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Report No: ICR 137111-BR

IMPLEMENTATION COMPLETION AND RESULTS REPORT

ON LOANS IBRD 77730 and 82000

IN THE TOTAL AMOUNT OF US$139.5 MILLION

TO THE

STATE OF RIO DE JANEIRO

WITH THE GUARANTEE OF THE

FEDERATIVE REPUBLIC OF BRAZIL

FOR THE

RIO DE JANEIRO SUSTAINABLE RURAL DEVELOPMENT PROJECT

MAY 30, 2019

Agriculture Global Practice
Latin America and Caribbean Region

CURRENCY EQUIVALENTS

Exchange Rate Effective November 30, 2018

Currency Unit =	Brazilian Real (BRL)
BRL 1 =	US$0.258
US$1 =	BRL 3.86

FISCAL YEAR
July 1 - June 30

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
BCR	Borrower Completion Report
COGEM	Micro-catchment Development Committee *(Comite Gestor das Microbracias)*
CPF	Country Partnership Framework
CPS	Country Partnership Strategy
DRM	Department of Mineral Resources (*Departamento de Recursos Minerais)*
EMATER-Rio	State Rural Extension Agency (*Empresa de Assistencia Tecnica e Extensao Rural do Estado do Rio de Janeiro*)
EMBRAPA	Brazilian Agriculture Research Enterprise (*Empresa Brasileira de Pesquisa Agropecuaria*)
ESS	Economic Sustainability System
FAERJ	Federation of Agriculture, Livestock and Fisheries of the State of Rio de Janeiro (*Federacion da Agricultura, Pecuaria e Pesca do Estado do Rio de Janeiro*
FAO	Food and Agricultural Organization
FAPERJ	State Research Support Foundation (*Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro*
FM	Financial Management
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
ICR	Implementation Completion and Results Report
IFR	Interim Financial Report
IRR	Internal Rate of Return
ISP	Institutional Sustainability Plan
ISR	Implementation Status and Results Report
LA	Loan Agreement
M&E	Monitoring and Evaluation
MDC	Micro-catchment Development Committee (*Comitē Gestor da Microbracia)*
MDP	Micro-catchment Development Plan (*Plano Executivo da Microbracia)*

MIS	Management Information System
NGO	Nongovernmental Organization
NNWF	North and Northwestern Fluminense Region
NPV	Net Present Value
PAD	Project Appraisal Document
PDO	Project Development Objective
PEM	Micro-basin Executive Management Plan
PESAGRO	State Agriculture Research Enterprise (*Empresa de Pesquisa Agropecuaria do Estado do Rio de Janeiro)*
PID	Individual Development Plan
PIU	Project Implementation Unit (*Secretaria Executiva do Projeto)*
PMU	Project Management Unit
Rio GEF	Sustainable Integrated Ecosystem Management in Production Landscapes of the NNWF GEF Project - Rio de Janeiro
SAFF	System for Physical and Financial Monitoring (*Sistema de Acompanamento Fisico Financiero)*
SEAPEC	State Secretariat of Agriculture and Fisheries
SEAPPA	State Secretariat of Agriculture, Livestock, Fisheries and Supply *(Secretaria de Estado de Agricultura, Pecuaria, Pesca e Abastecimento)*
SIAFE-Rio	Integrated System for Budget, Financial and Accounts Management (*Sistema Integrado de Gestão Orçamentária, Financiera e Contábil do Rio de Janeiro)*
SoRJ	State of Rio de Janeiro
UENF	North Fluminense State University (*Universidade Estadual do Norte Fluminense)*

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P101508	Rio de Janeiro Sustainable Rural Development Project
Country	**Financing Instrument**
Brazil	Investment Project Financing
Original EA Category	**Revised EA Category**
Partial Assessment (B)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
State of Rio de Janeiro	State Secretariat of Agriculture, Livestock, Fisheries, and Supply (SEAPPA)

Project Development Objective (PDO)

Original PDO

The PDO is to increase the adoption of integrated and sustainable farming systems approaches in specific areas of the Borrower's territory, thus contributing to the higher-order objective of increasing small-scale farming productivity andcompetitiveness in those areas.

Revised PDO

The objective of the Project is to increase the adoption of integrated and sustainable farming systems approaches in specificareasof the Borrower's territory and help re-establish an agricultural productive environment in areas of the Serrana Regionaffected bythe January 2011 natural disaster, thus contributing to the higher-order objective of increasing small-scale farmingproductivity and competitiveness in those areas.

FINANCING

	Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing			
IBRD-77730	39,500,000	38,735,596	38,735,596
IBRD-82000	100,000,000	60,000,000	50,518,222
Total	**139,500,000**	**98,735,596**	**89,253,818**
Non-World Bank Financing			
Borrower/Recipient	39,519,000	0	0
Total	**39,519,000**	**0**	**0**
Total Project Cost	**179,019,000**	**98,735,596**	**89,253,818**

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
10-Sep-2009	08-Mar-2010	11-Apr-2015	30-Nov-2015	30-Nov-2018

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
27-Oct-2011	9.58	Change in Project Development Objectives Change in Results Framework Change in Components and Cost Change in Financing Plan Other Change(s)
01-Oct-2012	18.83	Additional Financing
22-May-2013	20.83	Change in Components and Cost Reallocation between Disbursement Categories Change in Institutional Arrangements
29-Jun-2015	42.31	Change in Components and Cost Reallocation between Disbursement Categories Change in Institutional Arrangements
01-Sep-2017	56.16	Change in Implementing Agency Change in Results Framework Change in Components and Cost Cancellation of Financing Reallocation between Disbursement Categories

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Moderately Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	29-Dec-2009	Satisfactory	Satisfactory	.33
02	28-May-2010	Satisfactory	Satisfactory	.28
03	30-Jun-2010	Satisfactory	Satisfactory	3.09
04	02-Mar-2011	Moderately Satisfactory	Moderately Satisfactory	3.09
05	14-Dec-2011	Moderately Satisfactory	Moderately Satisfactory	12.51
06	30-Jun-2012	Satisfactory	Satisfactory	17.97
07	16-Jan-2013	Moderately Satisfactory	Moderately Satisfactory	21.11
08	16-Sep-2013	Moderately Satisfactory	Moderately Satisfactory	23.83
09	03-Apr-2014	Moderately Satisfactory	Moderately Satisfactory	27.10
10	08-Nov-2014	Moderately Satisfactory	Moderately Satisfactory	36.04
11	18-Jun-2015	Moderately Unsatisfactory	Moderately Unsatisfactory	41.58
12	31-Dec-2015	Moderately Unsatisfactory	Moderately Unsatisfactory	46.40
13	26-Jun-2016	Moderately Unsatisfactory	Moderately Unsatisfactory	53.41
14	21-Dec-2016	Moderately Unsatisfactory	Moderately Unsatisfactory	53.41
15	03-Jun-2017	Unsatisfactory	Unsatisfactory	53.41
16	27-Dec-2017	Moderately Unsatisfactory	Moderately Unsatisfactory	66.46
17	25-Jun-2018	Moderately Unsatisfactory	Moderately Unsatisfactory	74.98
18	23-Dec-2018	Moderately Satisfactory	Moderately Satisfactory	89.43

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Agriculture, Fishing and Forestry	**100**
Agricultural Extension, Research, and Other Support Activities	2
Public Administration - Agriculture, Fishing & Forestry	21
Other Agriculture, Fishing and Forestry	77

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Social Development and Protection	**50**
Social Inclusion	50
Participation and Civic Engagement	50
Urban and Rural Development	**17**
Rural Development	17
Land Administration and Management	17
Environment and Natural Resource Management	**34**
Renewable Natural Resources Asset Management	34
Biodiversity	17
Landscape Management	17

ADM STAFF

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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. **At the time of project preparation and appraisal (August 2009), Brazil had undergone a period of significant poverty and inequality reduction.** Moderate poverty fell from 32.9 percent in 2002 to 21.6 percent in 2008, while the Gini index also fell from 0.59 in 2002 to 0.55 in 2008 (Country Partnership Strategy [CPS] 08–11). While remaining relatively resilient during the 2008 financial crisis and recovering swiftly in 2009, economic growth slowed from the precrisis levels of 4–5 percent to 2 percent after 2009. Growth in the years after 2003 was largely based on favorable external conditions, credit-fueled consumption, and an expanding labor force. Fast employment creation was the driver of poverty reduction, while an expansion of targeted social programs helped reduce extreme poverty.

2. **Agriculture in the State of Rio de Janeiro (SoRJ) is more important than would normally be expected in an urbanized state.** At appraisal, around 25 percent of the state's gross domestic product (GDP) was derived from agriculture and agro-industrial activities, generating approximately 40 percent of rural employment. More than 60 percent of total state land was dedicated to agricultural activities, most of it in three administrative regions holding more than one-half of the state's rural population: the North and Northwestern Fluminense region (NNWF), and Serrana regions (PAD 2009).

3. **Despite its importance, the agriculture sector faced fundamental challenges.** These included low productivity, limited market links in the face of high demand for agricultural products (Metropolitan area of Rio de Janeiro and smaller urban centers), degradation of the natural resource base, rural poverty, and low capacity of agricultural producers to respond to market demands. These factors were associated with fragile organization of farmers, their widespread use of inefficient and unsustainable agricultural practices, poor infrastructure, the incipient nature of regional industrialization, markets and processes of agro-industrialization, and limited scope of public policies in rural areas.

4. **The World Bank was already active in rural areas of southern and southeastern Brazil, supporting capacity building at the local level for participatory rural development and environmental management practices.** In the years before the approval of the Rio de Janeiro Sustainable Rural Development Project ("Rio Rural"), the need became evident to focus on interventions within a market-oriented approach on agricultural development, calling for new projects to build on the existing productive and social base to enable a more sustainable development impact. The project built on the approaches and institutional structures established under the Integrated Management of Agroecosystems Project in Hydrographic Micro-catchments of the NNWF Project ("Rio Rural GEF") to provide support needed to address the main challenges of the rural sector in the SoRJ.

5. **Alignment with the Government's strategy.** The project responded directly to the Government's higher-level objective of increasing productivity and competitiveness in the small-scale farming sector while improving natural resources management. The state demonstrated commitment and support for local-level capacity building for participatory rural development and environmental management—all central pillars of rural operations in Brazil.

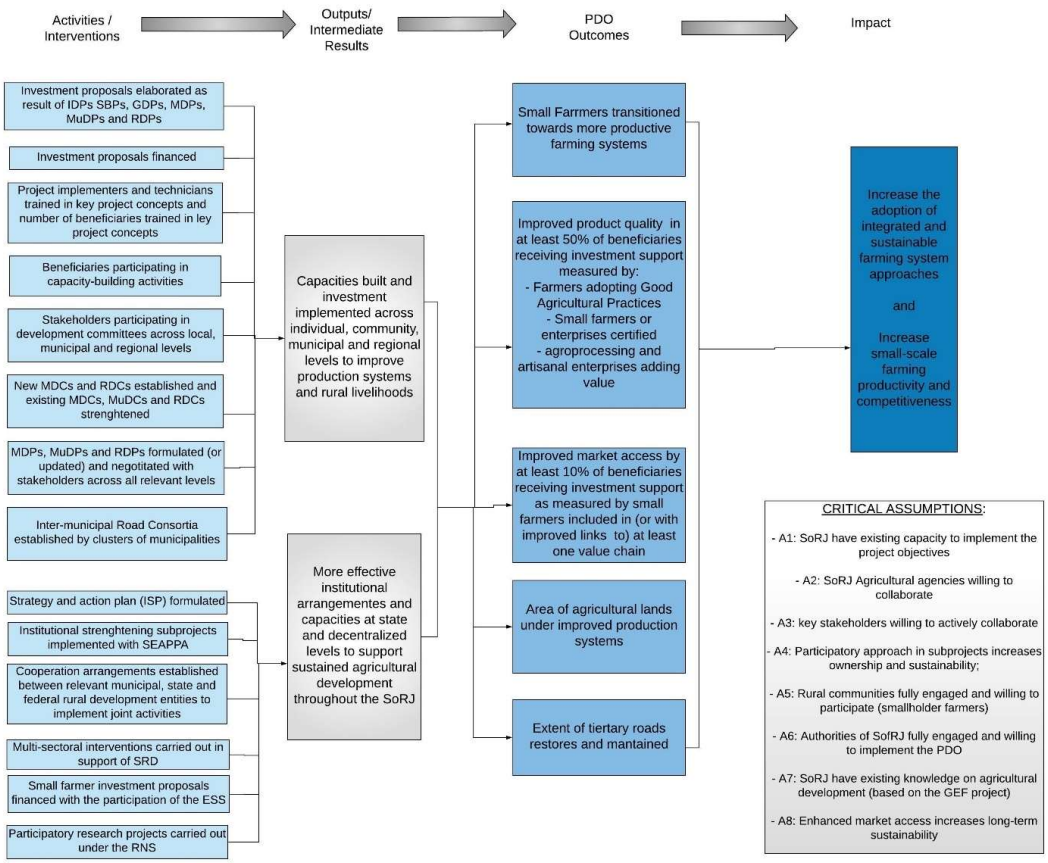
6. The project drew directly on the Rio de Janeiro Sustainable Integrated Ecosystem Management in Production Landscapes of the NNWF GEF Project ("Rio GEF"), which became effective in 2006 and closed in 2011, and on the accumulated knowledge of other World Bank-supported operations in the northeastern and southeastern regions of the country. The design of the project reflected the lessons of those experiences.

7. **Rationale for Bank support.** The project was anchored in the World Bank's CPS 08–11 Report No. 42677. By strengthening farming systems, the project was expected to contribute primarily to the third pillar of the CPS: a more competitive Brazilian economy. Main activities were related to better linking small farmers to markets, promoting education for innovation and growth, and improving governance by strengthening the public management of the rural sector.

Theory of Change (Results Chain)

8. The project was approved before presentation of a Theory of Change in the Project Appraisal Document (PAD) became mandatory, and consequently, the PAD did not contain a diagrammatic representation. With the objective of clarifying the World Bank team's thinking during the period of PAD preparation leading to approval, Figure 1 presents a reconstruction of the prevailing Theory of Change as interpreted by this Implementation Completion and Results Report (ICR) and reconstructed based on the implicit results chain described in the PAD.

Figure 1. Theory of Change



Project Development Objectives (PDOs)

9. According to the Loan Agreement (LA), the PDO of the project was "to increase the adoption of integrated and sustainable farming systems approaches in specific areas of the Borrower's territory, thus contributing to the higher-order objective of increasing small-scale farming productivity and competitiveness in those areas."

Key Expected Outcomes and Outcome Indicators

10. **Key expected outcomes.** These were (a) to strengthen the longer-term impact on sustained agricultural productivity at a larger scale, (b) to improve the efficiency of rural production processes, (c) to enhance market links, and (d) to improve the ability of public institutions to adapt to the evolving demands of the rural sector.[1]

11. **Outcome indicators were the following**:

- At least 50 percent of small farmers in targeted areas transitioned towards more productive farming systems[2]
- Improved product quality in at least 50 percent of beneficiaries receiving investment support as measured by:
  - (i) Number of beneficiary farmers adopting Good Agricultural Practices (GAP)
  - (ii) Number of small farmers or enterprises certified[3]
  - (iii) Number of agro-processing and artisanal enterprises adding value
- Improved market access by at least 10 percent of beneficiaries receiving investment support as measured by their inclusion in (or with improved links to) at least one value chain
- At least 50 percent of the targeted small farmer agricultural lands under improved production systems
- Length (km) of tertiary roads restored and maintained

12. **Targeted beneficiaries.** The project targeted an estimated 37,000 small-farming families (some 150,000 people in total) in the SoRJ. This corresponds to roughly 30 percent of the total rural population in the state. The target population primarily resided in the north (9 municipalities), northwest (13 municipalities), and Serrana (14 municipalities) administrative regions, covering approximately 23,000

[1] See PAD (2009), paragraph 21, page 6.
[2] "Improved production systems" were defined as those that resulted in sustainably better agroforestry, crop, or livestock quality and yields. For example, an improved food crop production system could be associated with the introduction of Conservation Agriculture (through adoption of crop rotations, minimal soil disturbance—zero or minimum tillage—and permanent soil cover) and GAPs.
[3] The project would support technical and financial assistance to farmers or enterprises to be certified in (a) organic agriculture; and (b) production of certified forestry products. Certification of organic products of farmers or their enterprises adopting organic farming would be provided by the Association of Organic Farmers of Rio de Janeiro.

square kilometers (53 percent of the total area of the state). Participating institutions would also benefit from capacity building, enabling them to more effectively meet rural sector demands.

Components

13. **Component 1: Supporting Rural Production and Competitiveness** (estimated total cost US$66.1 million of which IBRD US$32.6 million and Borrower US$15.4 million). This component provided assistance to rural beneficiaries to implement changes in rural production processes through (a) preinvestment activities to strengthen organization and capacity for agricultural productivity; and (b) investments to implement demand-driven activities (subprojects) through the provision of grants aimed at improving sustainable and productive farming systems (productive subprojects), compliance with environmental regulations and adoption of agroecological and environmentally sound practices (environmental subprojects), and erosion control and rehabilitation and maintenance of rural roads (rural roads subprojects).

14. **Component 2: Strengthening Institutional Frameworks** (estimated total cost US$5.2 million of which IBRD US$2.9 million and Borrower US$2.2 million). This component aimed at improving the Borrower's institutional frameworks supporting market-driven agricultural development by (a) strengthening rural institutions and coordination mechanisms through capacity building for the Borrower's agencies, providing better services and coordination with other public and private sector stakeholders through implementing specific activities (institutional subprojects) identified in an institutional sustainability plan (ISP), and contributing to the implementation of a national policy in support of territorial development; (b) improving public and private financial support mechanisms through the enhancement of links between the supply and the demand of financial resources for sustainable rural development activities; and (c) undertaking participatory research to establish a new and effective operational system (the Sustainable Services Research Network System) to conduct agriculture-related research and induce innovation.

15. **Component 3: Project Coordination and Information Management** (estimated total cost US$7.6 million of which IBRD US$3.8 million and Borrower US$3.8 million). This component supported the Borrower's overall project management and coordination functions, including monitoring and evaluation (M&E), as well as dissemination of key sustainable rural development information by financing (a) project coordination through the strengthening of the organizational and operational structure of the Project Implementation Unit (*Secretaria Executiva do Projeto,* PIU); and (b) information management through the development and implementation of a management information system (MIS) that ensured widespread access and adequate information flows to impact stakeholder decision making in support of sustainable rural development as well as through the promotion of the use of digital and other information technology tools among project stakeholders and beneficiaries.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION

16. The project was implemented over a period marked by a series of external events—a major flood that caused 850 deaths, a drought affecting the Serrana region, strikes by the staff of the implementing agency, a fiscal crisis with high inflation, currency devaluation, and judicial power seizures of the Designated Account —which affected implementation and forced the Borrower and the World Bank to adjust project design and implementation arrangements. The following table summarizes the project's timeline and changes.

Table 1. Main Features of Project Restructurings

Timeline		Project restructurings			
	2009 (August)	2011 (September)	2012 (October)	2017 (September)	2018 (November)
Event	Original loan (USD39.5 million)	Level 1 Restructuring Natural disaster	Additional Financing of USD100 million	Level 2 Restructuring Partial cancellation of USD40 million	Project closing
PDO		Change in PDO to include the emergency area (Serrana region)	No changes to PDO	No changes to PDO	No changes to PDO
PDO indicators	5 PDO indicators	3 PDO indicators (2 original PDO indicators were downgraded to intermediate indicators)	3 PDO indicators	3 PDO indicators	3 PDO indicators
Project targets		Reduction of original targets and inclusion of new targets at intermediate level related to the natural disaster in the Serrana region	Increase in project targets	Reduction of project targets	No further change in targets

Revised PDOs and Outcome Targets

17. **Revision of the PDO**. Due to the natural disaster that affected Rio de Janeiro's Serrana region in January 2011, the project was restructured in that year, and the PDO was revised to allow financing of emergency relief activities. The PDO was revised by the addition of a clause as follows: "to increase the adoption of integrated and sustainable farming systems approaches in specific areas of the Borrower's territory *and help re-establish an agricultural productive environment in areas of the Serrana Region affected by the January 2011 natural disaster*, thus contributing to the higher-order objective of increasing small-scale farming productivity and competitiveness in those areas." The restructurings carried out in 2012 and 2017 (partial cancellation) did not modify this PDO.

