTO E DA INOVAÇÃO. Campinas: nov. 2019.	Innovation Model	Incentive	Compare the interaction model between Embrapii IF Poles and companies to the theoretical models of university-industry-government relations	Documentary and/or bibliographic review
6	BEZERRA BORGES, D.; MEYER SOARES, P.; SANTANA SILVA, M. Programs and Instruments for Promoting Innovation with Technology-Based Companies in Brazil. <i>Journal of technology management & innovation</i> , v. 16, n. 2, p. 28–40, ago. 2021.	Innovation Model	Incentive	Comparative study of programs and instruments to foster innovation for smaller companies coordinated by the Federal Government and operated through its Autarchies, Public Companies and Social Organizations.	Documentary and/or bibliographic review
7	RENATO DA SILVA GOMES. Arranjos institucionais e governança para o fomento à inovação no Brasil: análise dos principais resultados da Embrapii 2013-2019. Brasília: Escola Nacional de Administração Pública, 2020. (Dissertação de mestrado)	Governance		To analyze the institutional arrangement that constitutes Embrapii and its model of action	Documental/bibliographic review
8	CASTRO, F. P. DE; CAMPOS, G. T. DE; GILABERTE, T. P. A Embrapii como perspectiva à inovação. <i>Cadernos de Prospecção</i> , v. 10, n. 2, p. 164–176, 30 jun. 2017.	Governance		Discuss the interaction between the main actors and institutions that participate in the public and private strategic alliance project - Embrapii	Documental/bibliographic review
9	ANTUNES, A. M. DE S. Inovação & propriedade industrial & indústria química. <i>Química Nova</i> , v. 36, n. 10, p. 1491–1496, 2013.	Knowledge and Technology Transfer		To contribute to the discussion about the transfer of knowledge from ICTs to companies in the Brazilian context.	Analysis of development indicators and patent data from the Brazilian versus international chemical industry.
10	GUARIEIRO, L. et al. Eixos Mobilizadores em Química: um breve olhar quinze anos depois. <i>Química Nova</i> , v. 41, n. 10, p. 1226–1236, 2018.	Knowledge and Technology Transfer		Outline a panorama for the construction of a new agenda within the scope of the SBQ (Brazilian Society of Chemistry) for the next 15 years, against the backdrop of Industry 4.0, Society 5.0, the Sustainable Development Goals, the creation of Embrapii, the SENAI Institutes of Innovation and the role of graduate programs in Chemistry.	Literature review
11	MOTTA, F. G. et al. O papel dos NITs na construção de uma relação de longo prazo com parceiros da ICT – O caso do IPT como Unidade Embrapii. Em: MORI, M. et al. (Eds.). . <i>Inovação em Rede: boas práticas de gestão em NITs</i> . Campinas: [s.n.], p. 81–106.	Knowledge and Technology Transfer		To identify the results achieved with the performance of the IPT (Institute of Technological Research) as an Embrapii Unit within the scope of the projects financed during the years 2012 to 2016. Focus on technology transfer processes	Case Study
12	PEDRO PAULO SPENCER SOARES. Indicadores de inovação e sustentabilidade: estudo de caso do modelo operacional da associação brasileira de pesquisa e inovação industrial – Embrapii. Recife: Universidade Federal de Pernambuco, 2021.	Knowledge and Technology Transfer		Diagnose the Innovation and Compliance policies carried out by the Embrapii Units, specifically with regard to the use of intellectual property management and compliance/integrity tools.	Exploratory and descriptive approach focusing on analysis of institutional records, as well as through the collection of information from the areas responsible for the implementation, execution and monitoring of innovation projects

