



UR-T1182: Promoting Productive Transformation and
Competitiveness of Uruguay's Agri-Food Industry
based on Science Technology and Innovation

Livestock Sector Assessments

DECEMBER 3, 2019

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A. Sector Performance, problems and opportunities

Economic Growth

- Rapid economic expansion: 4.1 % annual growth (2003-2018)
- Productivity growth for agricultural sector: 3% (2002-2013)
- Agri-food production & bio-economy: key pillars of the economy
- MGAP: promoting agricultural with “sustainable intensification”
- Goal: Double Uruguay’s agri-food production by 2050

National innovation plan for the agri-food industry

- National System of Productive Transformation & Competitiveness
- Link: Science, technology and innovation with production sectors
- Science & technology for agri-food industry (long-term strategy)
- Technology development centers to improve value added agri-food
- Development of knowledge platform for sustainable production

Livestock Industry

- Solid production capacity: wool #2, dairy #5, and beef #6
- Efforts to diversify exporting products with higher-value added
- Strong competitive cost-advantage in commodities
- Traceability & transparency action for beef production
- Dairy cow: average productivity of 3,500 L/hectar/year

Human capital for agricultural research

- Well-established HR capacity in agricultural research among LAC
- Number of researchers are growing with relative high % of PhDs
- Demand for researchers is estimated 2~3 times in the near future
- Major: UdelRa & National Agricultural Research Institute (INIA)
- Potential valuable human capital for innovative agricultural R&BD

Low-value added commodities

- Low complexity products: locked in low-value added commodities
- After traceability action for beef, innovative actions not prominent
- Some dairy products sold ‘anonymously’, not traceable
- Dairy products: low-value added, less processed, and not varied
- Volatility of raw livestock products due to global price fluctuation

Research collaboration

- Fragmented collaboration among key actors of innovation systems
- Low innovative and advanced inputs for agri-food industry
Based on mostly short-term needs, (not medium-and/or long-term)
- Collaboration based on personal relations rather than institutional
- Few successful collaborations among academy-research-industry

Poor commercialization and venture capital

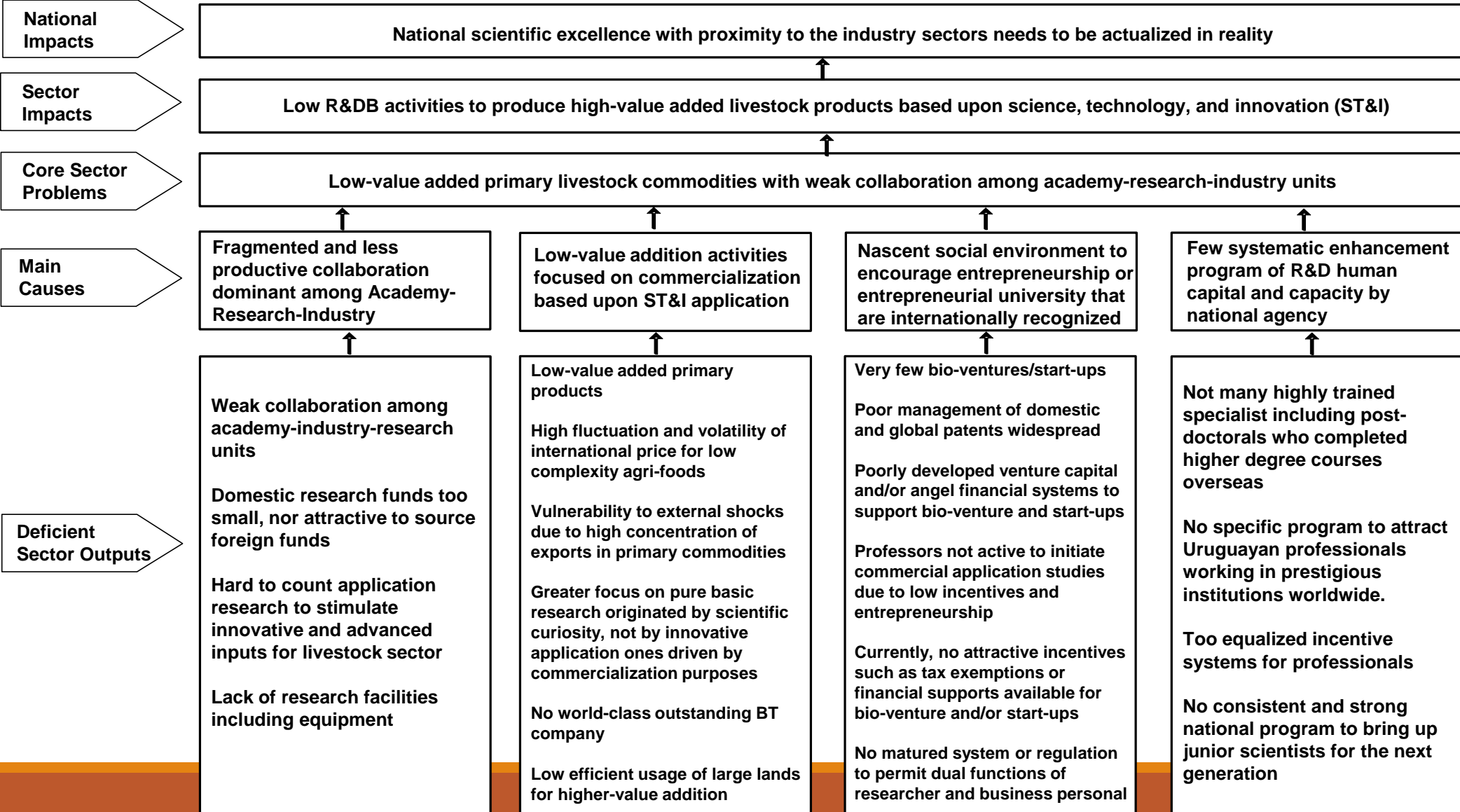
- Curiosity-driven basic science, apart from commercial demands
- Few BT companies operated within narrow areas of expertise
- No stable systems for research specialist to initiate own start-ups
- No secured systems to provide incentives (tax exemptions, etc.)
- Lags behind in terms of venture capital availability