18. **Beneficiaries and project area.** The 2011 restructuring diverted resources to new activities so the targets for some of the original indicators were reduced. The project area remained unchanged (59 municipalities), but the number of micro-catchments targeted was reduced from 270 to 200, the number of direct beneficiaries targeted was reduced from 24,400 to 19,300, and the number of indirect beneficiaries targeted was reduced from 37,000 to 28,000. The 2012 restructuring (Additional Financing [AF]) significantly increased the project's scale by adding 13 new municipalities, 166 micro-catchments, 27,700 direct beneficiaries, and 50,000 indirect beneficiaries. As part of the 2017 restructuring (partial cancellation), the number of direct beneficiaries was again reduced, this time to 35,000, while the number of municipalities and micro-catchments was not modified.

Revised PDO Indicators

19. **Emergency restructuring of 2011.** The Results Framework was modified to include (a) changes to the PDO and introduction of new intermediate-level indicators to monitor the implementation and results of emergency activities and (b) reduction in the number of beneficiaries and other target values related to the original PDO-level and intermediate-level results indicators, because of the redirecting of project resources to the emergency activities. The only PDO indicator that was not modified was "Extent of tertiary roads restored and maintained" (target: 1,300 kms). Two new intermediate results were introduced under Component 1: (a) number of emergency investment proposals financed (target: 2,300 emergency investment proposals) and (b) all resources related to emergency operations disbursed one year after the natural disaster (target: US$18.77 million).

20. **Restructuring of 2012 (AF).** The targets for three PDO outcome indicators were increased to reflect the goal of scaling up project activities, that is, the number of small farmers transitioned toward more productive and sustainable farming, number of small farmers included in at least one value chain, and hectares of agricultural lands under improved production systems. One PDO indicator was modified to reflect the type of improved farming systems promoted by the project: "Number of small farmers (at least 50% in targeted areas) transitioned towards more productive and sustainable farming systems." Two PDO indicators were reclassified as intermediate results indicators[4] under Component 1: (a) improved product quality and (b) extent of tertiary roads restored and maintained.

Revised Components

21. **Restructuring of 2012 (AF).** Changes were made to several components:

- **Component 1:** (a) longer-term rehabilitation activities in areas of the Serrana region; (b) identification, preparation, and implementation of new investments (productive and environmental 'Structuring Subprojects') by small producers. New activities would be implemented on a larger scale (across several micro-catchments and/or municipalities).

- **Component 2:** (a) new partnerships to enhance cohesion of public policies and institutions under Subcomponent 2.1 (Strengthening Rural Institutions and Coordination Mechanisms); (b) Subcomponent 2.2 (Improving Public and Private Financial Support Mechanisms), an evaluation of the economic sustainability system (ESS), subject to a positive evaluation, additional seed capital for the proposed mechanism; and (c) under Subcomponent 2.3 (Undertaking Participatory Research), additional value-chain studies and participatory research in support of investments under Component 1.

- **Component 3:** (a) incremental management and coordination functions (Subcomponent 3.1); and (b) additional information and outreach activities (Subcomponent 3.2).

Other Changes

22. Other changes introduced during the project implementation period included the following:

- **2011 restructuring:** (a) an extension of the end-disbursement date for the operational costs that enabled the loan proceeds for operational costs to be used beyond March 1, 2012.

- **2012 (AF) restructuring:** (a) AF of US$100 million, (b) increased project area and targets, and (c) two-year extension of closing date.

[4] No clear justification was given in the AF PAD for this change (reduction) in the number of PDO indicators other than (sic) "Project outcome indicators at PDO level and specific targets have also been updated to reflect the expansion of the original activities and the revised implementation schedule." The justification of the Project Management Unit (PMU) for this change was provided by email on May 9, 2019 (sic) "This indicator was excluded from the results framework because it was integrated with the measurement of beneficiaries included in productive value chains, since the improvement of product quality had been one of the axes worked in value chain subprojects. Maintaining this indicator would have been redundant."

- **2015 restructuring:** (a) allow the financing of operational costs for a longer period to help address the fiscal crisis.

- **2017 restructuring:** (a) cancellation of US$40 million of the AF Loan from Categories 1 and 2; (b) reallocation among disbursement categories; (c) simplification of project design, by eliminating institutional and structuring subprojects[5] (Component 2.1), not requiring the creation of consortia of municipalities for road maintenance; (d) change in the Results Framework: reductions in targets of two PDO indicators and the introduction of a new intermediate-level indicator (rural roads rehabilitated, target: 6,000 km).

Rationale for Changes and Their Implication on the Original Theory of Change

23. The rationale for the various restructurings was as follows:

- **2011 emergency restructuring.** Beginning shortly after effectiveness, natural disasters (heavy rains and floods) forced significant adjustments in project implementation arrangements. The World Bank was asked to support the implementing agency by redirecting resources to affected rural areas and providing an immediate response to restore physical access through rural road rehabilitation, restoration of damaged houses, and the restoration of productive assets. All those activities were within the scope of the project. Language relating to geographical targeting and the prioritization of productive activities was added to the PDO to allow the financing of emergency activities in the Serrana region.

- **2012 restructuring (AF).** This was mainly in response to (a) the need to adopt a more integrated and comprehensive approach to disaster risk management after the natural disaster of 2011 and (b) a scaling-up strategy for the project in anticipation of an expected major inflow of investments in the coming decade in the SoRJ, including World Cup in 2014 and the Olympic Games in 2016, and the consequent increased demand for agricultural products. The request for AF was fully consistent with the World Bank Group's CPS 2012–2015 (Report No. 63731-BR), in particular in its first and fourth strategic objectives: to increase the volume and productivity of public and private investments and to further improve sustainable natural resource management and enhance climatic resilience while contributing to local economic development and helping to meet rising global food demand. The AF also supported the state's integrated territorial development policies and strengthened its disaster risk management capacity, complementing the support provided as part of the World Bank's Rio de Janeiro program under the AF for the Strengthening Public Sector Management and Territorial Development TAL (P126735). It involved a slight

[5] During project execution, the bureaucratic process and the incipient organization of the small producers to take on greater investment to implement these public calls for access to the "structuring subprojects", as well as the complexity of the procedures for access to resources by those farmers, made this type of support impossible. With the restructuring of 2017, "structuring subprojects" were replaced by two additional subproject modalities: group and value chain subprojects: (a) group subprojects: under this modality, Rio Rural supported organized groups of smaller producers (3 to 10 producers) in overcoming bottlenecks on their farms, filling the gap of individual subprojects (productive and environmental) allowing mainly machines and equipment to be acquired and used in a group; (b) value chain subprojects: investments were focused on activities that add value to production, through improvement of product quality, stimulation of processing, processing, agroindustry, packaging, seal, and certification. They comprised actions essentially for groups of one or more micro-basins to increase efficiency and overcome bottlenecks in the main agricultural production chains, with emphasis on activities "beyond the farmgate."

adjustment of the PDO and an upward revision of targets consistent with the additional loan funds.

- **2017 restructuring (partial cancellation).** This restructuring was justified by the limited borrowing capacity of the state, which was significantly affected by an acute fiscal crisis, disrupting project implementation for almost one year. As with the other World Bank projects in the state, on several occasions, the judicial power ordered seizures of the funds in the Designated Account. Moreover, the fiscal crisis reduced public investments for rural roads rehabilitation and maintenance. The restructuring involved a cancellation of loan funds and a downward revision of targets consistent with the reduced funding.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

24. The relevance of the PDO to the CPS and Country Partnership Framework (CPF) is High. The PDO was highly relevant at the time of appraisal and remained consistently relevant throughout implementation with the World Bank's CPSs and CPF. The relevance of the PDO was ensured at the time of appraisal through its alignment with the CPS of 2008–2011 - Report No. 42677-BR (CPS 08-11). At closing, the primary themes of the PDO remained in the mainstream of the new World Bank/Brazil CPF 2018–2023 Report No. 113259-BR. The project responded to two challenges reflected in this CPF. First, it set out to stimulate investments and innovation, thereby increasing productivity, improving the business environment, facilitating access to capital and encouraging competition. Second, it promoted smart management of natural resources and better ways to mitigate natural risks and pollution through the sound management of water resources and environment, as well as property rights and land. Moreover, the project addressed the CPF focus areas of inclusion and sustainable development by promoting socioeconomic development of smallholder rural farmers. The project remained fully relevant, even when taking into consideration its various restructurings, none of which substantially altered the overall development objective.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

25. The project was innovative for the SoRJ, proposing a new approach building on productive potential and access to existing, profitable markets in the state. The project supported fruits, vegetables, and milk value chains, which are suited to small farmers and take advantage of urban demand from the metropolitan area of Rio de Janeiro and other smaller urban centers in the interior of the state. The project strengthened organizations of family farmers, helping them become more commercially competitive and promoting adoption of improved production systems to ensure long-term sustainability. The implicit 'Theory of Change' was sound and based on rational operational and technical assumptions.

26. Due to external factors, the implementation period was divided into four phases, with distinct performance characteristics:

(a) **Initial implementation phase, between approval and the 2011 emergency.** Progress achieved during this phase was modest because of legal, operational, and procurement challenges and by uneven readiness to implement.

(b) **Emergency implementation phase, between 2011 and the 2012 restructuring.** This second phase was defined by the 2011 emergency and the World Bank's speedy and effective response to an external event (including a new type of "Emergency Subproject"). These emergency activities were completed successfully in about one year, leading to impressive results. Rural poverty was reduced again after 2013, returning to the trend of the larger region of southern Brazil. The project—together with other emergency responses—contributed to this important result. Yet this may have led to an optimistic view of the project's potential. In addition, given the Rio Olympic Games, the participation of the state as an official location for the 2014 Soccer World Cup, and the overall optimistic expectations for the growth of BRICS (Brazil, Russia, India, China, and South Africa), there was consensus about the need to be prepared for significant economic growth in the coming years, leading to calls from state authorities to expand project coverage and increase the outcome targets.

(c) **Intermediate implementation phase, between the 2012 AF and the 2017 restructuring.** During this period, it gradually became evident that the US$100 million of AF had been approved in response to an overly optimistic view of the prospects for potential achievements and the possibilities of scaling up the scope and coverage of the operation. This realization coincided with dramatic political and economic (fiscal) crises in Brazil, which shifted public priorities and further constrained the project's pace of execution and rate of disbursement. The SoRJ was disproportionately affected by low oil prices, given its high reliance on oil royalties, and in June 2016, the local authorities declared a state of "fiscal emergency." The difficulties encountered during this period demonstrated that the expansion of the project's targets had been overly optimistic, and it was necessary to cancel US$40 million of loan resources.

(d) **Final phase of consolidation, between 2017 restructuring and the closing date.** The final restructuring enabled the project to consolidate basic results (with reduced scope and partial cancellation of loan funds), supported by marked improvement in project execution and disbursements, leading to achievement of most end targets.

27. The following paragraphs disaggregate the PDO by theme and present evidence of the project's achievements using the PDO outcome indicators and supporting information. The evidence includes a strong Borrower Completion Report (BCR)[6] based on, among others, extensive interviews with project institutions, beneficiaries, and other stakeholders, as well as data obtained from a representative sample of beneficiaries. The findings of an Impact Evaluation study are discussed as well,[7] along with data from

[6] *Avaliação Geral do Projeto de Desenvolvimento Rural Sustentável em Microbacias Hidrográficas do Estado do Rio de Janeiro. OPE Socias, Fevereiro 2019.*

[7] *Governo do Estado do Rio de Janeiro, Secretaria de Estado de Agricultura e Pecuária - SEAPPA (2018). "Impacto do programa Río Rural no Estado do Rio de Janeiro: Sumário Executivo".* For details on the Impact Evaluation see section IV A on Quality of Monitoring and Evaluation.

the project archives. The targets for each objective are compared with the achievements and results at project closing, but in view of the different restructurings and distinct implementation phases, a "split assessment" was undertaken for rating the overall outcome (see Section II D).

28. **PDO outcome - Theme 1:** "Increase the adoption of integrated and sustainable farming systems approaches in specific areas of the Borrower's territory."

- **Outcome indicator No.1**: **Area of agricultural lands under improved production systems (hectares) - Final Target: 160,000 ha.** The actual outcome was 223,152 ha of agricultural land under improved production systems, measured through the area of benefited properties. This outcome corresponds to 139 percent achievement of the target.

- **Outcome indicator No. 2: Number of small farmers included (or with improved links) in at least one value chain. Final target 2,600 farmers.** A total of 3,359 small farmers were included in (or with improved links to) at least one productive chain as a direct result of the project, corresponding to 129 percent achievement of the target. This result was calculated based on the number of beneficiaries of subprojects focused on productive chains. In addition, the technical report which evaluated the five productive chains supported (coffee, milk, organic, peach palm, and strawberry) concluded that, through the project's strategies and activities, these chains benefited small farmers by reducing their operating costs, increasing their productivity and income, improving pricing policy, and promoting important environmental gains, such as erosion control, reduction of pesticide use, and optimization of water use (AVALSUST 2018b)**.**

- **Outcome indicator No. 3: Number of small farmers transitioned towards more productive farming systems. Final target 35,000 farmers.** A total of 37,172 small farmers and family farmers (including at least 50 percent in the target areas) adopted more productive and sustainable systems, corresponding to 106 percent of the target. This was estimated through the number of Individual Development Plans (PIDs) multiplied by two because the PIDs showed that, on average, two members of the farming family actively managed the productive and business/administrative aspects of the property.

- **Breakdown of Outcome indicator No. 3: Number of female small farmers transitioned towards more productive farming systems. Final target 6,000.** At project end, 5,280 family farmers adopting more productive and sustainable systems were women, corresponding to 88 percent of the target.[8]

Additional Results

- **Intermediate results indicator: Km of rural roads rehabilitated and in maintenance (6,000 km).** The reports of the Production Roads Program indicate that 7,127 km of rural roads were rehabilitated and/or maintained, corresponding to 119 percent of the target. According to the report on the sustainability of roads and bridges served by the project, Rio Rural contributed to their good functionality through improvement of drainage systems,

[8] This indicator was measured directly from types of subprojects targeted to women. Note the difference from Outcome indicator 3, where an indirect measurement is made by assuming the number of small farmers by multiplying the number of PIDs by 2.

erosion control and adequate lining of canals/channels. However, it should be noted that drainage and erosion control structures also require maintenance (AVALSUST 2018c).

- **Intermediate results indicator: Targeted clients satisfied with project services (75 percent).** Through the Practices Evaluation Survey (PSATISF 2018b) carried out with 61 beneficiaries in the Northwest region and 42 in the Serrana, a 91.8 percent satisfaction index was obtained in the first region and 100 percent in the second region, resulting in an average index of 95.15 percent of beneficiaries highly satisfied with the practices developed by the project. Also, field trips during supervision missions always confirmed the high level of beneficiary satisfaction. Regarding satisfaction with the Micro-catchment Development Committee *(Comite Gestor das Microbracias,* COGEMs), from meetings held with 85 COGEMs from the Serrana region, a 78.14 percent satisfaction index was estimated. Considering all the mentioned indicators, the overall Satisfaction index is 79.2 percent (PSATISF 2018b), exceeding the target.

- **Intermediate results indicator: Number of participatory research projects carried out in support of sustainable rural development (50 projects).** According to the results of the participatory research reports, 75 participatory research projects supporting sustainable rural development were carried out, representing 150 percent of the target. From 2010 to 2018, State Agriculture Research Enterprise (*Empresa de Pesquisa Agropecuaria do Estado do Rio de Janeiro*, PESAGRO-Rio) operated in 30 municipalities and 35 hydrographic micro-basins, involving a public of 52 direct beneficiaries (experimental farmers), 3,939 indirect beneficiaries, and 28 researchers. Some BRL 4,718,660 was spent on participatory research with direct IBRD resources and BRL 788,707 with counterpart funds. (RFNPP 2018).

- Key benefits generated by the participatory research projects were documented for dairy and coffee value chains, as well as for organic agriculture. In the case of dairy, research contributed to improvements in afforestation of grasslands, diversification of grasses, multiplication of sugarcane forage, use of grazing rock dust, control of mastitis in herds, and training in sanitary conditions of production. In the case of coffee, research contributed to improving the quality and type of Arabica coffee produced in the northeast of Rio de Janeiro. Organic seed production was stimulated (20 species of vegetables, 24 of corn and beans, and 11 of green manures), efficiency of essential oils for the treatment of seeds was tested, and studies of organic agriculture and the observed behavior of rice cultivars in floodplains were conducted (RFNPP 2018).

- **Other relevant results.** Other results attributable to the project in relation to the development of agricultural value chains include (a) coffee chain: average increase of 20 percent in sales price due to increases in product quality, mechanization and reduction of production costs, mainly in the region northwest of Fluminense; (b) milk chain: increases in productivity (20 percent) and sale price due to investments in productive assets (cooling tanks), reduction of the rural exodus of producers, and improvements in the genetic quality of the herd; (c) palm hearts (*palmito*) chain: expansion of planted area and introduction of technologies that increase productivity and reduce crop losses, in addition to environmentally regulating the production properties; (d) production of strawberries: investment in suspended semi-hydroponic systems, with little or no use of pesticides; (e) based on participatory research projects developed with Rio Rural resources, the production

chain of olericultura was dynamized and it benefited from reduction of pesticides and the adoption of protected cultivation and circular vegetable garden systems (AVALSUST 2018b; RFNPP 2018).

- An ESS was established—as planned—to enable public and private resources to be raised. A total of 158 investment proposals were financed through the ESS for the benefit of family farmers, representing 263 percent of the target. Also, through the ESS, US$25,375,344 was leveraged (original target was US$ 1,000,000) (MRESULT 2018).

- Other results indicate that 370 hydrographic micro-basins were reached (366 original target), 370 COGEMs were established, aggregating 3,870 stakeholders, and 38,221 environmental and productive investment proposals (subprojects) were financed (6 percent above the target) (MRESULT 2018).

- The independent impact evaluation[9] concludes, among others, that the project positively affected profit per hectare due to the use of more productive practices, as well as improvements in the marketing of products. Because profits were positively affected, producers were able to pay higher salaries to hired workers. Given the recent nature of many of the investments that were surveyed—and based on the impact evaluation results for similar projects—longer-term potential appears positive. The report also concludes that if producers are well informed about the practices and their benefits, supported by adequate technical assistance and with the right incentives, they will adopt them, making possible an improvement in the environment and long-run sustainability (see further details/results in annex 6).

29. **PDO outcome - Theme 2:** "Help re-establish an agricultural productive environment in areas of the Serrana region affected by the January 2011 natural disaster." The relevance of this change to the PDO is confirmed by the increased rural poverty as a consequence of this natural disaster. No specific PDO indicators were included in the Results Framework; however, the corresponding intermediate outcomes were consistently monitored by the M&E system and reported in the Results Framework as intermediate results. The main achievements included the following:

- US$18.77 million of emergency financing was allocated to support special (emergency) subprojects in the Serrana region. A total of 2,277 emergency subprojects were financed (99 percent of the target) reaching a coverage of 1,908 farmers affected by the natural disaster (95 percent of the target). In addition, 890 km of roads (111 percent of the target) and 46 small bridges (115 percent of the target) were rebuilt, and 34 communities were served with soil conservation patrols assisting 4,858 beneficiaries.

- Emergency-related activities also contributed to strengthening community organizations, participatory identification of support projects from local planning, and training of technicians and beneficiaries. Producer associations were supported with the acquisition of

[9] "*Avaliação de Impacto do Programa Rio Rural sobre a Rentabilidade das Propriedades Rurais* "; Oportunidades, pesquisa e estudos sociais - OPE Sociais. November 20, 2018. See annexes 5 on Methodology and 6 on Main Results from the Impact Evaluation.

'mini-patrols'[10] responsible for the management of small machines and equipment made available to small producers to rehabilitate roads and other public infrastructure. Technical assistance was reinforced, operators of such equipment trained, and associations qualified in the management of community enterprises (RATIVEMERG 2013a, 2013b).

- PESAGRO-Rio strengthened the Participatory Research Units in the Serrana region where restoration of degraded areas was taking place, emphasizing agroecological transition, organic production, and the adoption of new technologies by experimental farmers.

30. According to the results evaluation of the emergency activities, 89 percent of the beneficiaries stated that as a direct results of project support, they were able to recover from the damage caused by the catastrophe within six months. Most technicians and beneficiaries interviewed recognized positively the role of the emergency committees in local social organization.

Justification of Overall Efficacy Rating

31. **Overall efficacy is rated Substantial.** Factors considered in determining the rating were the following:

- All three outcomes contained in the revised PDO were achieved, with quantitative outcomes embodied in the PDO indicators surpassing their end targets. A clear and strong causal connection supports the Theory of Change.