13	FERNANDEZ, G. D. R. Diretrizes para construção de uma metodologia de gerenciamento de projetos de pesquisa, desenvolvimento e inovação tecnológica – caso do escritório de gerenciamento de projetos do INT na Embrapii. Niterói: Universidade Federal Fluminense, 2016. (Dissertação de mestrado)	Project Management	Using the experience of the National Institute of Technology (INT), define guidelines for the construction of a project management methodology that focuses on the execution of RDI projects that assist researchers in conducting projects belonging to the Embrapii program.	Case Study
14	GONÇALVES, L. R.; DE MELLO, A. M.; TORRES JUNIOR, A. S. Composição de Carteira de Projetos de P&D com Recursos Públicos: dificuldades e soluções. Revista de Administração e Inovação, v. 12, n. 2, p. 238–256, 25 jun. 2015.	Project Management	The article examines the difficulties encountered in the process of composing the portfolio of Embrapii projects at the Institute of Technological Research of the State of São Paulo (IPT)	Bibliographic Research; Participant Observation; Semi-structured interviews; Desk research
15	SCHEFER, C. F. Embrapii e sua relevância como instrumento de Política de Ciência, Tecnologia e Inovação. Porto Alegre: Universidade Federal Do Rio Grande Do Sul, 2020. (Dissertação de mestrado)	Evaluation of Results and/or Impacts	Identify the main effects and consequences of the model in the accredited units and in the projects developed	Literature review and Meta-evaluation (based on the 2018 and 2019 partial evaluation instruments used by Embrapii)
16	RONSON, S.; AMARAL, D. C. Avaliação de redes de instituições de pesquisa científica e tecnológica baseada em um sistema de gestão padronizado. Gestão & Produção, v. 24, n. 3, p. 557–569, 28 set. 2017.	Evaluation of Results and/or Impacts	To propose an evaluation model as a mechanism for the improvement of a network of ICTs that uses the Embrapii management system (EOE) standard.	Action research cycles, which consisted of the study of the materials made available by Embrapii, the literature on evaluation, and the proposition of the model. Thesis adds ethnographic method with consultation with specialists.
17	RONSON, S. Proposta de padrão para sistema de gestão da inovação: a experiência Embrapii para a melhoria de um Sistema Nacional de Inovação. Mestrado em Processos e Gestão de Operações— São Carlos: Universidade de São Paulo, 10 ago. 2015.	Evaluation of Results and/or Impacts	To propose an evaluation model as a mechanism for the improvement of a network of ICTs that uses the Embrapii management system (EOE) standard.	Action research cycles, which consisted of the study of the materials made available by Embrapii, the literature on evaluation, and the proposition of the model. Thesis adds ethnographic method with consultation with specialists.
18	FREITAS, R. K. DE. A natureza jurídica das parcerias influencia o desempenho? Uma investigação nas parcerias estabelecidas pela Embrapii. Rio de Janeiro: Fundação Getulio Vargas, 217DC. (Dissertação de mestrado)	Evaluation of Results and/or Impacts	Diagnose the capacity of Embrapii Units to achieve their management goals and indicators, according to their legal nature (public, private and hybrid). Three management indicators were chosen, contained in Annex I of the 8th Amendment to the Management Contract between Embrapii, MCTIC and MEC: prospecting for companies; technical proposals; project contracting.	Exploratory research; Quantitative - statistical models/multiple linear regressions; Documentary research, bibliographic research and field research
19	SALLES-FILHO, S. et al. Effectiveness by Design: Overcoming Orientation and Transaction Related Barriers in Research-Industry Linkages. Revista de Administração Contemporânea, v. 25, n. 5, p. 22, 2021.	Evaluation of Results and/or Impacts	To analyze the effectiveness of the Embrapii model; Understand the factors that hinder or facilitate collaboration between Research Organizations and industry; 63 projects supported by Embrapii during its pilot phase (between 2012 and 2016) involving three research organizations and 44 companies	Questionnaires; Interviews; Technical visits
20	VARRICHIO, P. DE C.; TOSTO, G. DA L.; VILLELA, R. N. Novos modelos de financiamento à inovação tecnológica no Brasil: um estudo sobre a Embrapii nos projetos-pilotos do IPT. Revista de Empreendedorismo, Negócios e Inovação, v. 4, n. 2, p. 115–138, 2020.	Evaluation of Results and/or Impacts	Discuss the results that were evidenced in the partnership between companies and IPT-Embrapii	Exploratory, qualitative and descriptive research, based on secondary and primary data (semi-structured interviews)

Appendix 3: case studies

This appendix presents two illustrative case studies, selected due to their representativeness of the most frequently observed categories of impact, as well as the availability of detailed additional information from external sources. These cases are presented solely to provide concrete illustrations of how the results described translate into practice. They should not be interpreted as representative or conclusive with regard to the overall performance of the model. Comprehensive quantitative analyses are presented in the main body of the article.

3.1. ImunoScov19: product innovation for public health applications

The ImunoScov19 project, developed in Rio de Janeiro, Southeast of Brazil, by the Embrapii Unit COPPE UFRJ (a federal public university), in partnership with FK Biotechnology (a medium-sized private company) and Fiocruz (a public health foundation under the Ministry of Health), marked a major step in Brazil's COVID-19 diagnostic response. The test detects and quantifies IgG antibodies against the SARS-CoV-2 S-protein, enabling the identification of antibodies with 95% accuracy.

Unlike most tests targeting the N-protein, ImunoScov19 focused on the S-protein, offering reliable data on immunity and vaccine efficacy (Delduque et al., 2022). It proved instrumental in informing decisions on vaccine mandates and health policies (Aveni and Morais, 2021). Prior to its development, Brazil relied on costly PCR tests and faced supply chain constraints, despite requiring 20 million tests per month. ImunoScov19 significantly boosted national testing capacity, reaching tens of thousands of units per week and reducing costs to US\$3–5 per test.

The project also generated patent applications (WIPO, 2022), securing exclusive rights for FK Biotechnology and strengthening its market position. Beyond its economic impact (ABC, 2020; Nioi and Napoli, 2021), the test supported structured decision-making on quarantine, businesses reopening, and vaccination strategies.

3.2. Smart Logistics: environmental impact reduction through innovation

In Ourolândia, northeast of Brazil, the marble industry faced a severe environmental crisis due to inefficient extraction processes—only 30% of the extracted marble was used, while the rest was discarded as waste. In 2017, the State Public Ministry of Bahia filed 16 civil public lawsuits against local companies, demanding US\$146 million in fines for environmental damage.

The Smart Logistics project, led by the Embrapii Unit SENAI CIMATEC, a private non-profit institution, in partnership with 65 micro and small enterprises, introduced solutions to reduce waste and restore ecological balance (FIEB, 2021). Innovations included self-compacting mortar made from sawing waste, use of irregular marble blocks in construction, and the application of marble residues in cement production and soil amendment. Computational tools also helped optimise material flows and reduce environmental pressure. These measures enabled companies to continue operating while significantly mitigating environmental impact. Fines were reduced, with part converted into restoration initiatives, demonstrating how technological innovation can align with environmental responsibility.