Low R&D investment for technology & innovation

- National R&D investment about 0.4% of the GDP
- Still very far from OECD (2.5%), even from some LAC of 0.7%
- Insufficient for sustainable productivity & competitiveness
- Essential to increase innovative and value-added agri-foods
- Need to support science, technology, and innovation activities



Problem Tree



B. Livestock Sector Strategy

Current Status of Activities and Necessary Technology

Current status of activities for producing agri-food are summarized for beef cattle, dairy cow, meat/dairy/feed technology, and animal BT in terms of academic and production excellency, higher-value addition, industry application, and human resources. Necessary technology and activities for producing innovative and complex agri-food are proposed as well

Innovation and application research center

Key milestones need to establish labs of dairy and meat technology within the BT center, to carry out applicative research for the industry, based upon science, technology, and innovation leading to commercialization. Advanced and secured research collaboration networks need to be established, in order to develop value-added dairy and meat products in more sophisticated forms and manners

Strengthening R&BD capability

Strengthening current R&BD capabilities, development of new research capacities, and training and development of human resources identified as critical areas. Therefore, improvement actions should be implemented. Research facilities and equipment and their operation/management rules need to set-up from the beginning of BT center design

Facilitating academy-industry-research units' collaboration

Roles and responsibilities of public institutions and private companies in livestock research need to be enlarged and encouraged to involve collaboration among academy-research-industry units even if recent collaboration advances have led to sustainable productivity growth in beef and dairy industry

Increasing research fund and venture capital environment

Research funds should become larger and be allocated fairly to support the contingent projects that focus on application studies to lead commercialization. Selected research groups by a designated committee should be formed to attract foreign funds strategically. Venture capital or angel financial market should be active to develop and support bio-venture and/or start-ups in livestock sector

Current Status of Activities and Necessary Technology

Item	Current Status of Activities for Producing Agri-food					Necessary Technology and Activities for Producing Innovative and Complex Agri-food
	Academic Excellency	Production Efficiency	Higher Value Addition	Industry Application	Human Resource	
Livestock Biotechnology	O	-	Δ	Δ	Δ	<ul style="list-style-type: none"> - Genomics - Genome-Editing - Omics Analysis - Microbiome
Dairy Technology	Δ	O	Δ	O	Δ	<ul style="list-style-type: none"> - Higher-Value added by Dairy Technology - Animal Bioactive (Functional) Material Technology - Application of Mechanical Processing Technology
Meat Technology	Δ	O	Δ	O	Δ	<ul style="list-style-type: none"> - Higher-Value added by Meat Technology - Animal Bioactive (Functional) Material Technology - Application of Functional Property Transferring to Meat
Animal Feed Technology	Δ	Δ	Δ	Δ	Δ	<ul style="list-style-type: none"> - Animal Feed Technology - Commercialization of Animal Feed Products - National Raw Material (RM) Resource Management
Research and Business Development	-	Δ	Δ	Δ	Δ	<ul style="list-style-type: none"> - Collaboration among academy-research-industry - Productivity, innovation, and value-added products - Scientific and technological research commercialization
Capacity Building	-	-	-	Δ	Δ	<ul style="list-style-type: none"> - Human resource and capacity building - R&BD capacity building - Training and development of human resources

(Φ: Excellent, O: Good, Δ: Need in progress)



C. Livestock Sector Roadmap_ Innovation & Application

Livestock BT Lab

A technological innovation center for livestock BT with a clear mission can enable the industry to exploit new and emerging technologies by bringing together research commercialization and industry

Dairy Technology Lab

This technology laboratory should be considered as priority one to counteract against global price fluctuation and volatility of raw dairy products, and to add value through technological sophistication using biotechnology and manufacturing processes

Meat Technology Lab

Meat industry has a significant potential in terms of number of animals and competitive cost of production. To add value on the meat products, for example, management skills for fattening processes of beef would increase chance to export them by a higher price for Asian countries