- Number of direct beneficiaries far exceeded the revised target, with the exception of the number of women farmers transitioned toward more productive farming systems (88 percent achievement of the end target).

- Out of 24 intermediate outcome indicators, 21 met or exceeded the end targets, and all were achieved at a rate of 95 percent or better.

- Disbursement of the loan proceeds was less than optimal, reaching US$89.3 million or about 90 percent of aggregate loan proceeds, net of cancellation, due mainly to the procurement challenges described as well as fluctuations in the exchange rate.

- The sustainability outlook is positive for both the business investments and environmental elements, based on the fact that (a) participatory selection and implementation of subprojects increased ownership and therefore sustainability, (b) improved access to markets has generated a permanent revenue stream for beneficiaries, and (c) implementation was done largely by regular staff from the state government. The sustainability outlook for public policies is less clear because the consequences of the current fiscal situation are unpredictable.

[10] The 'mini patrols' consisted of a set of machines and implements for the preparation and conservation of the soils. They were destined to some producing associations in micro-basins of the Serrana region, affected by the catastrophe of 2011. In general, they were composed of a tractor with plow and in some cases, micro-tractors. The associations that received these patrols had to sign a commitment to use them according to the rules of the Rio Rural project and had to undergo training in environmental management and safeguards.

32. **Split assessment of rating.** Consistent with the ICR Guidelines, a split assessment was carried out to determine the outcome rating. Details are presented in Section II D. Splitting the assessment made no material difference to the outcome rating, when compared with the final rating based on the final outcomes at closing.

C. EFFICIENCY

Assessment of Efficiency and Rating

33. The project disbursed US$146.36 million (75 percent of funds approved), out of US$202.45 million available including the AF. Several external factors contributed to the lower-than-expected disbursement, including a devaluation of the Brazilian real and a fiscal crisis experienced by the SoRJ. On the one hand, the strong currency devaluation decreased unit costs in local currency and increased significantly the amount of local currency available to the project.[11] On the other hand, inflation also increased during implementation, raising many costs. As a result of these two sets of forces that affected the purchasing power of the loan proceeds, it is difficult to calculate in real terms exactly what was disbursed. What is noteworthy, however, is that the project exceeded its PDO indicator targets (except for women) and either exceeded or met most intermediate outcome targets, with lower-than-anticipated total costs.

34. **Economic efficiency.** To evaluate the economic and financial results of the project, 155 PIDs were randomly selected as a stratified random sample from the five regions of the SoRJ (representing about 1 percent of total PIDs implemented). In terms of value chains, the sample included 54 PIDs for horticulture (leafy vegetables, tomato, cauliflower, peppers, cassava, potatoes, sweet corn); 51 PIDs for milk production; 31 PIDS for fruticulture (citrus, passion fruit, strawberry, kale, banana, pineapple); 11 PIDs for coffee production; 6 PIDs for raising small animals; and 2 PIDs for forestry (palmito). In terms of territorial coverage, the sample included 35 PIDs from the Northern region; 30 PIDs from the Northwest region; 37 PIDs from the Central region; 29 PIDs from the Serrana region; and 24 PIDs from the Southern region. More details are presented in annex 4. These 155 PIDs benefited 236 households (about 1.4 percent of total households) representing 714 people.

35. Investments made by the PIDs included brush cutters, spring protection, vehicles (mini-tractors and wagons), plantations (coffee, passion fruit, palmito, forage cane and strawberry), improved pastures and rotational pasture systems, irrigation systems, organic fertilization, drying infrastructure and coffee pulping machines, milking machines and milk cooling tanks, sheds, spraying machines, animals (cows and chickens), riparian forests, agroforestry systems, greenhouses, and soil preparation. The results generated by the various investments were mainly increased production, lower production costs, and increased incomes.

36. **Net present value (NPV) and internal rate of return (IRR).** For the 155 PIDs evaluated (with 236 families and 2,120 ha), the economic NPV and the IRR of the investments made, or the incremental situation were US$3.0 million and 54 percent. Total investments at economic prices were US$603,800, of which, US$314,700 was funded by the project (or 52 percent) and US$289,000 was funded by participants and other sources (or 48 percent). The average values per participating family are US$2,600 of investments, US$2,500 as incremental net revenue per year, and 27 person-days as incremental annual

[11] PAD 2009 reports an exchange rate of BRL 2.15 per US$1.0; PAD 2012 reports an exchange rate of BRL 1.82 per US$1.0; at project closing (November 30, 2018), the exchange rate was BRL 3.86 per US$1.0.

use of labor. The average annual incremental net income per hectare is US$275, which is significantly more conservative than the estimated mean value for profit per hectare of US$800 in the Impact Evaluation.[12] For the Serrana region, subject to special attention due to the emergency, the returns were very close to the overall average returns.

37. Indicative estimates of economic viability were also generated for investments made by the project in rural road improvements and participatory research. In terms of the impact of **rural roads**, results are the following: (a) 92 percent reduction of days of non-trafficability, (b) reduction of production losses (20 percent in the case of milk and 36 percent in the case of vegetables), (c) reduction of 50 percent of travel time due to increase in traffic speed, (d) reduction of 40 percent to 60 percent of the average cost of vehicle maintenance, and (e) 20 percent to 50 percent reduction in average fuel consumption. The IRR of the improvement of two roads evaluated (around 7–9 km improved) varies between 20 percent and 280 percent. As for **participatory research**, results show (a) 50 percent increase in milk production and reduction of rock dust as a result of the introduction of the silvo-pastoral system with rotational grazing, (b) 30 percent increase in forage cane production as a result of the addition of rock dust to organic fertilization, (c) 30–50 percent increase in milk production as a result of the control of mastitis and good sanitary practices, and (d) increase of 10–40 percent in the productivity of horticulture and increase of 40 percent of the income as a result of the use of alternative inputs to pesticides. Regarding **greenhouse gas (GHG) emission** monitoring, results show how the most important actions to reduce GHG emissions are those related to actions against deforestation/forest regeneration as protection of recharge areas and areas of springs. One of the recommendations emerging from the analysis is to keep a focus on these activities when planning new projects.[13]

38. To estimate the aggregate economic return of the Rio Rural project, the economic flows of the sample of 155 PIDs were extrapolated based on the ratio between the project investments for all the PIDs and the project investments on the PIDs of the sample. Other project costs not directly related to the PIDs were incorporated into the analysis of the NPV and aggregate IRR. Incremental PID investments irrespective of financial source generated an economic NPV of US$317 million and an economic IRR of 54 percent. Incremental investments in the PIDs in addition to other project costs generated an economic NPV of US$299 million and an economic IRR of 45 percent. When carbon balance co-benefits were added, the economic NPV and IRR were US$346 million and 49 percent, respectively. Finally, considering that the average project investment per PID is higher than the average investment of sampled PIDs, such investment costs were adjusted, and the NPV and the economic IRR with other project costs and carbon co-benefits were US$301 million and 36 percent. These results are similar to the indicators of the economic analysis carried out for the project at appraisal. The analysis offers unbiased economic indicators at the aggregate level, but the small sample size of PIDs only allows indicative conclusions. The large variability of results in terms of economic NPV and IRR do not allow comparisons by region and by value chain.

[12] As explained by the Food and Agricultural Organization (FAO) economist who prepared the EFA: "The average annual incremental income per hectare is USD 275, which is more conservative than the estimated mean value of profit per hectare of US$800 in the Impact Evaluation. Even though the sample does not allow for comparisons among regions or value chains, we can say that in the Serrana region, subject to special attention due to the emergency, the returns were very close to the overall average returns. Further, it is emphasized that: 'In many instances, it is too early for the most recent subprojects to have produced an impact'."

[13] Bassi, Lauro. 2018. "*Primeira avaliação: resultados de cadeias produtivas avaliadas apoiadas pelo Programa Rio Rural/BIRD e resultados do monitoramento da biodiversidade e armazenamento de carbono*."

39. **Sensitivity analysis.** The returns generated by the project investments are sensitive to production and/or price changes because a reduction of 11 percent in sales or revenues would reduce the economic IRR to 12 percent. The returns are moderately sensitive to rising input costs as a 20 percent increase in costs would generate a marginally acceptable return. In contrast, the returns are very resilient in terms of labor costs and changes in investment costs as these would have to increase by 60 percent and 120 percent before the returns would fall to a marginally acceptable level.

40. **Efficiency rating.** Efficiency is rated Substantial, based on overall financial and economic results, including the rural investment subprojects (PIDs), the largest investment, but also other auxiliary investments such as rural roads, participatory research, and impacts in GHG emissions. It is worth noting that assessment of the efficiency of the project proved to be a challenging exercise due to the complex context in which the project operated,[14] the concentration of investments toward the last years of the project, the small sample size to estimate the aggregate economic return of rural investment subprojects (PIDs), and the fact that in many instances it is too early for the most recent subprojects to have produced an impact. Still, results are significant and could be considered a lower-bound for the overall project.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

41. The overall outcome rating is Moderately Satisfactory based on the following:

- **High** relevance of the PDO based on its sustained alignment with World Bank strategy documents for Brazil
- **Substantial** rating for efficacy, based on the achievement or surpassing of almost all key targets and important collateral/complementary achievements
- **Substantial** rating for efficiency, based on positive economic and financial outcomes

42. **Split assessment of overall outcome.** According to "Bank Guidance: Implementation Completion and Results Report (ICR) for Investment Project Financing (IPF) Operations" and given the nature of the various restructurings, a double split assessment was done to assess the overall outcome rating. Table 2 presents the results of the double split assessment, which recognized three separate assessment periods delineated by two restructurings: (a) the September 2011 restructuring due to the emergency in the Serrana region, which involved a change in PDO (Split 1), and (b) the September 2017 restructuring which included a partial cancellation of funds (US$40 million) and a significant reduction in project targets (Split 2).

43. Achievement of the PDO indicators was assessed by comparing current values as of the date of each restructuring against target values according to each Results Framework.[15] For Split 1, the targets for most PDO indicators had been achieved (except for indicators that did not have a target for year 1 of the project), and hence the ratings are Substantial and High. For Split 2, the PDO indicators showed a lower level of achievement, and hence the ratings are Modest and Substantial. At project closing, all PDO indicators had achieved or exceeded the targets set out in the Results Framework, so the rating is Substantial. The weight of each period was based on noncumulative disbursements reported by the

[14] See Section I.B Significant changes during implementation.
[15] Annex 7 provides a detailed measurement of PDO indicators for split assessment.

project. This yields a final outcome rating of 4, equivalent to Moderately Satisfactory, which is consistent with the final Implementation Status and Results Report (ISR) rating at closing.

Table 2. Split Assessment of Outcomes

	Split 1 Restructuring of 2011	Split 2 Restructuring of 2017	Project closing 2018
RELEVANCE OF PDO		**HIGH**	
EFFICACY PDO			
Number of small farmers (at least 50% in targeted areas) transitioned towards more productive and sustainable farming systems.	Substantial	Modest	Substantial
Improved product quality measured by: Number of farmers adopting Good Agricultural Practices (GAP)	Substantial	N/A	N/A
Number of small farmers or enterprises certified	Substantial	N/A	N/A
Number of agro-processing and artisanal enterprises adding value	High	N/A	N/A
Improved market access by at least 10% of beneficiaries receiving investment support as measured by their inclusion in (or with improved links to) at least one value chain	Substantial	Substantial	Substantial
At least 50% of the targeted small farmer agricultural lands under improved production	Substantial	Modest	Substantial
Extent of tertiary roads restored and mantained	High	N/A	N/A
EFFICIENCY		**SUBSTANTIAL**	
Outcome ratings	Satisfactory	Moderately Satisfactory	Moderately Satisfactory
Numerical value of outcome ratings	5	4	4
Disbursement	$ 9,575,735.53	$ 56,156,124.77	$ 89,155,068.25
Share of disbursement	10%	47%	43%
Weighted value of the outcome rating	0.48	1.86	1.70
Final outcome rating		**Moderately Satisfactory 4**	

E. OTHER OUTCOMES AND IMPACTS

Gender

44. The project's focus on family farming was reflected in an investment strategy designed to produce important impacts on women as key actors in family farming. Specific attention was given to vulnerable groups including women, reflected in the number of women that participated in training activities and in the number of investment proposals from women financed by the project. In the Results Framework, a PDO-level indicator "number of small farmers (at least 50% of selected areas) transferred to more productive and sustainable systems" was disaggregated by gender reporting 88 percent achievement rate at project closing. Gender targets were also at intermediate level such as "number of women trained in key project concepts" reporting 175 percent achievement rate at project closing.

45. Participation by women in the awareness-raising phase of the project, as well as in community decision-making spaces such as the COGEMS, was reported as significant during project execution. The role of State Rural Extension Agency (*Empresa de Assistencia Tecnica e Extensao Rural do Estado do Rio de Janeiro*, EMATER-Rio) technicians was key in promoting women's participation in these meetings and in productive processes, evidenced by the increase in the number of women who received financial resources and technical support.

46. Dedicated subprojects such as the "Kit *Galinha Caipira*" (local chicken breed), handicrafts, and some specific value chains helped increase female participation in rural communities while increasing their earnings. The role of women in value chains such as peach palm[16] and organic palm trees stood out as fundamental in value-adding and in the marketing of their agriculture produce, including access to institutional markets (public purchases). In this way, the project had a clear impact on promoting female autonomy in the SoRJ.

Institutional Strengthening

47. **Grassroot institutional development.** The micro-basin approach was based on the idea of strengthening grassroots institutions (COGEMs) as instruments of community organization and channeling of local demands to higher decision-making bodies and allocation of public resources. At closing, the project had supported 370 COGEMs in 366 micro-basins and more than 19,000 producers had accessed resources dedicated to subprojects.

48. **Institutional alliances.** The project built a significant number of partnerships with state institutions for risk management and environmental adequacy, as well as integration with credit programs. Cooperation agreements were established with partners that have similar actions to Rio Rural, such as North Fluminense State University (*Universidade Estadual do Norte Fluminense,* UENF), Brazilian Agriculture Research Enterprise (*Empresa Brasileira de Pesquisa Agropecuaria*, EMBRAPA)-Soils, EMATER-Rio, PESAGRO-Rio, Department of Mineral Resources (*Departamento de Recursos Minerais)*, EMBRAPA-Agrobiology, Baixo Paraíba Basin Committee, National Ministry of Agrarian Development (*Ministerio do Desenvolvimiento Agrario*)/National Program to Strengthen Smallholder Agriculture (*Programa Nacional de Fortalecimento da Agricultura Familiar*), *Banco do Brasil*, nongovernmental organizations (NGOs), Brazilian Micro and Small Business Support Service (*Serviço Brasileiro de Apoio à Micro e Pequenas Empresas*), FAERJ (Federation of Agriculture, SoRJ), State Research Support Foundation (*Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro*, FAPERJ), State Secretariat for Planning and Management (*Secretaria de Estado de Planejamento e Gestão do Estado do Rio de Janeiro*), and the German universities of Cologne, Jena, and Leipzig.

49. **Participatory research.** Through a Participatory Research Nucleus, the project developed seven action plans: (a) Implementation and Maintenance of Participatory Research Units; (b) Implementation and Maintenance of Long-term Agriculture Experiments; (c) Network for Research, Innovation, Technology, Services, and Sustainable Development in Hydrographic Hydrological Systems; (d) Production of Agroecological Inputs; (e) Adequacy of Rural Dairy Farms to Good Practices; (f) Agroecology, Organic and Sustainable Agriculture (Studies); and (g) Institutional Strengthening.

50. The achievements of this subcomponent were to continue the seven Participative Research Units implemented by Rio Rural GEF and to implement new units; to promote validation events for research lines; to prepare, correct, and publish technical manuals; to participate in the regional meetings of PESAGRO-Rio; and to publish studies, including some 14 papers in 2017 alone.

51. According to the Final Report of the Participatory Research Nucleus, from 2010 to 2018, 33 percent of the financing of research projects developed by PESAGRO-Rio came from Rio Rural, while 66 percent

[16] *Bactris gasipaes* is a species of palm native to the tropical forests of South and Central America. It is often cultivated by smallholders for hearts of palm and fruits.

came from other sources, such as FAPERJ (Foundation for Research Support of the SoRJ), State Fund for Environmental Conservation and Urban Development, (*Fundo Estadual de Conservação Ambiental e Desemvolvimento Urbano*), National Council for Scientific and Technological Development, Financier of Studies and Projects, Ministry of Agriculture, Livestock and Food Supply, State Secretariat of Agriculture, Livestock, Fisheries and Supply (*Secretaria de Estado de Agricultura, Pecuaria, Pesca e Abastecimento,* SEAPPA), and Parliamentary Amendment.

52. **Institutional strengthening and technical assistance.** EMATER-Rio incorporated the methodology based on hydrographic basins as part of its efforts. Its technicians incorporated this approach when working with rural communities during the various phases of the project (sensitization, training, and monitoring). The COGEMs met regarding implementation and maintenance and often expanded the purpose of strengthening the participation of producers in the micro-basin.

Mobilizing Private Sector Financing

53. **ESS.** A proposal for an ESS was designed with Global Environment Facility (GEF) resources and operationalized with resources from the Rio Rural project. The objective was to create a financing mechanism for family farmers. The ESS focused on raising funds from the following sources: (a) public policies in general; (b) payment for environmental services in carbon, water, and biodiversity; (c) agricultural credits; and (d) private partnerships in the areas of sustainable business and socioenvironmental responsibility. The ESS was implemented in a decentralized manner, leveraging co-investment resources and integrating partnerships with public and private institutions. At project end, 158 investment proposals were presented (263 percent of target), of which 86 were approved, leveraging US$25,375,344 in co-investments from various sources (US$1.2 million municipal governments, US$17.4 million state governments, US$3.0 million Federal Government, and US$3.6 million other private sources). The number of proposals directed to public financial institutions (federal, state, municipal governments) was the largest, corresponding to 74 percent of the total proposals made.[17]

Poverty Reduction and Shared Prosperity

54. The project had no explicit poverty reduction objective. However, the target population (small farmers) and the aim of improving productive farming systems and reduce the vulnerability of the territories where the target population lives, indirectly relates to a potential poverty impact.

55. As part of the evaluation strategy, the PMU contracted several analyses to document the effects of the project on the target population. One was a diagnosis to understand the determinants and the recent evolution of poverty in the SoRJ, which would allow contextualizing effects attributable to the project. The main finding of this study was that the bulk of observed rural poverty reduction in Rio de Janeiro between 2001 and 2015 did not derive from the productivity or profitability of agricultural activities. Rather, it was the joint effect of public transfers plus income growth of rural dwellers coming from nonagricultural activities.

56. Another study determined that the project enabled the recovery of the productive capacity of soils, contributed to the preservation of water springs and protection of biodiversity, combining community self-management and the promotion of smallholder proactivity. In other words, “the project combines

[17] Rio Rural. 2016. “*Estratégia de cofinanciamento programa Rio Rural*.” Project Report.

the adoption of productive systems that are sustainable and the management of natural resources, demonstrating that it is possible to generate income and, at the same time, to meet the demands of the market and environmental legislation" (DPOBREZA 2018, 29).

57. The Impact Evaluation,[18] in its chapter referring to impacts on living conditions and poverty levels, identifies modest impacts in terms of time allocation and household mobility observed through greater migration of the elderly (possibly for health care reasons) and reductions in youth and adult migration suggesting that rural areas could be perceived as more attractive due to expectations of higher income. At the same time, the report also acknowledges that many indicators associated with living conditions do not yet show clear impact because the expected effects require a longer period to mature and be observable.

Balance of GHG emissions

58. A GHG appraisal of the main set of activities implemented under the project was carried out using the Ex Ante Carbon-balance Tool (EX-ACT), which quantifies the net carbon balance (in tCO_2e) resulting from GHGs emitted or sequestered during project implementation, compared to the scenario before project implementation.[19] The main hypothesis is that project-supported activities mitigated or reduced GHG emissions when compared with the situation ex ante.

59. The analysis focused on selected practices and actions covered by a GHG analysis performed in 2009 (before the project, presented in a study by Branca and Medeiros of 2010) and included an update of the analysis carried out in 2017. Other actions, such as the "Improvements in feeding practices of dairy herds" were not included in the analysis due to the lack of data. The actions considered were (a) Protection of springs and streams and support for the establishment of legal reserves, (b) Expansion of agroforestry systems, (c) Improved management of annual crops, (d) Improvements in pasture management, (e) Support to family agroindustry, and (f) Technical support. The results in terms of balances of GHG as tCO_2 equivalent per year showed modest impacts.

