

**ASSESSING THE IMPACT OF IOT DRIVEN DIGITALIZATION IN BRAZILIAN  
AGRIBUSINESS: EVIDENCE FROM A PILOT PROJECT**

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**Introdução**

This study evaluates the adoption of IoT-based solutions in Brazilian agribusiness through a pilot project with two use cases: optimizing agricultural machinery and precision livestock farming. Using operational data, mixed methods, and managerial accounting, it measures efficiency gains, cost savings, and environmental impact. Results show financial payback in under three cycles and positive EVA. The study offers a structured, replicable evaluation protocol and integrates an economic-financial lens that goes beyond purely technical assessments of digital technologies.

**Contexto Investigado**

Amid rising global demands for sustainable, efficient, and digital agriculture, Brazil launched the National IoT Plan, prioritizing rural innovation. This study evaluates two IoT applications: machinery optimization via telemetry and precision livestock farming with sensors, electronic scales, and analytics. Implemented in the Cerrado biome, it used a structured protocol combining theoretical frameworks and empirical tools. The study fills global research gaps by demonstrating measurable value and offers a replicable framework for guiding projects, public policies, and IoT scalability.

**Diagnóstico da Situação-Problema**

The pilot IoT project emerged from a scenario of limited systematized information and absence of real-time monitoring in operations. Without telemetry and sensor technologies, farms lacked critical data on machinery performance, input use, and animal management, relying on empirical decision-making. This led to inefficiencies, higher costs, and limited predictability. The lack of robust data also hindered public policy design. To address these gaps, a structured intervention was implemented to generate real-time data and support technical, economic, and strategic decisions.

**Intervenção Proposta**

The study used an applied, qualitative pilot project to assess the technical and economic impacts of IoT adoption in mechanized agriculture and precision livestock systems. Guided by explanatory case study logic, it triangulated data from documents, interviews, field visits, and IoT-generated data. Analyses applied the Logical Model and Results Chain to link inputs to impacts. Key indicators included fuel use, animal weight gain, and emissions. Economic analysis used ABC costing, discretionary expense logic, and the Gecon model to evaluate value creation and replicability across agribusiness.

**Resultados Obtidos**

The pilot project showed that IoT adoption in Brazilian agribusiness improved operational efficiency and sustainability. In machinery management, fuel use dropped 22.9%, with CO<sub>2</sub> emissions cut by 27.8 tons, yielding a payback in under two crop cycles and EVA of R\$ 0.11 per real invested. In livestock, "selective culling" based on predictive analytics cut feed use by 46%, CO<sub>2</sub> by 70%, and water by 21%, with a one-year payback. Both cases proved economically viable, with scalable potential and strong environmental gains, reinforcing IoT as a transformative tool in tropical agriculture.

**Contribuição Tecnológica-Social**

This study highlights how IoT can drive sustainable innovation in agriculture by applying tools like the logical framework, results chain, ABC costing, and EVA in real farm settings. It quantified operational and economic gains from digitalization: fuel savings and CO<sub>2</sub> reduction in machinery, and input efficiency in livestock. Though lacking direct environmental metrics, impacts were inferred from reduced carbon-intensive inputs. The study also offers a replicable framework for future projects and public policies targeting precision agriculture and measurable socio-environmental results.