Animal Feed Technology Lab

One of the main factors making the technical advances possible was the increased use of concentrate feeds. Laboratory for feed technology would be indispensable to carry out commercialization of animal feed products

Livestock R&BD

Academy-industry collaboration, professional training, and knowledge-technology adoption and transferring can be implemented if these will be focused to support productivity, and bring out innovation and value-added agri-food products through BT center for livestock R&BD

Capacity Building Center for Livestock BT

R&BD human resource and capacity building for BT are key factors for improving livestock technologies. R&BD capacity building becomes feasible through strengthening R&BD capabilities, development of new research capacities, and continuous training and development of HR



C. Livestock Sector Roadmap (2021~2030)_Draft

Centers	2021~2023	2024~2026	2027~2030
Innovation Research Center Livestock BT	Establish Livestock BT Lab (Scientific & Technical Innovation & Application)	Develop Livestock Biotechnology (Commercialization)	Sophistication and Export of Commercialized High-Value BT Products
Application Research Center Dairy Technology	Establish Dairy Technology Lab (Scientific & Technical Innovation & Application)	Develop Dairy Technology Lab (Commercialization)	Sophistication and Export of Commercialized High-Value Dairy Products
Meat Technology	Establish Meat Technology Lab (Scientific & Technical Innovation & Application)	Develop Meat Technology Lab (Commercialization)	Sophistication and Export of Commercialized High-Value Meat Products
Animal Feed Technology	Establish Animal Feed Technology Lab (Scientific & Technical Innovation & Application)	Develop Animal Feed Technology Lab (Commercialization)	Sophistication and Export of Commercialized High-Value Animal Feed Products
Research and Business Development (R&BD)	Establish Collaboration Center (Scientific & Technical Innovation & Application)	Develop Collaboration Works (Commercialization of Integrative Products)	Ensure & Export at least 5 World-Class Collaborative & Integrative Complex Products
Capacity Building Center Capacity Building for Livestock BT	Establish Capacity Building Center (HR Training & Capacity Development)	Capacity Development & Sophistication (Support for Academy, Industry, Bio- venture/Start-ups, etc.)	Secure Competent World-Class Specialist and Export of Successful CDP to LAC, etc.



C. Livestock BT Roadmap (2021~2030)_Draft

Centers	2021~2023	2024~2026	2027~2030
Genome Selection	Equipment supporting facility dev. (Core facility center) HR training	Big data collection Systemic informatics dev. Database system dev	New breed dev. Performance test Customer-oriented product dev.
Genome-Editing	Equipment supporting facility dev. (Core facility center) HR training	Core genome-edited livestock prod. Genome-edited cell banking system Maintaining system dev.	Safety assessment Performance test Field test
Omics Application	Equipment supporting facility dev. (Core facility center) HR training	Systemic tech. dev. Systemic informatics dev. Database system dev.	Industry integration system dev. Industrial application
Microbiome Application	Equipment supporting facility dev. (Core facility center) HR training	Microbiota selection Microbiota characterization Field test	Microbiota banking system dev. Industrial application



D. Livestock BT Research Projects



Research Project	Target Livestock	Target Trait	Collaboration Partner
Agrigenomics Solutions for Breeding Livestock Animals	Cattle	Climate change adaptation Productivity High quality/Value addition	SNU, Local & International Team
	Chicken/Pig	Disease resistance Climate change adaptation Productivity Value addition	SNU, Local & International Team
Microbiota in Livestock Animals	Cattle	Disease prevention High quality/Value addition	SNU, Industry Sector, Local & International Team
	Chicken/Pig	Disease prevention Productivity	SNU, Industry Sector, Local & International Team
	Others	Disease prevention Sustainable production system	SNU, Industry Sector, Local & International Team
Genome-edited Livestock	Cattle	Disease resistance Climate change adaptation Productivity	SNU, Industry Sector & International Team
	Chicken/Pig	Disease resistance Climate change adaptation Productivity Biomaterial production	SNU, Industry Sector & International Team
Omics Analysis	All Livestock	High Quality Value addition Customer-oriented product	Local Team & Industry Sector

D. Conclusion

In summary, Uruguay has many strengths which puts the country in a strong position to tackle these development challenges and boost growth in the coming years. Uruguayan livestock sector needs to hone in and emphasize "scientific excellence with proximity to the industry" under the frontier line of "value-addition" and "higher productivity" within the framework of an innovative model of articulation and synergies among research-academy-industry. Therefore, It is also highly recommended to examine whether the livestock sector possesses innovation and collaboration capacity which would drive the related industry to develop high-value added products and to counteract against the global adverse conditions. To this end, furthermore, Uruguay should prioritize potential projects according to urgency and necessity, and allocate resources in an appropriate manner and time to keep carrying out these projects.

The report will be updated by more feedback and input (written comments, description, and statements, etc.) from stakeholders of Uruguay. Let's make this project epitomize what global partnerships could do for Uruguay!!!

Muchas Gracias