Other Unintended Outcomes and Impacts

60. **Social capital.** By promoting solidarity among rural producers, the project strengthened the role of cooperative mechanisms, such as cooperatives and associations, in integrating producers into the market, thereby, facilitating their access to inputs and improving their ability to sell their products (especially in local markets). The project achieved other unintended effects and impacts, such as promoting inclusion of women and youth in rural activities, as well as strengthening links with the National School Food Program (*Programa Nacional de Alimentação Escolar*).

61. Results from the impact evaluation related to social capital[20] show that producers participated more actively, and community participation was more collaborative on productive than on social aspects. The project appears to have increased participation in activities which delivered more economic benefits and reduced their participation in activities bringing social benefits. In other words, social capital was

[18] "*Avaliação de Impacto do Programa Rio Rural sobre as condições de vida e a pobreza;*" Oportunidades, pesquisa e estudos sociais - OPE Sociais. November 20, 2018. See annexes 5 on Methodology and 6 on Main Results from the Impact Evaluation.
[19] Saraiva Schott and Bernstad 2018.
[20] "*Avaliação de Impacto do Programa Rio Rural sobre o capital social;*" Oportunidades, pesquisa e estudos sociais - OPE Sociais. November 20, 2018. See annexes 5 on Methodology and 6 on Main Results from the Impact Evaluation.

important and systematically fostered, well before the investment stage. It was an essential component of the adoption process, on the premise that value chains do not function without organization, cooperation, and collaboration. The assumption was that if producers were organized, trained, and well informed about sustainable farm practices and provided with appropriate incentives, they would adopt practices which improved their profitability and long-term sustainability.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

62. **Realism and ambition of objectives.** The PDO refers to concepts such as "integrated, sustainable, farming systems" that are complex in nature. To reduce possible confusion, the term "farming system," which was fundamental for the overall structure of components and subcomponents and selection of activities, was clearly defined as "a population of individual farms that have broadly similar resource bases, enterprise patterns, household livelihoods, and constraints, and for which similar development strategies and interventions would be appropriate, including the key role played by the community, the environment, and support services, to achieve their common objective" (PAD 2009). This definition posed a challenge in calibrating and assessing during implementation the overall level of ambition of the project. Given the different shocks encountered by the project, the team was forced to adjust objectives and targets to maintain their realism.

63. **Simple and flexible design.** The overall design of the project with two technical components (supporting rural production and competitiveness and strengthening institutional frameworks) and one project management component (project coordination and information management) allowed enough flexibility so that even with restructuring, the basic structure of the project was not altered. In addition, the structure of its components also facilitated the operationalization of (a) the micro-basin methodological approach; (b) the possibility of integrating knowledge produced by institutions related to the agriculture sector (participatory research); and (c) the Participatory and Negotiated Territorial Development approach as a way to build and strengthen the community organizations and their social fabric. These elements constituted a triad that enabled the achievement of results.

64. **Readiness for implementation.** Because the project was prepared taking into account the experience of the Rio GEF project, the readiness for implementation was guaranteed to a certain extent. The main challenges that were encountered had more to do with the lack of fiscal resources to operate than with the lack of capacity within the implementation unit and among the institutional and strategic partners on the ground.

65. **Results Framework and impact evaluation.** As designed, the M&E strategy called for a rigorous impact evaluation.[21] During implementation, indicators in the Results Framework were adjusted to better capture response actions to the different shocks the project experienced, for example, emergency subprojects for the Serrana region in 2011, recovery of rural roads, and water investments.

[21] See section IV A on Quality of Monitoring and Evaluation.

B. KEY FACTORS DURING IMPLEMENTATION

66. **Natural disaster (flooding) and emergency response.** In January 2011, exceptionally heavy rains occurred in the Serrana region of the SoRJ, the state's most important production pole for horticulture, floriculture, and aviculture. Extensive flooding and mudslides in 11 municipalities resulted in over 850 deaths, left close to 20,000 people homeless, caused extensive damage to rural infrastructure (roads, bridges, rural buildings, and homesteads), damaged or destroyed crops and livestock and other productive assets, and led to disease outbreaks. In rural areas, most of the affected households were operators of small family-run farms, with little access to credit or agricultural insurance. As a consequence of this natural disaster, rural poverty in the state increased, reversing a declining trend. Rapidly restoring the productive capacity of these households became a government priority, to avoid further loss of income. The implementing agency SEAPEC *State Secretariat of Agriculture and Fisheries* estimated that 17,000 families depending on agriculture for livelihoods were affected, with approximately 3,400 families experiencing direct losses of assets and income. The total economic cost of the disaster in rural areas was estimated by SEAPEC at BRL 269 million (about US$163 million).

67. In the wake of the disaster, the state government requested the World Bank's assistance to provide emergency support to affected farmers in rural areas to help them resume agricultural production. The types of assistance included the restoration of physical access through rural road rehabilitation, repair or reconstruction of damaged dwellings, and restoration of productive assets. These activities fell within the scope of the project, which had just started implementation in the Serrana region. The project was restructured; the PDO was modified to include the (sic) "Serrana Region affected by the January 2011 natural disaster," and US$18.77 million of the original loan (IBRD) was reallocated into a new category of emergency response subprojects. At the same time, the number of beneficiaries and other target values related to the original results indicators were adjusted downward to compensate for the redirecting of project resources to the emergency activities. Emergency actions under the project began immediately after the catastrophe of January 2011, with resource releases occurring from May 2011 until the end of 2012.

68. **Drought and emergency response.** In late 2014 and early 2015, the SoRJ was heavily affected by a drought that hit the Southeast region of the country. This drought triggered another restructuring. The borrower requested the inclusion of water management subprojects (for example, storage and distribution of rainwater and groundwater for human consumption, drilling of tube wells, and installation of supply and distribution networks) and a drought management committee, within the scope of the project. Through EMATER-Rio technicians and producers, agriculture practices were identified that were suited to the needs of each affected holding. In addition to these activities supported by the project, producers who were trained by the Rio Rural GEF project helped in disseminating mitigation practices to other affected producers.

69. **Fiscal crisis.** The economic crisis affecting the state posed a substantial challenge for project implementation. The state's fiscal situation deteriorated rapidly in 2015 when the Brazilian economy entered into recession after the price of petroleum fell sharply and the resulting drastic reduction of Petrobras investments and operations in the state affected the services industry. The recession precipitated a rapid rise in unemployment in 2015 and 2016, further depressing domestic demand, while the large fiscal deficits translated into rapidly rising public debt. General government gross debt rose from 56.3 percent of GDP at the end of 2014 to 69.5 percent by end of 2016. In 2016, the state government started paying salaries in installments. The crisis revealed the inadequacy of the state's fiscal policy and

made clear that the efforts to diversify the economy and increase tax revenue had not been successful. As with other World Bank projects in the state, in August 2016, the judiciary seized undisbursed loan proceeds in the Designated Account, disrupting project activities. This crisis delayed project implementation for almost one year.

70. **Strike of EMATER-Rio.** During 2012 and 2013, EMATER-Rio employees went on strike, demanding improvements in salaries and working conditions. The main strategy adopted to put pressure on the state government was to boycott implementation of the Rio Rural project, interrupting project activities in the hydrographic micro-basins, including the sending of documents to the PMU. The strike lasted approximately one year and affected all regions of the state, causing significant delays for the project. There was disruption in the preparation of Micro-basin Executive Management Plans (PEMs), PIDs, supervision reports, and rendering of accounts. Following interventions by SEAPPA, the Executive Secretariat of the Rio Rural project, and the EMATER-Rio board of directors—and in the face of strong pressure from project beneficiaries—the strike ended and activities resumed. In the short run, the strike had a negative impact on the implementing agency and the project, but over the longer run, it had the effect of improving personnel management practices within public agencies including the implementation agency, increasing the relevance of merit criteria in the selection and promotion process. This had a longer-term positive impact on the capacity of the implementing agency.

71. **Procurement**. At decentralized levels, procurement activities were carried out without major difficulties by subproject beneficiaries using simplified procurement procedures approved for extremely small-value procurements (less than US$5,000). At the central (state) level, in contrast, procurement activities were greatly affected by the weak capacity of the PIU, which was reflected in implementation delays and high-risk ratings during most of the project's life. The main challenges included the following:

- In the initial years, the procurement of road maintenance machinery had to be repeated thrice because of poor specifications and the PIU's alleged discrimination against foreign suppliers.
- Despite the World Bank's repeated recommendations, the PIU often applied inappropriate selection criteria for the hiring of individual consultants, which forced the World Bank to impose a temporary freeze on new hiring, except for key PIU positions.
- An indication of possible governance issues in the procurement of gravel for road maintenance constrained the PIU's strategy for road rehabilitation.
- During the fiscal crisis, the seizure of loan proceeds by judicial decisions at the federal level halted project implementation for a sustained period during which no major procurement was carried out.
- In 2018, two large national procurement tenders (National Competitive Bidding) for road rehabilitation were questioned by the state's Court of Accounts (*Tribunal de Contas*) and because the PIU was unable to provide responses satisfactory to the Court on time, those tenders were eventually removed from the project. Other large procurements, for example, for the reconstruction of bridges and the installation of sanitation kits, were also dropped due to the PIU's inability to prepare the tenders on time.

72. During the second half of 2018, the Procurement Plan was updated to include only smaller and simpler activities, removing the more complex activities that posed greater challenges to the PIU's capacity. Thereafter, the procurement function improved noticeably, allowing the rating to be upgraded to Moderately Satisfactory.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

73. The scope of the M&E framework was broad, designed to systematically track and measure project implementation, accommodate midcourse corrections if needed, and demonstrate results for the productive, socioeconomic, and environmental elements of the project. Most project-related information would be collected at three points in time: (a) at the beginning of the project (baselines constructed using existing information previously collected by the Rio GEF and complemented by additional baseline surveys in the project's first year and other available data); (b) at the time of the Midterm Review (Midterm Impact Evaluation); and (c) at closing (Impact Evaluation and a BCR). The Theory of Change, while not presented in diagram form in the PAD, was clear as explained through the project's objectives, key activities, and strategies. The PDO specified the target population as the small-scale farming sector and clarified that increased productivity and competitiveness in this sector were higher-level objectives, that is, likely to be achieved beyond the life of the project. The technical and operational strategy supporting the PDO was conceptually logical.

74. The PDO indicators, while highly relevant, showed some weaknesses with respect to their complexity and vagueness in some cases. In addition, several required core indicators were omitted (number of beneficiaries, gender participation). The MIS was conceptually ambitious and based on participatory principles designed to ensure widely accessible streams of information intended to empower stakeholders to identify priority interventions needed in the sector, create continuous feedback to support project implementation, and create web-based, customized computer applications to be used by internal and external audiences. The decentralized system would build on existing information systems and databases from the Rio GEF project to monitor the project's physical and financial progress. Baseline surveys and evaluation studies would be outsourced/shared, with some coordination activities and field surveys to be conducted by state and federal institutions (with recurrent costs covered). [22]

M&E Implementation

75. The project agencies collected, analyzed, and disseminated key datasets; coordinated planned studies; and complied with fiduciary reporting requirements. During implementation, development of the originally planned MIS was abandoned due to restrictions on hiring of consultants. Part of the activities that were under the original MIS were developed by the project's communication and monitoring teams, with participatory tools and the project's web portal. In addition to the regular MIS, the methodology for the planned Impact Evaluations was discussed and developed in the early years of implementation. Because the project developed an Impact Evaluation and also due to the different shocks faced early on

[22] Under this model, EMATER would conduct household-level socioeconomic surveys, EMBRAPA would generate soil and production system surveys, FEEMA (state environmental agency) would manage the surface water surveys, and the UENF would handle the biodiversity survey.

during implementation, a baseline was not done for the regular MIS, but only for the Impact Evaluation. A methodologically robust final Impact Evaluation was carried out using treatment and control groups and randomized sampling, which enabled identification of benefits attributable to the project. The Impact Evaluation was carried out in the Central and Southern regions of the state covering 120 micro-basins in 35 municipalities. It focused on three fundamental dimensions (impact domains): (a) profitability of rural properties; (b) social capital; and (c) and living conditions. A summary of the methodology and identification strategy is presented in annex 5. A summary of the main results by impact domain can be found in annex 6. The full Impact Evaluation reports are available in the project file and are cited in the bibliography presented in annex 10.

76. The BCR was loosely structured around the World Bank's ICR template and was of good quality, informative, and directly useful to the ICR. Numerous studies (including baselines for research efforts beyond the project), evaluations, monitoring and activity reports were prepared over the course of the project, associated with specific types of productive and environmental practices, with the rural road and bridge investments, and with activities in progress. Project restructurings entailed several adjustments to indicators and targets in response to changing circumstances and realities on the ground including climatic and financial emergencies. They were designed to reflect different, improved, or more appropriate measures of project achievement and changed circumstances. The 2011 restructuring modified the PDO to introduce the concept of the emergency objectives and introduced new monitoring indicators to measure the achievements.

M&E Utilization

77. Project monitoring data and periodic progress reports were valued inputs to management decision making as well as key research and reporting deliverables. These include the ISR, the BCR, the project economic and financial analysis, the final Impact Evaluation, supervision missions and Aide Memoires, institutional training programs, and project results dissemination activities. M&E data and analyses were disseminated through bulletins to rural communities, results/knowledge-sharing events for project technicians and managers, and through the project website.[23] Reports were generated on environmental education and prevention of environmental shocks, as well as public campaigns such as "Rio 2016: Clean Water for the River and Atlantic Forest Connection." Project data released on the Internet by the project's institutional partners generated numerous studies, books and research articles, theses, and dissertations.

Justification of Overall Rating of Quality of M&E

78. **Overall M&E is rated Substantial.** The M&E system, as designed and implemented, permitted assessment of the project's achievements. Moderate shortcomings in design of the Results Framework are balanced against a strong evaluation and reporting performance during implementation and proactive dissemination and utilization of M&E products. Further, the World Bank flexibly and pragmatically adjusted the PDO and Results Framework in response to changing circumstances, to improve the quality and/or utility of project indicators and targets, and to ensure that the Results Framework adequately reflected project activities, objectives, and realities on the ground.

[23] http://www.microbacias.rj.gov.br.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

Environmental Safeguards Compliance

79. Environmental Safeguards Compliance was rated Satisfactory throughout the project's life. Environmental risks were considered Low for most of the project life, except for a period of about 1.5 years (from late 2016 to early 2018) when the environmental performance risk was rated Moderately Unsatisfactory due to a delay in the implementation of mitigation measures to control erosion in bridges supported under the project. The delay was mainly associated with the state's fiscal situation which subsequently, delayed procurement of erosion control works. Except for this issue associated with the bridges, all other environmental interventions (especially farmers' transition to agroecological farming systems) were judged Satisfactory.

80. The project was classified Category B, which required an Environmental Management Framework. The project triggered five environmental safeguard policies: Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), Pest Management OP/BP 4.09), Physical Cultural Resources (OP 4.11/BP), and Forests (OP/BP 4.36). Performance was as follows:

- Environmental impacts were for the most part positive, including enhanced soil nutrition and reduced erosion through improved cropland and grazing management; rehabilitation of degraded Atlantic forest areas, especially in riparian zones and around springs; sustained use/conservation of natural resources, leading to improved biodiversity; reduced use of pesticides in croplands; erosion control in rural road rehabilitation areas; and water conservation benefits and climate co-benefits.

- Strong technical capacity of the project unit, project partnerships with environmental and agricultural research agencies and environmental NGOs, and strong support to community self-management of natural resources strengthened the environmental evaluation of all investments and definition of appropriate instruments. High overall compliance—collectively and individually—shows that farmers bought into environmental conservation measures and mitigation measures.

- Integrated pest management techniques were disseminated, focused on biological controls, and types of parasites and tools for behavioral control of pests and insects.

- No measures were needed to preserve physical cultural resources because no project activity placed cultural assets at risk. Further, the project's strong natural resources management and conservation focus took natural habitats into account in all activities.

81. **Climate change co-benefits.** The project generated climate change adaptation and mitigation co-benefits in agricultural areas. Specifically, it enhanced climate change adaptation by (a) reducing exposure of communities and systems by conducting proper micro-catchment planning; this led to improved land- and water-use planning and management at the farm level, in turn promoting the adoption of improved cropland and grazing management, conservation agriculture, reforestation of riparian areas, and natural regeneration of vegetation around springs and (b) reducing sensitivity by enhancing soil nutrition and on-farm water management. Some climate change mitigation co-benefits were generated through the reduction and removal of GHG emissions through improved cropland and grazing management and

restoration of Atlantic forest especially in riparian areas and springs, as well as increasing feed-use efficiency and reducing forest degradation in grazing areas.

Social Safeguards Compliance

82. Involuntary Resettlement (OP 4.12) was triggered on a precautionary basis. The project did not lead to any involuntary resettlement. When needed for community development activities, small plots were acquired through voluntary donation from project beneficiaries, following legal procedures that were thoroughly documented. Throughout its implementation, compliance of project activities with social safeguards was regularly supervised on a biannual basis. The project performance rating remained Satisfactory throughout the project's life. Overall compliance with social safeguards is judged Satisfactory and social risk is Low.

Fiduciary Compliance

83. Financial management (FM) performance was rated Moderately Unsatisfactory until the second semester of 2018, when the rating was upgraded to Moderately Satisfactory due to improved performance. The Moderately Unsatisfactory rating was mainly due to (a) late submission of interim financial reports (IFRs); and (b) project financial data being registered in two separate systems that required constant reconciliations. These included SIAFEM (SoRJ FM system) and its replacement Integrated System for Budget, Financial, and Accounts Management (*Sistema Integrado de Gestão Orçamentária, Financiera e Contábil do Rio de Janeiro,* SIAFE-Rio) (the state government's public FM system, where expenditures are budgeted, committed, and accounted for and through which all payments are made) and System for Physical and Financial Monitoring (*Sistema de Acompanamento Fisico Financiero,* SAFF) (the project FM and monitoring system used for the preparation of IFRs). Discrepancies often appeared between the SIAFEM data and the IFRs. There was also a delay in the launch of SIAFI-Rio—the budgeting and accounting state system that replaced SIAFEM—which had an impact on the generation of the IFRs.

84. The project's FM function was adversely affected by repeated seizures of loan proceeds. Because the SAFF was not adequately monitoring subproject implementation, funds in the Designated Account were seized in August 2016 in compliance with a judicial order. This had an impact on project execution by leading to a halt in any further advances to the Designated Account, while the Federal Government reaffirmed its commitment to continue with the project and committed to reimburse the sequestered amount. This event created a critical disruption to the project. Moreover, funds continued to be seized from the Designated Account, which at the end of 2018 totaled BRL 6,455,606.09 (including interest earned of BRL 3,069,967.24).

85. The FM risk rating varied between Moderate to High. The FM risk was changed to High at the end of the project, due to (a) the high risk of undocumented advances at the end of the project, with the World Bank/PIU exploring options to submit substitute expenditures, to cover both the amounts seized by the judicial authorities from the Designated Account (due to the state's fiscal situation) as well subprojects unable/unlikely to document the resources transferred to them, before the expiry of the grace period; (b) high volume of subproject execution at the end of the project; and (c) the project's final combined 2018 and 2019 audit report, which will be received only in September 30, 2019.

86. Except for the 2014 audit report, all other audit reports were submitted late. Apart from the 2012 and 2014 audit reports (which expressed a modified audit opinion, that is, qualified), all other audit reports expressed an unmodified opinion.

87. All IFRs received during the life of the project were considered acceptable (after revisions), but many were received late. As of April 8, 2019, the undocumented balance in the Designated Account according to Client Connection was BRL 59,782,829.26. Under the original arrangement, any undocumented balance remaining at the end of the grace period (April 31, 2019) would have to be refunded to the World Bank.

88. To date, no ineligible expenditures have been identified. The grace period was extended, and it will end on May 31, 2019. The final audit is expected after the end of the grace period.

Procurement Compliance

89. The World Bank's procurement oversight was continuous, comprehensive, and benefited from having a single experienced Procurement Specialist for the project duration. The PIU's chronic inability to overcome procurement weaknesses made the procurement function especially challenging, as did major delays in procurement review and approvals by the State Court of Accounts (*Tribunal de Contas*), which negatively affected the efforts to maintain timely procurement processing and the scope and quantity of procurement packages. Planned road works and bridges were especially hard-hit. The World Bank responded through repeated procurement training, frequent adjustments to procurement strategy and planning, more frequent procurement supervision, and contracting a consultant familiar with World Bank procurement rules to support the PIU. Section III discusses procurement as a key factor affecting project implementation. In contrast to the experience in the central PIU, at decentralized levels, beneficiaries performed well in conducting direct procurement of goods and services through the agreed community participation in procurement modality (stipulated in the PAD), characterized by simplified procurement procedures and the small value of procurement contracts (<US$5,000).

90. The 2011 (Level I) Restructuring introduced a new category of 'Emergency Subprojects' to restore the productive environment of flood-affected small farmers. While these used existing community procurement procedures, procurement risk remained High due to the project's decentralized nature and the higher ceilings on financial support per beneficiary allowed under this instrument. Risks were reduced, however, by training beneficiaries and local technicians in the World Bank procurement processes, increasing field supervision of emergency activities using the EMATER field network, and reassigning project procurement personnel. Procurement quality improved slowly under the AF as the PIU adjusted to the increased volume of procurement under the larger project, supported by agreed and closely monitored action plans to improve procurement capacity, development of a procurement monitoring module in the MIS, and the use of checklists to maintain momentum. Based on the above history, procurement ratings were mostly in the unsatisfactory range throughout until restored to Moderately Satisfactory in the final year.

C. BANK PERFORMANCE

Quality at Entry

91. Key elements relevant for assessing the project's quality at entry are as follows:

- **The World Bank supported the client in preparing the first large-scale World Bank-supported market-focused rural intervention in the SoRJ,** scaling up and complementing the previous Rio GEF and other GEF donor-funded rural and environmental operations, whose primary focus was environmental protection and natural resources management. The project was designed to take the unique opportunity offered to execute a strongly market-oriented agricultural operation to simultaneously support farmers' competitiveness and protection of global biodiversity resources. Lessons emerging from those state operations, as well as similar projects elsewhere in Brazil and Latin America, were also considered.

- **The project built on accumulated experience.** Its design and operational methodology benefited from two decades of World Bank-supported multiphased community-driven and micro-catchment-based small farmer programs in both the northeastern and southeastern regions of Brazil and took certain features from the "productive alliance" model which was expanding under World Bank-supported rural operations in Latin America at the time.

- **The project's implementation approach was sound and logical**, based on socioeconomic and environmental studies and identified relevant productivity and environmental issues, their consequences, and the challenges faced in overcoming them. The project adopted a hybrid approach stressing small farmer organization (loosely interpreted in the PAD, but formalized under the AF), competitiveness, market access, and agricultural sustainability—financed through a matching grant mechanism with beneficiary contribution—while retaining the micro-catchment as organizing unit and geophysical location. However, the resulting project was quite complex for a state with limited experience with such market-oriented methodologies and approaches, in addition to limited institutional capacity (as became evident during implementation).

- **Fiduciary aspects (procurement, FM, and safeguards) were adequately assessed.** FM and procurement capacity assessments were conducted for SEAPPA, EMATER, and PESAGRO, the main implementing agencies, and appropriate risk ratings were applied; action plans and training were designed to boost those agencies. Safeguards were addressed adequately, and the required assessments and plans were prepared; the project was expected to have positive environmental and social impacts. However, persistent procurement issues and disagreements during a major part of the implementation period (distracting attention from other core development issues) seem to indicate that a more careful assessment would have been appropriate ex ante to smooth implementation.

- **The M&E system/arrangements were clearly described albeit ambitious in scope.** The PDO specified the targeted beneficiaries, but it was framed very broadly. The Results Framework at appraisal covered the gamut of project activities and goals; however, the PDO indicators did not capture entirely the essence of the PDO, and some indicators were multifactored, vaguely defined, and likely to be difficult to measure (mainly because of lack of clarity on the methodologies to collect and process data). As noted, there were no indicators for women, youth, or other vulnerable groups. These were weaknesses in project design which affected quality at entry.

- **The PAD states that the project explicitly targeted women and youth, but this was not reflected in the RF indicators or specific aspects of project design.** The regions selected for

project focus were adequate as they presented the lowest socioeconomic indicators in the state. During extensive consultations supporting preparation, communities expressed acute concerns about deepening poverty and outmigration, along with their receptivity to sustainable and productive technologies and practices. More attention could have been given to the selection of farmers' organizations and identification of instruments to support their strengthening to be able to successfully benefit from the project.

92. **The project risk assessment was realistic, but it did not cover all potential risks.** Institutional weaknesses should have been more explicitly recognized during preparation/appraisal, together with additional mitigation measures. Some critical events that disrupted project implementation and affected disbursement were not anticipated.

Quality of Supervision

93. Key elements relevant for assessing project supervision are as follows:

- **The World Bank's focus was generally proactive and supportive**, but the difficult operating context led the supervision team to focus on unblocking processes in the short run while focusing less on long-run developmental impacts. The urgency in providing adequate solutions to extreme weather events as well as to the fallout from financial crisis and repeated sequestration of funds by federal agencies, were important factors in this uneven focus.

- **The size of and justification for the AF can be questioned.** The injection of US$100 million of additional World Bank financing, with the goal of engaging the state in a longer-term intervention to deepen and expand coordinated agricultural and environmental management to intensify the project's development effectiveness, seemed reasonable at a time when the state was enjoying an apparently permanent growing trend. In retrospect, however, the decision to introduce an AF of almost three times the original loan may have been questionable, as it later became apparent that it was too large for the SoRJ to absorb. A more conservative approach with a smaller AF would have been less risky.

- **Supervision of fiduciary and safeguards aspects was managed well by experienced World Bank specialists.** Special note is made of the quality of the support provided by the World Bank in the area of procurement, given the acute capacity constraints, governance issues and bureaucratic obstacles, stemming from the state's fiscal emergency and the larger national political and economic crises during the second half of the project period.

- **The World Bank management expressed appreciation for the project team's skill in managing repeated challenges over the project engagement period,** which included a complete cessation of project activities in 2016 due to fiscally driven tensions associated with the retention of funds in the Designated Account.

- **Supervision missions mobilized a wealth of technical support—although coordination was, at times, challenging—to maintain a balanced focus between achieving developmental outcomes while assuring adequate implementation progress.** Even though a balanced team of specialists sourced regionally participated in supervision (from World Bank

Headquarters, the County Management Unit and from other international agencies such as FAO), they were not always present at the same time to discuss critical issues with the client and to find commonly agreed solutions. Mission findings were reported in a candid and informative manner, which incorporated action plans with systematic follow-up. Again, because of the difficult issues on several fronts requiring urgent solutions, the World Bank supervision was obliged to focus on problem-solving to facilitate overall project implementation and disbursement.

- **Recurring crises prevented the World Bank team from focusing consistently on M&E,** but this did not constrain the production of high-quality, methodologically sound studies or undermine the project's ability to collect, organize, utilize, and disseminate key data. Further, an impressive body of research papers and complementary analyses were financed and disseminated (see annex 8).

94. **The World Bank worked with the SEAPEC project team and other executing agencies to ensure orderly project closure and sound transition arrangements for the regular operation of supported activities.** This included determining responsibility and arrangements for the completion of some incomplete investments, ensuring the timely delivery of the Impact Evaluation and BCR, and insisting that the Borrower maintain a basic core team to support the World Bank's ICR.

Justification of Overall Rating of Bank Performance

95. The World Bank's overall performance is rated **Moderately Satisfactory,** due to modest shortcomings in Quality at Entry and Quality of Supervision (as described earlier). These shortcomings are mainly associated with the complexity of project design given the challenging institutional context for project implementation, limitations in M&E and the RF, and questions associated with the size of and rationale for the AF. These shortcomings were at least partially overcome owing to the close supervision support provided by the World Bank team and the team's effectiveness in working with the borrower to address successfully the large number of challenges that arose during implementation.

D. RISK TO DEVELOPMENT OUTCOME

96. The main risk to development outcome is the fiscal situation of the SoRJ, which could potentially affect the effectiveness of institutions involved in activities key to ensuring sustainability (through the operational capacity of their staff). On the other hand, the decentralized approach adopted by the project (that is, transfer of powers from SEAPPA's center to its regional and subregional offices, especially with key on-the-ground implementers, including EMATER-Rio and PESAGRO) provided increased local capacity building and outreach. This was reinforced by project resources specifically invested for strengthening the capacity of key implementing agencies at the local and regional levels. The sustainability of the institutional approach, despite the fiscal constraints, is considered likely.

97. The project also developed extensive partnership models through NGOs, farmer/producer organizations and cooperatives, leading to an enhanced understanding of the benefits of strengthening associative behavior and demonstrating how smallholder producers could develop and maintain market links. The initial reluctance on the part of many beneficiaries to adopt new approaches and practices (which stemmed from a combination of cultural factors, risk-averse strategies, and bad experiences with more traditional models of rural extension in the past) was overcome by the extensive utilization of a

highly participatory approach for the delivery of technical assistance, which emphasizes strengthening local organizations, learning exchanges, and beneficiary empowerment. The continuous use of the COGEM model contributed significantly to increasing beneficiary participation and transparent decision making.

98. Market risk associated with prices, production quality, and timing of delivery for honoring contracts could potentially hamper the profitability of many of the productive investments made under the project. Although the project cannot control market risk, it has contributed to equipping small farmers with a deeper awareness of market demands and more integrated production systems, and they are better able to react and adapt to changing market conditions and to monitoring and addressing risks after the project.

99. The project has also contributed to a deeper understanding of the risks associated with external weather events and climate change, as well as provided the chance to increase state- and local-level capacities to respond to these types of shocks in the future.

V. LESSONS AND RECOMMENDATIONS

100. **Demand-driven approaches for mobilizing investment support normally take time and require intensive capacity building.** The experience with the evolution needed for the identification and implementation of subprojects confirmed that participatory approaches require a period of assimilation both by technical assistance institutions as well as producers (from two to three years). Beneficiaries need time and training to mature and develop ideas into actual investment proposals. More mature and better organized beneficiary groups are typically more responsive to market opportunities and show higher capacity for mobilizing the level of resources needed to prepare investment proposals. A realistic assessment of their initial capacity is essential for planning appropriate capacity-building and technical assistance activities and to avoid overly optimistic implementation plans, as well as to ensure achievement of impacts at the beneficiary level.

101. **Definition of hydrographic micro-basins as the working unit can be extremely useful.** This concept, building on the previous experience with the GEF operation and experiences in other states of Brazil, allowed field technicians and organized producers an overall understanding of the situation and the concentration of efforts to set up an adequate PEM. This helped consolidate the results of the diagnosis, with the recommendations coming from the technical strategy and the priorities defined by the farmers' organizations. It also helped put into perspective the complementarity between the PIDs and the different types of subprojects (productive, environmental, and value chain). Finally, it made possible the implementation of the COGEMs, which was another element contributing to further participation and empowerment of beneficiaries.

102. **Focusing on business development and responding efficiently to market demand, typically requires a flexible, diversified marketing approach.** Public purchasing programs are important, mainly in the first stages to build confidence, but not to be considered as the final solution ignoring other private commercial prospects (even though they could be more stringent and demanding). Also, beneficiaries learned that proximity to market is not the only aspect to be considered for achieving effective access to markets; other factors are more important to gain and maintain access, such as capacity for frequent and timely delivery of quality products, as well as capacity to adjust to shifting market demands or changes in market structure. Adequate managerial and marketing capacity are key factors to increase effective, sustainable access to markets.

103. **Decentralization of project implementation to the municipal level can increase flexibility.** Shifting decision making closer to demand and markets increases possibilities for building local capacity, and it is a catalyst to more effective rural public policy instruments, contributing to long-term sustainability of the intervention. In addition, the approach based on COGEMs was instrumental in strengthening of capacity building and empowerment of the beneficiaries leading to a better selection and implementation of subprojects and helping beneficiaries take a more entrepreneurial approach.

104. **Flexible project design can allow the World Bank to respond quickly and effectively to unforeseen extreme events such as flooding, drought, and fiscal crisis and to provide emergency responses tailored to needs on the ground.** Project design should allow for some degree of flexibility to allow efficient responses in cases of emergency. At the same time, it is imperative to allow time for a careful assessment of the underlying assumptions and the rationale for the response (such as size of additional financing/partial cancellation, expansion of areas, institutional changes, and complexity of new components or activities).

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: Adoption of farming systems approaches, re-establishing agriculture production in Serrana region

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of small farmers transitioned towards more productive farming systems	Number	0.00 01-Oct-2010	35000.00 30-Nov-2018		37172.00 06-Dec-2018
Number of female small farmers transitioned towards more productive farming systems	Number	0.00 01-Oct-2010	6000.00 30-Nov-2018		5280.00 06-Dec-2018

Comments (achievements against targets):

Comments: Exceeded 106%. At appraisal, the indicator aimed that at least 50% of small farmers in targeted areas transitioned towards more productive farming systems (those that result in sustainably better agro-forestry, crop or livestock quality and yields), with an estimated overall number of small farmers in project focal areas and a target of 37,000. During the 2011 restructuring, the estimated overall number of small-farmers in project focal areas was decreased to 28,000. At closing, the target was 35,000 and the project reached 37,172 small farmers that transitioned to more productive farming systems. Under this indicator, a sub-indicator was created: number of female small farmers transitioned towards more productive farming systems. - This sub-indicator was not considered with the 2009 PAD and even thought at closing the target of 6,000 female small farmers transitioning to more productive farming systems was not reached, the project had 88% of success for

this sub-indicator. With the inclusion of gender indicators, the project highlighted the importance of women in agricultural productive systems as well as key actors of development and income generators.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
No. of small farmers included in (or with improved links to) at least one value-chain	Number	10.00 01-Oct-2010	2600.00 30-Nov-2018		3359.00 06-Dec-2018

Comments (achievements against targets):

Comments: Exceeded 129%. The original PDO outcome indicator at appraisal was Improved market access by at least 10% of beneficiaries receiving investment support as measured by their inclusion in (or with improved links to) at least one value chain, revised with the 2011 restructuring and reworded as number of small farmers included in (or with improved links to) at least one value chain. Since 2009, the original target was 2,600 and at closing, the result was 3,359.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area of agricultural lands under improved production systems (Hectares)	Number	0.00 01-Oct-2010	160000.00 30-Nov-2018		223152.00 06-Dec-2018

Comments (achievements against targets):

Comments: Exceeded 139%. Since appraisal, the target was set at 160,000. At closing the result showed an amount of 223,152 hectares. Data are extracted from the SAFF (Sistema de Acompanhamento Físico e Financeiro), the number of PIDs and the average area of the benefited properties.

A.2 Intermediate Results Indicators

Component: Component 1: Supporting Rural Production and Competitiveness

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Roads rehablitated	Kilometers	0.00 01-Oct-2010	6000.00 30-Nov-2018		7127.00 06-Dec-2018
Roads rehabilitated - rural	Kilometers	0.00	6000.00		7127.00
Roads rehabilitated - non-rural	Kilometers	0.00	0.00		0.00

Comments (achievements against targets):

Exceeded 119%. At appraisal, the intermediate results indicator was not considered or included. With the 2017 restructuring, the indicator was incorporated with a target of 6,000 and a final result of 7,127. However, it should be noted that at appraisal, a PDO outcome indicator was created as Length (km) of tertiary roads restored and maintained with a target of 1,300 km. With the 2012 restructuring, the indicator

was moved as intermediate results indicator under component 1, and later dropped. According with the 2014 ISR 10, archived November 08th, 2014, the indicator reached 3,389 km of tertiary roads restored and maintained.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of stakeholders participating in development committees across all levels	Number	1000.00 01-Oct-2010	4000.00 30-Nov-2018		3870.00 06-Dec-2018

Comments (achievements against targets):
Substantial achievement: 96.75%. At appraisal, this intermediate results indicators was drafted as number of stakeholders participating in development committees across local, municipal and regional levels with a target of 4000. During the 2017 restructuring, the indicator was revised and reworded as number of stakeholders participating in development committees across all levels. At closing, the results reached were 3,870.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of beneficiaries trained in key project concept	Number	0.00 01-Oct-2010	50000.00 30-Nov-2018		59651.00 06-Dec-2018
Number of women beneficiary trained in key project concept	Number	0.00 01-Oct-2010	7800.00 30-Nov-2018		13671.00 06-Dec-2018

Comments (achievements against targets):
Exceeded 119%. At appraisal, the target was projected for 42,000 beneficiaries. In 2011 the indicator was revised to include 2,000 affected by the natural disaster. As well, a new sub-indicator was added: Number of women beneficiary trained in key project concept with a target of 7,800 women beneficiaries trained. The inclusion of this indicator shows the importance of the inclusion of gender in this project as key stakeholders of development and income generation in agricultural activities. At closing, 59,651 beneficiaries were trained in key project concept.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
A strategy and action plan (ISP) formulated to strengthen rural institutions in the State of Rio de Janeiro	Number	0.00 01-Oct-2010	1.00 30-Nov-2018		1.00 06-Dec-2018

Comments (achievements against targets):
Achieved 100%. The strategy was formulated since the 2009 PAD and no more updates were necessary.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
No. of small farmer investment proposals financed with the participation of the ESS	Number	0.00 01-Oct-2010	60.00 30-Nov-2018		158.00 06-Dec-2018
Amount (US$) leveraged for	Amount(USD)	0.00	1000000.00		25375344.00

small farmer investment subprojects			15-Jun-2018		

Comments (achievements against targets):
Exceeded 263%. The original target was stated as 60 and the final result showed that 158 small farmer investment proposals were financed with the participation of the ESS

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Targeted clients satisfied with project services	Percentage	0.00 01-Oct-2010	75.00 30-Nov-2018		79.20 06-Dec-2018

Comments (achievements against targets):
Exceeded 106%. This is not an original intermediate results indicator. It was incorporated with the 2017 restructuring with a target of 75 and a final result of 79.2.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of investment proposals (subprojects) financed	Number	0.00 01-Oct-2010	36200.00 30-Nov-2018		38221.00 06-Dec-2018

Comments (achievements against targets):

Exceeded 160%. The strategy was formulated since the 2009 PAD and minor wording updates were performed. The target was also maintained from the beginning of the project by 36,200. At closing, the result showed that 38,221 investment proposals (subprojects) were financed.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
All resources related to emergency operations disbursed one year after disaster (US$)	Amount(USD)	0.00 01-Feb-2011	14000000.00 30-Nov-2018		14000000.00 06-Dec-2018

Comments (achievements against targets):

Achieved 100%. Not an original intermediate results indicator. This indicator was incorporated with the 2011 restructuring due to the 2011 natural disaster. The target was 14,000,000 and the result showed that 14,000,000 were reached.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of emergency investment proposals financed	Number	0.00 01-Feb-2011	2277.00 06-Dec-2018		2277.00 06-Dec-2018

Comments (achievements against targets):

Substantial achievement: 99%. Not an original intermediate results indicator. Was introduced as new indicator with the 2011 restructuring due to the natural disaster that occurred that year. The target proposed was 2,300 with a final result of 2,277 emergency investment proposals financed.

Component: Component 2: Strengthening Institutional Frameworks

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
An economic sustainability system established	Number	0.00 01-Oct-2010	1.00 30-Nov-2018		1.00 06-Dec-2018

Comments (achievements against targets):
Achieved 100%. Not an original intermediate results indicator. It was considered in the 2011 restructuring paper with the ESS design in year 2 and the ESS established in year 3.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of cooperation arrangements established to implement joint activities	Number	0.00 01-Oct-2010	4.00 30-Nov-2018		10.00 06-Dec-2018

Comments (achievements against targets):

Exceeded 250%. The strategy was formulated since the 2009 PAD, minor wording adjustments were made and no more updates were necessary. The original target was and at closing, the result showed 10 cooperation arrangements established to implement joint activities.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of participatory research projects carried out in support of sustainable rural development	Number	21.00 01-Oct-2010	50.00 30-Nov-2018		75.00 06-Dec-2018

Comments (achievements against targets):

Exceeded 150%. The intermediate results indicator was formulated since the 2009 PAD and no more updates were necessary. The original target was 50 and the final result showed that 75 participatory research projects were carried out under the RNS.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of Microcatchment Development Plans (MDP) formulated and negotiated	Number	50.00 01-Oct-2010	366.00 30-Nov-2018		370.00 06-Dec-2018

Comments (achievements against targets):

Exceeded 101%. At appraisal, the original intermediate results indicator was stated as Number of MDPs, MuDPs, and RDPs formulated (or updated) and negotiated with stakeholders across all levels (Under component 1). With the 2012 restructuring moved under component 2.

With the 2017 restructuring, the wording in the indicator was revised and updated to number of MDP formulated and negotiated. The original target was 366 and at closing the result showed that 370 MDPs were formulated and negotiated.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of new MDC established or strengthened	Number	0.00 01-Oct-2010	366.00 30-Nov-2018		370.00 06-Dec-2018

Comments (achievements against targets):
Exceeded 101%. At appraisal, the original intermediate results indicator was drafted as number of new MDCs and RDCs established and existing MDCs, MUDCs and RDCs strengthened (Under component 1) with a target of 200 new MCDs and 50 existing MCDs. With the 2011 restructuring, the new target for MCD was adjusted to 152 and for existing MCDs 48. The 2012 restructuring revised the indicator as follows: number of MDCs, MuDCs and RDCs established and strengthened, adjusting the target of MDCs to 366. At closing, results showed that 370 new MDCs were established or strengthened.

Component: Component 3: Project Coordination and Information Management

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
MIS established and operating	Text	GEF MIS 01-Oct-2010	MIS effectively operating 30-Nov-2018		MIS effectively operating 06-Dec-2018

Comments (achievements against targets):
Achieved 100%.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
M&E system established and effectively collecting and analyzing relevant information	Text	GEF M&E system established 01-Oct-2010	M&E system properly operating 30-Nov-2018		M&E system properly operating 06-Dec-2018

Comments (achievements against targets):
Achieved 100%. During YR1, M&E system established. YR2 to closing, M&E was effectively operating.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
PIU structure functionning across all levels	Text	Decree to restructure existing GEF PIU 01-Oct-2010	PIU operating 30-Nov-2018		PIU operating 06-Dec-2018

Comments (achievements against targets):
Achieved 100%.

B. KEY OUTPUTS BY COMPONENT

Objective/Outcome: Increase the adoption of integrated and sustainable farming systems approaches in specific areas of the Borrower-s territory and help re-establish an agricultural productive environment in areas of the Serrana Region affected by the January 2011 natural disaster.	
Outcome Indicators	Number of small farmers (at least 50% in targeted areas) transitioned towards more productive farming systems. **Target: 35,000 / Result: 37,172 (106%)**
	Number of female small farmers transitioned towards more productive farming systems **Target: 6,000 / Result: 5,280 (88%)**
	Number of small farmers included in (or with improved links to) at least one value-chain **Target: 2,600 / Result: 3,359 (129%)**
	Area of agricultural lands under improved production systems (Hectares) **Target: 160,000 / Result: 223,152 (139%)**
Intermediate Results Indicators	**Component 1: Supporting Rural Production and Competitiveness – Capacities built and investments implemented across individual, community, municipal and regional levels to improve production systems and rural livelihoods, and restoration of the productive environment in areas of the Serrana region affected by the natural disaster** 1. Roads rehabilitated. **Target: 6,000 / Result: 7,127 (119%)** - Roads rehabilitated – rural. - Roads rehabilitated – non rural 2. Number of stakeholders participating in development committees across all levels. **Target: 4,000 / Result: 3,870 (96.75%)** 3. Number of beneficiaries trained in key project concept. **Target: 50,000 / Result: 59,651 (119%)** - Number of women beneficiary trained in key project concept. **Target: 7,800 / Result: 13,670 (175%)** 4. A strategy and action plan (ISP) formulated to strengthen rural institutions in the State of Rio de Janeiro. **Target: 1 / Result: 1 (100%)** 5. Number of small farmer investment proposals financed with the participation of the ESS. **Target: 60 / Result 158 (263%)** - Amount (US$) leveraged for small farmer investment subprojects. **Target 1,000,000 / Result:**

	25,375,344 (2538%) 6. Targeted clients satisfied with project services. **Target: 75.0 / Result: 79.2 (106%)** 7. Number of investment proposals (subprojects) financed. **Target: 36,200 / Result: 38,221 (105.58%)** 8. All resources related to emergency operations disbursed one year after disaster. **Target: 14,000,000 / Result: 14,000,000 (100%)** 9. Number of emergency investment proposals financed. **Target: 2,300 / Result: 2,277 (99%)**
	Component 2: Strengthening Institutional Frameworks – More effective institutional arrangements and capacities at state and decentralized levels to support sustained agricultural development and disaster risk management throughout the SoRJ 1. An ESS established. **Target: 1 / Result: 1 (100%)** 2. Number of cooperation arrangements established to implement joint activities. **Target: 4 / Result: 10 (250%)** 3. Number of participatory research projects carried out in support of sustainable rural development. **Target: 50 / Result: 75 (150%)** 4. Number of microcatchments development plans (MDP) formulated and negotiated. **Target: 366 / Result: 370 (101%)** 5. Number of new MDC established or strengthened. **Target: 366 / Result: 370 (101%)**
	Component 3: Project Coordination and Information Management – Project management functioning and able to effectively implement and monitor project activities across all territorial levels, as to disseminate and share SRD knowledge and information to influence decision-making processes of key stakeholders 1. MIS established and operating. Target: **MIS effectively operating / Result: MIS effectively operating (100%)** 2. M&E system established and effectively collecting and analyzing relevant information. **Target: M&E system fully established and operating / Result: M&E system fully established and operating (100%)** 3. PIU structure functioning across all levels. **Target: PIU operating efficiently / Result: PIU operating efficiently (100%)**

Key Outputs by Component (Linked to the achievement of the Objective/Outcome)[24]	Component 1: Supporting Rural Production and Competitiveness – Capacities built and investments implemented across individual, community, municipal and regional levels to improve production systems and rural livelihoods, and restoration of the productive environment in areas of the Serrana region affected by the natural disaster 1. Number of subprojects financed (No target/result: 38,221) 2. Number of farmers help due to the 2011 Natural Disaster Emergency (No target/1,908) 3. Number of youth farmers participating in project activities (no target/result: 383) 4. Number of producers that access to subprojects resources in 366 micro catchments (19,315/no target) 5. Number of beneficiaries/persons involved with environmental training (no target/6,772) 6. Number of PIDs elaborated (no target/18,586) 7. Number of rural communities benefited with roads rehabilitated (no target/result 34) 8. Number of beneficiaries with roads rehabilitated (no target/result 4,858)
	Component 2: Strengthening Institutional Frameworks – More effective institutional arrangements and capacities at state and decentralized levels to support sustained agricultural development and disaster risk management throughout the SoRJ 1. Number of cooperation agreements established (10 [100%]) 2. Number of publications and work documents (no target/results 14) 3. Number of technical manuals and guidelines elaborated (no target/result 40) 4. Number of PEM/DRP published in the portal (no target/result 217)
	Component 3: Project Coordination and Information Management – Project management functioning and able to effectively implement and monitor project activities across all

[24] Primary source: December 23, 2018 ISR (ISR34415)

	territorial levels, as to disseminate and share SRD knowledge and information to influence decision-making processes of key stakeholders 1. Preparation of a budget for the implementation team (100%) 2. Design and implementation of an accurate M&E program (target yes/result yes 100%)

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Supervision/ICR	
Maurizio Guadagni	Task Team Leader(s)
Luciano Wuerzius	Procurement Specialist(s)
Miguel-Santiago da Silva Oliveira	Financial Management Specialist
Alberto Coelho Gomes Costa	Social Safeguards Specialist
Katia Lucia Medeiros	Environmental Safeguards Specialist
Julia Conter Ribeiro	Team Member
Patricia Rodrigues de Melo	Team Member
Michele Martins	Team Member
Mario I. Mendez	Team Member
Sofia Keller Neiva	Team Member

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY07	2.420	15,168.47
FY08	8.304	37,508.92
FY09	27.430	145,968.14
FY10	1.490	6,792.42
Total	**39.64**	**205,437.95**
Supervision/ICR		
FY10	10.542	57,251.48

FY11	17.457	110,400.87
FY12	8.175	65,703.89
FY13	9.950	69,255.52
FY14	11.763	100,808.12
FY15	11.013	82,567.94
FY16	20.022	135,876.17
FY17	14.485	108,453.19
FY18	10.222	103,361.34
FY19	14.608	112,999.49
Total	**128.24**	**946,678.01**

ANNEX 3. PROJECT COST BY COMPONENT

Component/Subcomponents	Initial Appraisal Amount (US$)	Closing Amount (US$)	AF Planned Amount (US$)	AF Closing Amount (US$)	Planned Initial and AF Amount (US$)	Closing Initial and AF Amount (US$)	Percent of Approved (%)
1. Support to Small Farmer Production and Competitiveness	66.13	89.63	108.10	46.29	174.23	135.92	78
1.1. Pre-Investment	18.66	4.96	14.50	1.19	33.16	6.15	19
1.2 Investments	47.46	84.67	93.60	45.10	141.06	129.77	92
1.2.1 Investment on Subprojects	47.46	84.67	78.10	40.65	125.56	125.32	100
1.2.2 Investments on Rural Roads	0.00	0.00	15.50	4.45	15.50	4.45	29
2. Institutional Frameworks	5.17	1.58	4.84	0.85	10.03	2.43	24
2.1 Strengthening Rural Institutions and Coordination	2.76	0.26	1.57	0.30	4.33	0.56	13
2.2. Improving Public and Private Financial Support Mechanisms	0.86	0.00	0.14	0.00	1.01	0.00	0
2.3 Undertaking Participatory Research	1.55	1.32	3.13	0.55	4.69	1.87	40
3. Project Coordination and Information Management	7.60	6.24	10.50	1.68	18.10	7.92	44
3.1 Project Coordination	5.20	5.01	6.13	0.81	11.33	5.82	51
3.2. Information Management	2.40	1.23	4.38	0.87	6.78	2.10	31
Front-end Fee	0.10	0.08	0.00	0.00	0.10	0.08	80
Project Total Costs	**79.01**	**97.53**	**123.44**	**48.82**	**202.45**	**146.36**	**72**

ANNEX 4. EFFICIENCY ANALYSIS

1. During the initial ex ante evaluation, a financial and economic analysis was performed based on 31 farm models involving 21 main crops or livestock activities. For the AF, the financial and economic analysis was revised based on 33 farm models with 25 crops or livestock activities. For the final evaluation, 155 PIDs were selected as a stratified random sample to evaluate the financial and economic results of the five state regions: North, Northwest, Mountain, Central, and South. The sample was proportionally obtained from lists by regions and production systems in the main value chains. The sample of 155 PIDs benefited 236 families with 714 people. In terms of value chains, there were 54 PIDs of horticulture (leafy vegetables, tomato, cauliflower, peppers, cassava, potatoes, sweet corn); 51 PIDs of milk production; 31 of fruticulture (citrus, passion fruit, strawberry, persimmon, banana, pineapple); 11 PIDs of coffee production; 6 PIDs for raising small animals; and 2 PIDs on forestry. In terms of territorial coverage, there were 35 PIDs in the northern region, 30 PIDs of the northwest region, 37 PIDs of the center region, 29 of the mountain region, and 24 from the southern region. The details of the analysis are presented in Excel spreadsheets available in the project files. In general terms, the investments made by the various PIDs included brush cutters; spring protections; vehicles, mini tractors, and wagons; plantations (coffee, passion fruit, palmito, forage cane, and strawberry); improved pastures and rotational pasture systems; irrigation systems; organic fertilization; drying infrastructure and coffee pulping machines; milking machines and milk cooling tanks; sheds; spraying machines; animals (cows and chickens); riparian forests; agroforestry systems; greenhouses; and soil preparation. The results generated by the PIDs were mainly higher production and income, generally associated with higher production costs. Labor costs have increased or remained at the same level. Sales were generally carried out through existing market channels (associations, cooperatives, local markets and industries, wholesale markets and middlemen). The selected PIDs were evaluated through individual workshops conducted by EMATER extension agents trained in the FAO's RuralInvest methodology. Due to the relatively small selection universe of the PID, the financial and economic results obtained from this analysis provide unbiased estimates of viability at the aggregate level but do not allow for reliable comparisons by region, crop, or value chain.

2. During the ex-ante evaluation and the evaluation for the AF, the analytical parameters essentially included an annual discount rate of 12 percent and an evaluation period of 20 years. This final evaluation uses the same parameters. The BRL/U.S. dollar exchange rate considered ranged from 1.75 in 2010 to 3.74 in 2018. For the financial analysis, the family workforce involved in the PIDs was not included because it does not represent a currency expense. For the economic analysis, family labor was included and valued at market price. It is assumed that the economic price of labor is equal to the financial or market price because the medium to long-term unemployment rate tends to be close to the voluntary unemployment rate (according to the IBGE – Brazilian Institute of Geography and Statistics). Economic project costs were estimated by deducting the average 20 percent ICMS - *Imposto Sobre Operações Relativas à Circulação de Mercadorias e Serviços de Transporte Interestadual de Intermunicipal e de Comunicações* (value added tax) from financial project costs. The fiscal impact was not assessed as most beneficiary families would be exempt from ICMS (value added tax) under the terms of the current legislation.

Economic Analysis

3. **Annex 3 shows the costs of the project.** In aggregate terms, the Rio Rural project channeled US$146 million, of which US$66 million was from the IBRD loan and US$35 million from the counterpart of the federal and state governments. In addition, the participating families and their organizations contributed about US$45 million as co-financing. Of the US$146 million of total costs, 97 percent relate to the cycle of

planning, implementation, and M&E of PIDs. These costs involved pre-investments, productive investments, micro-basin management planning and institutional strengthening, participatory research, project management, M&E, and communication. Rio Rural also channeled US$4.4 million to improve rural roads. Indicative estimates of economic viability were generated for rural road improvements and the impact of participatory research. Finally, additional benefits were estimated by the favorable carbon balance generated by the project.

4. **Table 4.1 presents the aggregate economic results.** For the 155 PIDs evaluated (with 236 families and 2,120 ha), the economic NPV and the IRR of the investments made or the incremental situation were US$3.2 million and 43 percent. Total investments were US$707,300, of which US$377,600 was funded by the project (or 53 percent) and US$329,700 was funded by participants and other sources (or 47 percent). The average values per participating family are US$3,000 of investments, US$2,800 as incremental net revenue per year, and 28 person-days as incremental annual use of labor. The average annual incremental net income per hectare is US$275, which is more conservative than the estimated mean value of profit per hectare of US$800 in the Impact Evaluation.[25] Even though the sample does not allow for comparisons among regions or value chains, we can say that in the Serrana region, subject to special attention due to the emergency, the returns were very close to the overall average returns.

5. To estimate the aggregate economic return of the Rio Rural project, the economic flows of the sample of 155 PIDs were extrapolated based on the ratio between the project investments for all PIDs, and the project investments on the PIDs of the sample. Other project costs not directly related to the PIDs were incorporated into the analysis of the NPV and aggregate IRR. Based on table 4.2, incremental PID investments independently of the financial source generated an economic NPV of US$317 million and an economic IRR of 54 percent. Incremental investments on PIDs and other project costs generated an economic NPV of US$299 million and an economic IRR of 45 percent. When carbon co-benefits were added, the economic NPV and IRR were US$346 million and 49 percent, respectively. Finally, considering that the average project investment per PID is higher than the average investment of sampled PIDs, such investment costs were adjusted, and the NPV and the economic IRR with other project costs and carbon co-benefits were US$301 million and 36 percent. This last scenario is considered the base-case scenario. These results are similar to the indicators of the economic analysis carried out for the project at appraisal. The analysis offers unbiased economic indicators at the aggregate level, but the small sample size of PIDs only allows indicative conclusions. The large variability of results in terms of economic NPV and IRR do not allow comparisons by region and by value chain.

6. The Rio Rural project is sensitive to production and/or price changes because a reduction of sales or revenues of 11 percent would reduce the economic IRR to 12 percent. The project is moderately sensitive to rising input costs, as a 20 percent increase in costs would generate a marginally acceptable return. In contrast, the project is quite resilient in terms of labor costs and changes in investment costs, as they will have to increase by 60 percent and 110 percent, respectively to generate a marginally acceptable return.

7. In terms of impact of the roads evaluated, there is (a) 92 percent reduction of days of non-trafficability, (b) reduction of production losses (20 percent in the case of milk and 36 percent in the case of vegetables), (c) reduction of 50 percent of travel time due to increase in traffic speed, (d) reduction of

[25] *Compendio da Avaliação de Impacto. Impacto dos indicadores Econômicos dos produtores em microbacias: Estado do Rio de Janeiro*, 2018. *Lucro médio por hectare das unidades produtivas no ano anterior. Impacto*.

40–60 percent of the average cost of vehicle maintenance, and (e) 20–50 percent reduction in average fuel consumption. The IRR of the improvement of two roads evaluated (around 7–9 km improved) varies between 20 percent and 280 percent. In terms of impact of participatory research evaluated by the project, there is (a) 50 percent increase in milk production and reduction of rock dust as a result of the introduction of the silvopastoral system with rotational grazing, (b) a 30 percent increase in forage cane production as a result of the addition of rock dust to organic fertilization, (c) 30–50 percent increase in milk production as a result of the control of mastitis incidence and good sanitary practices, (d) increase of 10–40 percent in the productivity of horticulture, and (e) increase of 40 percent of the income as a result of the use of alternative inputs to pesticides.

Financial Analysis

8. Table 4.2 presents the aggregate financial results. For the 155 PIDs evaluated (with 236 families and 2,120 ha), the financial NPV and IRR of the investments made or the incremental situation were US$4.2 million and 58 percent, respectively. The average value per participating household was US$3,400 as incremental net revenue per year. The average annual incremental net income per hectare is US$380, which is also more conservative than the estimated mean value for profit per hectare of US$800 in the abovementioned Impact Evaluation.

9. To estimate the project's aggregate financial return, the financial flows of the PIDs in the sample were extrapolated on the same basis as stated earlier. Based on table 4.3, incremental PID investments independently of the financial source generated a financial NPV of US$441 million and an IRR of 58 percent. Incremental investments on PIDs and other project costs generated a financial NPV of US$418 million and an IRR of 49 percent. When carbon balance co-benefits were added, the financial NPV and IRR were US$467 million and 52 percent, respectively. Finally, considering that the average project investment per PID is higher than the average investment of sampled PIDs, such investment costs were adjusted, and the financial NPV and IRR with other costs and co-benefits by carbon balance were US$411 million and 38 percent, respectively. This last scenario is considered the base-case scenario.

Sensitivity Analysis

10. To assess the sensitivity of PID economic and financial indicators considering investments and other costs, switching values (percentage that reduces the overall economic IRR to 12 percent) were estimated for gross annual revenues, annual costs of inputs, and annual costs of labor. As shown in table 4.3, the project is sensitive to production and/or price reduction because a 11 percent reduction of revenues would reduce the overall economic IRR to 12 percent. The project is moderately sensitive to rising input costs as a 20 percent increase in cost would generate a marginally acceptable return. In contrast, the project is quite resilient in terms of labor costs and changes on investment costs as they will have to increase by 60 percent and 110 percent, respectively, to generate a marginally acceptable return.

Table 4.1. Economic Assessment Results (US$)

Key Paramaters	Number
Number of PIDs on the Sample	155
Number of PIDs financed by the Program	16,215

Assessment level	Participants		Productive Base (Ha)		Investments			Annual Net Income			Incremental NPV	IRR
	Families	Persons	Without PID	With PID	Without PID	With PID	Increment	Without PID	With PID	Increment	@ 12%	%
PIDs												
Total from Sample of PIDs	236	714	2,119	2,119	991,578	1,595,351	603,773	406,771	988,099	581,327	3,037,860	54%
Mean per PID	2	5	14	14	6,397	10,293	3,895	2,624	6,375	3,750	19,599	54%
Mean per Family	1	3	9	9	4,202	6,760	2,558	1,724	4,187	2,463	12,872	54%
Mean per Hectare	-	-	1	1	468	753	285	192	466	274	1,434	54%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	103,731,857	166,894,256	63,162,399	42,553,537	103,367,863	60,814,327	317,799,364	54%
PIDs + other Program costs												
Total from Sample of PIDs	236	714	2,119	2,119	991,578	1,762,893	771,315	406,771	988,099	581,327	2,855,695	45%
Mean per PID	2	5	14	14	6,397	11,374	4,976	2,624	6,375	3,750	18,424	45%
Mean per Family	1	3	9	9	4,202	7,470	3,268	1,724	4,187	2,463	12,100	45%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	103,731,857	184,421,374	80,689,517	42,553,537	103,367,863	60,814,327	298,742,581	45%
PIDs + other costs + Carbon co-benefits												
Total from Sample of PIDs	236	714	2,119	2,119	991,578	1,762,893	771,315	406,771	1,064,383	657,612	3,303,105	49%
Mean per PID	2	5	14	14	6,397	11,374	4,976	2,624	6,867	4,243	21,310	49%
Mean per Family	1	3	9	9	4,202	7,470	3,268	1,724	4,510	2,786	13,996	49%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	103,731,857	184,421,374	80,689,517	42,553,537	111,348,192	68,794,655	345,547,414	49%
Investment adjusted to Total Costs												
Total from Sample of PIDs	236	714	2,119	2,119	991,578	2,157,432	1,165,854	406,771	1,064,383	657,612	2,874,133	36%
Mean per PID	2	5	14	14	6,397	13,919	7,522	2,624	6,867	4,243	18,543	36%
Mean per Family	1	3	9	9	4,202	9,142	4,940	1,724	4,510	2,786	12,179	36%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	103,731,857	225,695,202	121,963,345	42,553,537	111,348,192	68,794,655	300,671,447	36%

Table 4.2. Financial Assessment Results (US$)

Key Paramaters	Number
Number of PIDs on the Sample	155
Number of PIDs financed by the Program	16,215

Assessment level	Participants		Productive Base (Ha)		Investments			Annual Net Income			Incremental NPV	IRR
	Families	Persons	Without PID	With PID	Without PID	With PID	Increment	Without PID	With PID	Increment	@ 12%	%
PIDs												
Total from Sample of PIDs	236	714	2,119	2,119	1,189,894	1,914,421	724,527	934,685	1,738,117	803,431	4,212,701	58%
Mean perPID	2	5	14	14	7,677	12,351	4,674	6,030	11,214	5,183	27,179	58%
Mean per Family	1	3	9	9	5,042	8,112	3,070	3,961	7,365	3,404	17,850	58%
Mean per Hectare	-	-	1	1	562	903	342	441	820	379	1,988	58%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	124,478,228	200,273,107	75,794,879	97,780,141	181,829,427	84,049,285	440,702,911	58%
PIDs + pther Program costs												
Total from Sample of PIDs	236	714	2,119	2,119	1,189,894	2,115,472	925,578	934,685	1,738,117	803,431	3,994,104	49%
Mean perPID	2	5	14	14	7,677	13,648	5,971	6,030	11,214	5,183	25,768	49%
Mean per Family	1	3	9	9	5,042	8,964	3,922	3,961	7,365	3,404	16,924	49%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	124,478,228	221,305,649	96,827,420	97,780,141	181,829,427	84,049,285	417,834,772	49%
PIDs + other costs + Carbon co-benefits												
Total from Sample of PIDs	236	714	2,119	2,119	1,189,894	2,115,472	925,578	934,685	1,814,401	879,716	4,441,513	52%
Mean perPID	2	5	14	14	7,677	13,648	5,971	6,030	11,706	5,676	28,655	52%
Mean per Family	1	3	9	9	5,042	8,964	3,922	3,961	7,688	3,728	18,820	52%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	124,478,228	221,305,649	96,827,420	97,780,141	189,809,755	92,029,614	464,639,604	52%
Investment adjusted to Total Costs												
Total from Sample of PIDs	236	714	2,119	2,119	1,189,894	2,588,918	1,399,024	934,685	1,814,401	879,716	3,926,748	38%
Mean perPID	2	5	14	14	7,677	16,703	9,026	6,030	11,706	5,676	25,334	38%
Mean per Family	1	3	9	9	5,042	10,970	5,928	3,961	7,688	3,728	16,639	38%
Extrapolation to Program Total	16,215	74,694	221,676	221,676	124,478,228	270,834,201	146,355,972	97,780,141	189,809,755	92,029,614	410,788,490	38%

Table 4.3. Sensitivity Analysis on Financial and Economic Returns

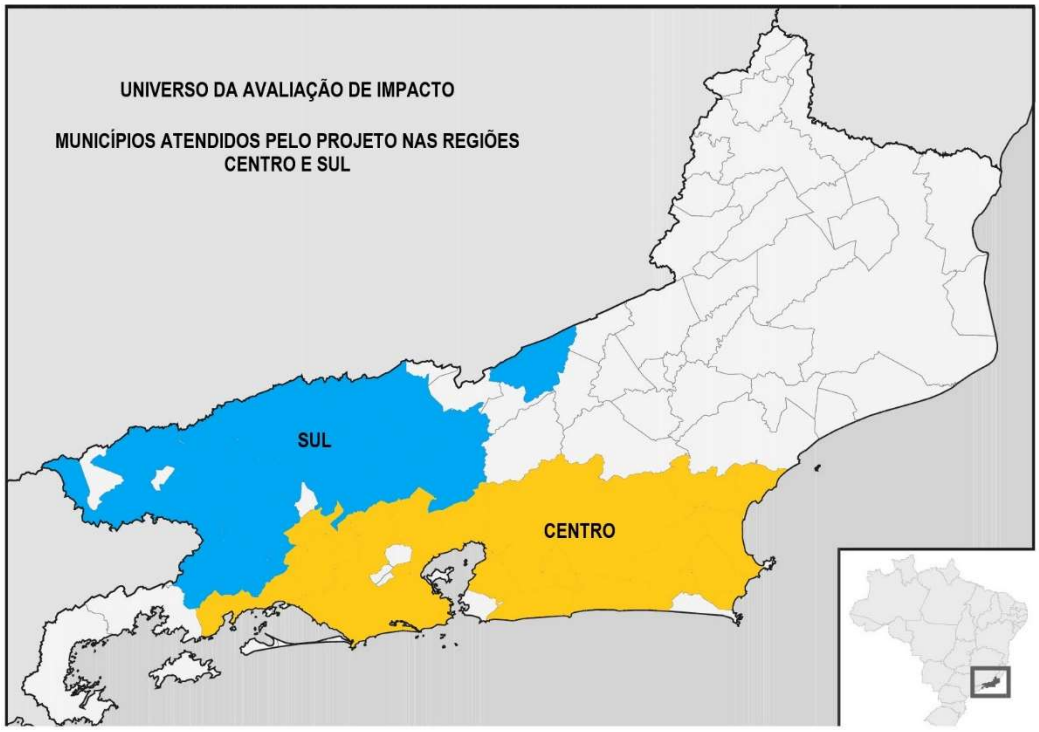
Scenario	Economic	Financial
	Project IRR (%)	Project IRR (%)
Base-case scenario	36	38
89% of PID revenues	12	21
120% of PID input costs	12	22
160% of PID labor costs	12	38
210% of PID investment costs	12	14

ANNEX 5. IMPACT EVALUATION: METHODOLOGY

Impact Evaluation Universe

1. The Impact Evaluation was limited only to two regions of the state—the Central and South regions. These two regions were not ideal choices because the agrarian sector is stronger in the Northwest region and the Serrana region. However, when the Impact Evaluation started, the project was already well established in the Northwest region of the state, making it very difficult to obtain control groups. The Serrana region, due to the January 2011 natural disaster, was considered a priority, with all the micro-basins receiving emergency assistance, and hence it was not possible to obtain comparison groups there either because the original project dynamic was altered by the emergency. On the other hand, the project had not started in the Central and South regions, and therefore was the best available option from the experimental design point of view.

Figure 5.1. State of Rio de Janeiro – municipalities from the South and Central regions participating in Rio Rural Project



2. As shown in table 5.1, the SoRJ has 92 municipalities, 78 of which participated in the project. About 22 of 32 municipalities in the Central region, and 13 of 25 in the South region, were selected for the Impact Evaluation. In terms of micro-basins, about one-third (120) of all micro-basins covered by the project (373) took part in the Impact Evaluation.[26]

[26] It is important to note that in terms of the total resources of the project, micro-basins considered for the Impact Evaluation correspond to approximately 20 percent of resources available. In addition, the impact of the project can be very heterogeneous because the agricultural activities are very different between the regions of the state. This makes it much more difficult to extrapolate the impact of these two regions to the rest of the state. Quite possibly, the impact of the project is substantially greater in the two regions where resources are concentrated the most, that is, Northwest and Serrana regions.

Table 5.1. Rio Rural Project - Total Number of Municipalities and Micro-Basins

Region	Number of Municipalities	Covered by the Project		Covered by the Impact Evaluation	
		Municipalities	Micro-Basins	Municipalities	Micro-Basins
Northern	9	9	66	—	—
Northeast	13	13	95	—	—
Central	32	25	73	22	70
Serrana	13	13	80	—	—
Southern	25	18	59	13	50
Total	**92**	**78**	**373**	**35**	**120**

Source: Emater/Rio.

Methodology

3. The impact of the project was evaluated by contrasting economic indicators constructed from information obtained from producers located in micro-basins benefiting from the project versus the corresponding set of indicators obtained from nonparticipating micro-basins.

4. As the micro-basins were not chosen at random, in principle, the economic indicators of these micro-basins should differ even in the absence of the project, taking into account that the observed differences cannot be fully attributed to the project's action. However, because the selection process for micro-basins was only carried out on the basis of a single synthetic indicator as defined in the Operations Manual, the impact can, in this case, be obtained from the contrast between the economic indicators of the benefited and not benefited micro-basins, being controlled by the value using the methodology known as discontinuous regression.

5. A description of how this discontinuous regression methodology was used to estimate the magnitude of the impact of the project on economic progress in the communities served and their corresponding statistical accuracy is presented here.

6. In principle, the differences between the treatment and comparison micro-basins of the same municipality can be decomposed into two components. On the one hand, these differences arise from the fact that one benefited from the project and the other did not. On the other hand, micro-basins may also differ because of other factors that influence these economic indicators, after which they received different scores. Thus, based on this information, the impact of the project is estimated as the difference between the economic indicators of the treatment and control micro-basins, based on an adjustment to take into account other contrasts resulting from the difference of scores between the treatment and control that may also explain the diversity of these economic indicators.

7. More precisely, if $\boldsymbol{R_{k,t}}$ is an economic indicator for a treatment micro-basin of municipality *k*, and $\boldsymbol{R_{k,c}}$ is the same indicator for a control micro-basin of municipality *k*, then it can be stated,

$$R_{k,t} = R_{k,c} + \delta_k + \lambda_k\left(P_{k,t} - P_{k,c}\right),$$

where $\boldsymbol{\delta_k}$ denotes the impact of the project in municipality *k*, $\boldsymbol{P_{k,t}}$e $\boldsymbol{P_{k,c}}$ the micro-basins of treatment and control in municipality *k*, and $\boldsymbol{\lambda_k}$ denotes the relationship between the result and the score. Using as an approximation the hypothesis that for all *k*, $\boldsymbol{\lambda_k} = \boldsymbol{\lambda^*}$, and that $\boldsymbol{\delta_k} = \boldsymbol{\delta_0} +$

$\boldsymbol{\beta}.\boldsymbol{P_{k,t}}$, this means that the magnitude of the impact of the project varies linearly with the score received. In this case, alternatively we can state that

$$\delta_k = \delta_0 + \beta.P_{k,t} = \bar{\delta} + \beta.\left(P_{k,t} - \bar{P}_t\right),$$

where $\overline{\boldsymbol{\delta}}$ is the average impact of the project and

$$\bar{P}_t = \frac{1}{m}\sum_{k=1}^{m} P_{k,t.}$$

8. Therefore,

$$R_{k,t} - R_{k,c} = \bar{\delta} + \beta.\left(P_{k,t} - \bar{P}_t\right) + \lambda^*\left(P_{k,t} - P_{k,c}\right).$$

9. Then, the average impact of the project $\overline{\boldsymbol{\delta}}$ is given by

$$\bar{\delta} = \frac{1}{m}\sum_{k=1}^{m}\delta_k = \overline{\Delta R} - \lambda^*.\overline{\Delta \mathrm{P}},$$

where *m* denotes the number of municipalities included in the evaluation of the project.

$$\overline{\Delta R} = \frac{1}{m}\sum_{k=1}^{m}\Delta R_k,$$

$$\overline{\Delta \mathrm{P}} = \frac{1}{m}\sum_{k=1}^{m}\Delta \mathrm{P}_k,$$

$$\bar{\delta} = \frac{1}{m}\sum_{k=1}^{m}\delta_k = \frac{1}{m}\sum_{k=1}^{m}\Delta R_k - \frac{\bar{\lambda}}{m}\sum_{k=1}^{m}\Delta P_k,$$

$$\Delta R_k = R_{k,t} - R_{k,c},$$

$$\Delta P_k = P_{k,t} - P_{k,c}.$$

10. Therefore, as already mentioned, the impact is estimated as the mean of the differences in economic indicators between treatment and control, $\overline{\boldsymbol{\Delta R}}$, adjusted by the consequences of the differences of scoring, $\boldsymbol{\lambda}^*.\overline{\boldsymbol{\Delta \mathrm{P}}}$ or equivalent to the regression intercept.

ANNEX 6. IMPACT EVALUATION: MAIN RESULTS

I. INDEPENDENT IMPACT EVALUATION OF RIO RURAL

1. **Background.** The Rio Rural project aimed to promote sustainable rural development in hydrographic micro-catchments (or micro-basins) through the provision of training, technical assistance, and financial incentives to small family farmers in key areas of the SoRJ.

2. The unit selected for the implementation of the Rio Rural project was the hydrographic basin. Understanding the territory as a system of multiple 'layers' socially constructed, it is verified that the development discussions occurred across different territorial levels (micro-basins, municipalities, regions, hydrographic basins), with the hydrographic micro-basin being the minimum territorial unit capable of integrating social variables with economic and environmental conditions. This approach facilitates the articulation and implementation of interventions necessary for local development, allowing for a systemic and integrated vision, as well as greater horizontality in the management of development policies rather than vertical and sectoral approaches.

3. It was understood from the interpretation of the PA) that three interlaced channels were used to achieve the objectives of the project. First, income generation was sought through increases in land productivity and greater appreciation of local production, which was supposed to be achieved on the basis of both increased marketing support and improvements in local infrastructure. Second, the project sought to recover the productive capacity of soils, the protection of water resources, and the conservation of biodiversity. Finally, in support of the first two channels, the dynamization of the organizational capacity and the self-management of the rural communities was sought through the support for strengthening active social networks—in short, to promote the empowerment of family farmers and the formation of community networks.

4. **Project areas.** The project was implemented in five regions of the state, comprising a total of 78 municipalities[27] and 373 micro-basins. The beneficiaries of the project were/are small family farmers, fishermen, women, youth, and other rural producers organized into formal and informal groups (associations, cooperatives, and so on). When it was originally conceived, the project was supposed to provide direct benefit to approximately 37,000 rural people. More specifically, the focal area of the project would cover the North, Northwest, and Serrana regions, which concentrated 224 (83 percent) of the 270 micro-basins to be worked and where 61 percent of the municipalities involved were located. Replication would occur in 46 micro-basins (17 percent of the total) inserted in 23 municipalities distributed in four other regions. The total number of people in the micro-basins covered by the project was about 148,000.

5. With the AF, the goal of the project was to benefit 78,000 rural families, 47,000 of whom would benefit directly in 72 of the 92 municipalities of the state, including individual, collective, and territorial groupings. This contingent of families that would benefit from the project was equivalent to 93 percent of family farmers, small farmers, rural women, and young people and 70 percent of the total farmers in the SoRJ, according to data from the Census of Agriculture and Livestock (IBGE – Brazilian Institute of Geography and Statistics, 2006). If other activities of the project are considered, the number of beneficiaries added by the AF would be approximately 50,000 rural families (as shown in table 6.1).

[27] Corresponding to about 85 percent of the total number of municipalities in the state.

Table 6.1. Project Beneficiaries

Area/Beneficiaries	Original Project	Restructured Project	AF	TOTAL
Municipalities	59	59	13	72
Micro-basins	270	200	166	366
Beneficiary population	37,000	28,000	50,000	78,000
Direct beneficiaries	24,400	19,300	27,700	47,000

6. **Coverage of the impact assessment.** The impact assessment of the project was limited to only two regions of the state: Central and South. In fact, these two regions are not the best choices for an evaluation of the project's impact because the agricultural sector is much stronger in the Northwest and Serrana region of the state. However, when this evaluation began, the project was already well established in the Northwest region, which made it difficult to obtain comparison groups. Because of the January 2011 disaster, the Serrana region was considered a priority, with all the micro-basins receiving emergency assistance, and thus, in this case, it would not be possible to obtain comparison groups. On the other hand, in the Central and South regions, the project had not yet started and therefore was the ideal situation for an experimental impact assessment. The SoRJ has 92 municipalities, of which 78 were served by the project (85 percent). In the impact assessment, which covered only two regions (Central and South), there are 35 municipalities (38 percent of the state) and about 120 micro-basins (32 percent of the 373 in the state).[28]

7. **Reporting**. The purpose of this report contracted by the Rio PIU was to assess the magnitude of the impact of the Rio Rural project on some key aspects and to verify the validity of its Theory of Change. The results of the impact evaluation were presented in three stand-alone reports addressing the three key areas: (a) levels of income and profitability of rural properties benefiting from the project, (b) living conditions of the targeted family units and levels of poverty, and (c) formation of social capital.

A. Impact Evaluation: Economic Impacts on Family Farms under the Project [29]

8. The instrument used for the assessment of economic impacts considered numerous questions aimed at measuring the various economic aspects of rural family farms. To measure the impact of the project on several economic aspects of the productive units benefited, a questionnaire was constructed with 93 questions grouped in 12 dimensions.[30] To estimate the impact of the project on the economic situation of the beneficiary's productive units, 333 basic indicators were constructed and measured based on the individual interviews to the units in the sample. In addition to these indicators, other indicators were constructed based on the costs and the returns recorded from different productive activities, summarizing the total income and total costs of the units. The total number of units interviewed was 2,089, corresponding to 1,199 of the Central region and 890 of the South region. As mentioned previously, the impact of the project was evaluated by contrasting economic indicators constructed from information obtained from producers in micro-basins that benefited with those from non-benefited micro-basins.

9. The main results are presented in the following tables in a concise form for each of the dimensions of the economic questionnaire, highlighting the most relevant indicators on which a statistically significant

[28] See annex 5 for a summary of the Impact Evaluation methodology.
[29] Based on the report "*Avaliação de Impacto do Programa Rio Rural sobre a Rentabilidade das Propriedades Rurais*" prepared by Oportunidades, pesquisa e estudos sociais - OPE Sociais. November 20, 2018.
[30] Land, hydric and energetic resources, environment, agricultural practices, technical assistance, productive services, production, investments, capital, expenditures, and financing.

impact of the project was detected. This helps interpret to what extent the magnitude of the impacts found mean that the actions taken had in fact, led to the producers achieving higher levels of productivity and, consequently, greater profitability of their activities. It also contributes to understanding the extent to which the results found corroborate the Theory of Change that underlies the design of the project.

10. **Results reported.** The impact evaluation report on levels of income and profitability of rural properties benefiting from the project concludes that the positive impact of the project on the levels of profit per hectare was due to the use of more productive practices, as well as to improvements in the marketing of the products, allowing the producer to pay a higher salary to hired workers. In summary, the producer is making bigger profits and is sharing some of that profit to the extent that s/he is paying better wages to employees. These results clearly corroborate the Theory of Change that supports the design of the project, which is that if producers are well informed about the practices and their benefits and if they have adequate technical assistance and the right incentives, they will adopt them. In addition, these rural producers came to realize that the adoption of these practices also made it possible to promote an improvement in the environment and, therefore, increase farming/agricultural sustainability in the long run.

Table 6.2. Statistically Significant Positive Impacts of Rio Rural on the Economic Indicators

Area of Analysis	Indicator
Land Use	Percentage of productive units (family farms) having a reserved area or with native vegetation
Agricultural Practices	Percentage of productive units (family farms) that used subsoiling
	Percentage of productive units (family farms) that implemented pasture rotation
	Percentage of productive units (family farms) that implemented precision irrigation
Technical Assistance	Average volume of milk cooling tanks owned by productive units
Production	Total net margin per ha obtained by productive units
	Net margin per ha of obtained by productive units from agricultural production
	Percentage of productive units implementing intensive livestock productive systems
	Percentage of total volume of milk produced that is pasteurized for marketing
Expenditures	Average monthly salary perceived by temporary laborers in the productive unit
Financing	Percentage of productive units receiving less than the amount of financing requested

Table 6.3. Statistically Significant Negative Impacts of Rio Rural on Other Indicators

Area of Analysis	Indicator
Land Tenure	Percentage of productive units where the land is under rent or other forms of partnership
Land Use	Average size of productive units
Environment	Percentage of productive units that bury their trash and residues
	Percentage of productive units that burn their trash
	Percentage of productive units that use their trash for composting
	Percentage of productive units that did not properly treat their waste
Agricultural Practices	Percentage of productive units (family farms) that used subsoiling
	Percentage of productive units (family farms) that implemented crop rotation
	Percentage of productive units (family farms) that burn their crop residues
	Percentage of productive units (family farms) that burn their crop residues as an alternative measure to control plagues
Productive Services	Average use of tractors and agricultural vehicles used in the productive units during the year

Area of Analysis	Indicator
Production	Total annual amount of fertilizer used in agricultural production (including seeds and seedlings production) in the year
	Average land used for crops, seeds, and seedlings production in the productive unit in the year
	Percentage of the production of milk cattle (including buffalos) in the productive units for which the main marketing channel for last year was not successful
	Percentage of total volume of milk produced that is pasteurized for marketing
Financing	Percentage of productive units receiving financing last year
	Percentage of productive units not receiving financing last year for bureaucratic reasons

B. Impact Evaluation: Impacts on Living Conditions and Poverty under the Project [31]

11. With the objective of measuring the living conditions of the families benefited by the project, a questionnaire was constructed with 80 questions grouped into 10 dimensions,[32] organized in two parts. The first part of the questionnaire, composed of three blocks, was answered by the reference person at the residence, comprising information about the location of the residence, the construction materials of the residence, and about migration and whether any members planned or went to live in the city. The second part of the questionnaire was addressed to all members of the residence and was composed of seven blocks, comprising information about identification of each person and relationship with the owner, household composition and demography, migration, education, access to information from outside the household, work history, and incomes.

12. With the objective of estimating the impact of the project on the indicators of living conditions in the beneficiary productive units, 246 basic indicators were constructed. Besides these indicators, some indicators of per capita income were also constructed using information from both the family questionnaire and the economic questionnaire. A total of 2,089 interviews were carried out, 1,199 in the Central region and 890 in the South region.

13. As before, the impact of the project was assessed by contrasting the performance of indicators constructed from information obtained from producers in micro-basins benefiting from the project versus the indicators obtained from micro-basins not benefiting from the project.

14. **Results reported.** It is noteworthy that in the case of many indicators, a significant impact was found but in the opposite direction than would be expected, while in others, no impact was found. However, it is also noteworthy that many of these indicators related to living conditions are indicators that take time to come into effect and their change will only be perceived in the long run. For the most sensitive indicators, it was possible to capture some impact of the project.

15. A summary of the results obtained for each of the dimensions investigated, where significant positive or negative impacts were found, is presented in tables 6.5 and 6.6. Even if 246 indicators were used, only 19 indicators were found to have significant impacts.

[31] Based on the report "*Avaliação de Impacto do Programa Rio Rural sobre as condições de vida e a pobreza*" prepared by Oportunidades, pesquisa e estudos sociais - OPE Sociais. November 20, 2018.
[32] Three dimensions on household information (location, dwelling, migration); seven dimensions for household members (demography, migration, education, access to information, work, income derived from work, identification).

16. There was some evidence of the impact of the project in terms of time allocation and mobility. More specifically, the results seem to indicate a greater migration of the elderly, possibly suggesting a greater level of wealth in families. On the other hand, there is also some evidence of an impact of the project toward reducing youth and adult migration, possibly suggesting that rural areas become more attractive by offering more opportunities to economically active youth and adult population.

Table 6.5. Statistically Significant Positive Impacts of Rio Rural on Living Conditions

Dimension	Indicator
Residence	Percentage of residences where the roof is built with tiles
	Percentage of residences where there is no bathroom
Migration	Percentage of residences where the head of the household migrated to a city in the last 3 years with an age of 65 years or more
	Percentage of residences where the head of the household migrated to a city in the last 3 years because of health issues
	Percentage of residences where the head of the household migrated to a city in the last 3 years because of other family of personal issues or demands
Household composition and demographics	Percentage of residences where all children live with their fathers
	Percentage of residences where all children live with their fathers and their mothers
	Percentage of residences where all children live with either their fathers or their mothers
Education	Percentage of residences where at least one adult has completed primary education

Table 6.6. Statistically Significant Negative Impacts of Rio Rural on Living Conditions

Dimension	Indicator
Residence	Percentage of residences where the roof is built with concrete
Migration	Percentage of residences where the head of the household does not consider migrating to a city
	Percentage of residences where the head of the household has migrated to a city in the last 3 years
	Percentage of residences where a head of the household's child has migrated to a city in the last 3 years
	Percentage of residences where a family member has migrated to a city in the last 3 years and was less than 17 years old
	Percentage of residences where a family member has migrated to a city in the last 3 years and was between 30 and 64 years old
	Percentage of residences where a family member has migrated to a city in the last 3 years in the center of the district or municipality
	Percentage of residences where there is absence of an adult born in the municipality or district and plans to move to a city
Labor force	Percentage of residences where at least one adult, more than 16 years old, has worked during the last 12 months
Women jobs	Percentage of women, between 16 and 64 years old, who worked during the last 12 months

C. Impact Evaluation: Impacts on Social Capital under the Project [33]

17. One of the objectives of the Rio Rural project was to promote beneficiaries' empowerment and the formation of active community networks. The term social capital is used in this study as a characteristic that a community has or could have that facilitates collective action by its members; a community capable of more easily implementing collective actions has greater social capital.

18. To measure the social capital of the communities benefited by the project, a questionnaire was constructed with 49 questions grouped in 14 dimensions.[34] For measuring the impact of the project on social capital, 241 basic indicators were constructed to better characterize in which dimensions the impact is most evident. The total number of interviews was 2,089 (1,199 in the Central region and 890 in the South region).

19. **Results reported.** According to the project design, the Rio Rural project was expected to have a greater impact on certain dimensions of social capital such as productive cooperation and less on others such as degree of trust or solidarity. Tables 6.7 and 6.8 present a summary of the indicators on which positive and negative significant impacts were found, respectively. From a total of 241 indicators, 31 were found with statistically significant positive impacts and 17 with statistically significant negative impacts.

20. The project seemed to increase participation in activities that bring more 'economic' benefits and reduce participation in activities that bring 'social' benefits, a result that is consistent with the overall design of the project. For producers to adopt a more productive and sustainable production system in their properties, they must first associate and then participate in a participatory planning process culminating in the PID. All this process was geared toward developing the social capital of communities comprising more participatory family farmers.

Table 6.7. Statistically Significant Positive Impacts of Rio Rural on Social Capital

Dimensions	Indicators
Community Participation	Participation in some local group, association of organization
	Participation in some local group, association of organization with political interests aimed to revendicating public services
	Active participation in some local group, association of organization with political interests aimed to revendicating public services
Benefits	Support available in urgent situations
	Access to agricultural inputs or technologies
	Access to irrigation
	Access to infrastructure
	Access to other productive inputs
Connectivity	Presence of groups that work inside the area of the micro-catchment without integration with other groups
	Presence of groups that work inside the area of the micro-catchment and integrated with other groups with different objectives

[33] Based on the report "*Avaliação de Impacto do Programa Rio Rural sobre o capital social*" prepared by Oportunidades, pesquisa e estudos sociais - OPE Sociais. November 20, 2018.
[34] Type of community participation, level of participation, democracy, connectivity, networks, trust, solidarity, cooperation, information and communication, sociability, social inclusion, conflict, leadership, benefits.

Dimensions	Indicators
	Presence of groups that work inside and outside the area of the micro-catchment without integration with other groups
	Presence of groups that work inside and outside the area of the micro-catchment with integration with other groups
Networks	Able to receive financing support from someone outside the household in case of need
	Able to receive help from neighbors from 1 or 2 days to take care of the production unit
	Not able to trust receiving help from neighbors from 1 or 2 days to take care of the production unit
Solidarity	Believe that members of the community help each other at least in a few cases
	Believe that members of the community help each other only in exceptional cases
	Percentage of people that feel members of the community never help each other
	Willing to cooperate with a community project benefiting the community, even though it does not benefit them directly
Cooperation	Work with members of the community in tasks aimed producing common benefits
	No member of the household has ever worked with other community members in tasks benefiting the community
	Community member that does not participate in community activities is certainly criticized
	Community member that does not participate in community activities is probably criticized
	Facing a community problem, nobody in the community would help
Communication	Make or receive at least 2 phone communications per day
	Community leaders are one of the three key sources of information regarding public actions.
	Community leaders are one of the three key sources of information regarding the markets.
Social Inclusion	Access to health services
Empowerment	Percentage of people that consider they do not contribute to making the community a better place to live
	Community had a meeting several times for preparing or delivering a request or document to government or to local leaders in relation to something benefiting the whole community.
	Community had a meeting at least once for preparing or delivering a request or document to government or to local leaders in relation to something benefiting the whole community.
	Some requests have been successful.

Table 6.8. Statistically Significant Negative Impacts of Rio Rural on Social Capital

Dimensions	Indicators
Community Participation	Participation in some local group, association of organization for religious, artistic, or sportive interest
	Number of times that some member of the household has participated in two of the main local groups, associations of organizations in the last 12 months
	Average value (cash or goods) the household contributed with any group, association, or organization in the last 12 months
Democracy	Percentage of groups where people become members on their own initiative
Benefits	Groups providing leisure or fun activities to members
	Groups providing spiritual, social status, or self-esteem benefits to their members
	Groups providing leisure or fun activities, as well as spiritual, social status, or self-steam benefits to their members
Connectivity	Groups that work outside the micro-catchment, with or without integration with other groups

Dimensions	Indicators
	Groups that work outside the micro-catchment, with effective integration with other groups
Networks	Average number of close friends
Cooperation	Community member that does not participate in community activities will certainly not be criticized or is unlikely to be criticized.
	Community member that does not participate in community activities will not be criticized.
Communication	Rarely make or receive a phone call
Empowerment	Number of people declaring the community had only one meeting in the last 12 months for preparing or delivering a request or document to government or to local leaders in relation to something benefiting the whole community
	Most of those requests were not successful.
	Number of people who met a politician, phone him/her, or delivered a letter within the last 12 months

II. ASSESSMENT OF ENVIRONMENTAL SUSTAINABILITY OF RURAL ROADS AND BRIDGES[35]

21. Rural roads investments, which are usually relatively small in physical scale when included in an agricultural development project, frequently generate some substantial positive impacts but also may generate direct and indirect adverse environmental impacts. Direct environmental impacts are generally due to construction- and rehabilitation-related activities, while indirect impacts are generally due to the use of roads. In this context, three aspects that lead to environmental impacts, especially related to erosive processes, are highlighted in the evaluation of investments in rural roads and bridges in the Rio Rural project: improper cross-section design, inadequate or absence of proper drainage, and lack of environmental protection measures (especially against erosion).

22. This independent assessment review presented the results of the evaluation of tertiary rural roads and bridges built under the Rio Rural project. Roads sections located in 10 municipalities of the priority regions of Rio Rural (Serrana, Northwest, and North) were evaluated, as well as 23 bridges in 3 municipalities of the Serrana region (Nova Friburgo, Teresópolis, and Sumidouro).

23. The tertiary rural road improvements under Rio Rural and the set of associated environmental measures aimed at improving the relationship between the road and the landscape and at increasing long-term sustainability from a social and environmental point of view. The environmental control measures were primarily aimed at controlling the erosive process and correcting possible effects of engineering interventions, such as the case of slope conformation for small rectification and smoothing of curves and drainage works, such as the reform or implantation of manholes and improvement of gutters and other minor structures.

24. In the case of roads, the evaluation was conducted using three complementary key indicators. In the case of bridges, one key indicator was adopted. Each key indicator included different parameters that

[35] Bassi, Lauro. 2018. *"Avaliação da sustentabilidade ambiental de estradas rurais terciárias e pontes."* Programa Rio Rural. Governo do Estado do Rio de Janeiro.

allowed quantitative evaluation criteria and qualitative through direct perception. The key indicators were the following:

- **Roads:** (a) Efficiency in erosion control, (b) efficiency of drainage system, and (c) efficiency in reducing impacts on the road environment
- **Bridges:** Erosion control measures in bridges

25. The field assessment of the inventory of roads and bridges in the 10 selected municipalities covered (a) 38 stretches of roads that covered an extension of 305.7 km and benefited around 13,755 people and (b) 23 bridges, involving 33 micro-basins, benefiting around 7,650 people.

26. **Summary results for roads.** The road platforms were evaluated in an integrated manner together with gutters, culverts, and slopes, which can cause problems, especially erosion, when wrongly sized, poorly shaped, or left unprotected. After assessing each key element affecting the sustainability of the road segment inspected, the overall results obtained show that 65 percent of roads evaluated had high sustainability, 33 percent average sustainability, and 2 percent low sustainability. The following positive aspects were observed, which were responsible for the high environmental sustainability in 65 percent of the road segments evaluated:

(a) **Drainage system:** (i) Culverts that generally meet the requirements for expected volumes of rainwater to be drained and (ii) correctly sized gutters, in most of the evaluated sections, with good functionality.

(b) **Erosion control:** (i) Road platforms with good conformation allowing the lateral drainage of the rainwater toward the gutters without causing erosion and (ii) slopes generally adequately shaped and protected.

(c) **Materials used:** It was observed that, in general, the primer coating had been suitably selected and exhibited good aggregation, giving stability to the pallet, and the materials used had good resistance against erosion.

27. On the other hand, sustainability issues were identified in at least 35 percent of the evaluated segments, mainly related to (a) platform erosion, because of inadequate conformation, low-quality coating material and low erosion resistance, or inadequately designed gutters; (b) erosion at drainage exits, caused by the inadequate conduction of the water coming from the gutters; and (c) need for adequate maintenance.

28. **Summary results for bridges.** All the evaluated bridges were located in the Serrana region and are part of the emergency project for the recovery of the road infrastructure after the catastrophe of 2011. The main results obtained from the field inspection showed high sustainability in 92 percent of the evaluated bridges in terms of erosion control measures (degree of protection of the bed slopes).

III. ASSESSMENT OF PARTICIPATORY RESEARCH ACTIVITIES UNDER THE PROJECT[36]

Introduction

29. This report refers to the actions developed by PESAGRO's Participative Research Nucleus from 2010 to 2018 under the Rio Rural project. These actions were implemented following six action plans:

- **Plan 1: Participatory Research Units.** Aiming at adapting technologies to the socioeconomic conditions of producers in the selected micro-basins in line with the lines of action encouraged by the Rio Rural project.
- **Plan 2: Long-term Experiments.** Presenting solutions for technological bottlenecks of the main productive value chains in the state.
- **Plan 2.1 Research Network.** Facilitating the integration of research, teaching, and extension actions for sustainable rural development; raising and resolving demands of interest groups; sharing ideas, methods, and financial resources and stimulating synergies between institutions, avoiding overlapping of actions, with the farmer and his/her family as a priority beneficiary, as well as technicians and consumers.
- **Plan 3: Production of agroecological inputs.** Providing access to farmers, experimentation, and use of alternative inputs and enabling the implementation or transition from conventional models to agroecologically more sustainable ones.
- **Plan 4: Adequacy of Rural establishments of Dairy Cattle to Good Practices**. Making it possible for farmers to implement milk production systems with good practices that are adequate to the legislation and preserving the environment.
- **Plan 5: Agroecology, Organic, and Sustainable Agriculture**. Carrying out studies to solve bottlenecks and diagnostics for the implementation of public policies of agroecology and organic agriculture in the SoRJ.
- **Plan 6: Institutional Strengthening.** Improving institutional infrastructure and public sector processes to serve the external public and meet its institutional mission.

30. **Scope of the participatory research activities.** The actions of these activities reached 28 municipalities and 37 micro-basins, 52 farmers experimenters/promoters participating, and 3,939 farmers within these micro-basins. The number of participatory research activities can be broken down as follows:

Table 6.9. Participatory Research Activities by Type (2010 to 2018)

Action Plans Implemented		Number
1.	Units of participatory research	24
2.	Long-term experiments	26

[36] RFNPP 2018 - State of Rio de Janeiro. 2018. *Relatorio Final do Nucleo de Psquisa Participativa no Programa Rio Rural*. Secretaria de Agricultura, Pecuaria, Pesca e Abastecimiento; Superintendencia de Desenvolvimento Sustentavel. Rio de Janeiro. Pages 36.

Action Plans Implemented	Number
3. Adoption of technology by family farms related to good dairy practices	21
4. Studies and research on organic agriculture	4
TOTAL	75

Table 6.10. Other Outputs of the Project

Concept	Number
Number or researchers from PESAGRO participating	41
Number of PESAGRO's state centers participating	6
Number of technical manuals produced	20
Number of technical publications produced	72

Main Results

31. The main conceptual results obtained (based on anecdotal evidence) were the following:

- With the introduction of rotational silvo-pastoral systems, there was an increase in the diversity of grasses in the properties, with good soil cover and nutritional value, and after the system was implemented the farmers increased the number of divisions on their own initiative.

- In the establishment and expansion of the systems, the farmers of the Northwest showed preference for grasses with seed propagation (Mombasa, Brachiaria brizanta, Brachiaria massai), mainly because of better drought resistance.

- Mombasa grass (Panicum maximum) presented the best response to milk production (according to the reports of the partner farmers and the data obtained in the verification) together with improvement in soil fertility and no negative influence on the amount of green matter.

- Average milk production increased from 40 L a day to 80 L a day per property. Considering the average price of milk at BRL 1.20 per L, the producers that previously had a dairy activity revenue of BRL 48.00 per day experienced a 100 percent increase.

ANNEX 7. SPLIT ASSESMENT: PERFORMANCE OF PDO INDICATORS

		September 2011 Restructuring (emergency)					October 2012 Restructuring (AF)					September 2017 Restructuring (partial cancellation)					November 2018 Project Closing			
	PDO Indicators (original)	PDO Indicators (2011)	Observed	Target YR1 (RF)	End Target (RF)	%	PDO Indicators (2012)	Observed	Target YR3 (RF)	End Target (RF)	%	PDO Indicators (2017)	Observed	Target YR8 (RF)	End Target (RF)	%	PDO Indicators (2018)	Observed	Target (EF)	%
1	19,500 small farmers transitioned toward more productive farming systems	Number of small farmers (at least 50% in targeted areas) transitioned toward more productive farming systems	0	0	13,300	Met	Number of small farmers (at least 50% in targeted areas) transitioned toward more productive and sustainable farming systems	0	9,170	47,000	0.00	Number of small farmers (at least 50% in targeted areas) transitioned toward more productive and sustainable farming systems	22,841	45,850	35,000	65.26	Continue as per 2012 restructuring	37,172	35,000	106.21
2	Improved product quality measured by:	Improved product quality measured by:					Moved to intermediate outcomes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2a	9,500 farmers adopting GAPs	Number of farmers adopting GAP	0	0	6,600	Met	Dropped	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2b	130 small	Number of small	5	5	30	100	Moved to intermed	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

		September 2011 Restructuring (emergency)					October 2012 Restructuring (AF)					September 2017 Restructuring (partial cancellation)					November 2018 Project Closing			
	PDO Indicators (original)	PDO Indicators (2011)	Observed	Target YR1 (RF)	End Target (RF)	%	PDO Indicators (2012)	Observed	Target YR3 (RF)	End Target (RF)	%	PDO Indicators (2017)	Observed	Target YR8 (RF)	End Target (RF)	%	PDO Indicators (2018)	Observed	Target (EF)	%
	farmers or enterprises certified	farmers or enterprises certified					iate outcomes													
2c	280 agro-processing and artisanal enterprises adding value	Number of agro-processing and artisanal enterprises adding value	11	5	80	220	Moved to intermediate outcomes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3	2,050 small farmers included in (or with improved links to) at least one value chain	Number of small farmers included in (or with improved links to) at least one value chain	10	10	1,000	100	Number of small farmers included in (or with improved links to) at least one value chain	10	1,450	2,600	0.69	Number of small farmers included in (or with improved links to) at least one value chain	2,430	2,500	2,600	93.46	Continue as per 2012 restructuring	3,359	2,600	129.19
4	266,000 hectares of agricultu	Area of agricultural lands under	0	0	180,000	Met	Area of agricultural lands under	0	27,500	185,000	0.00	Area of agricultural lands under	105,278	165,000	160,000	65.80	Continue as per 2012	223,152	160,000	139.47

		September 2011 Restructuring (emergency)					October 2012 Restructuring (AF)					September 2017 Restructuring (partial cancellation)					November 2018 Project Closing			
	PDO Indicators (original)	PDO Indicators (2011)	Observed	Target YR1 (RF)	End Target (RF)	%	PDO Indicators (2012)	Observed	Target YR3 (RF)	End Target (RF)	%	PDO Indicators (2017)	Observed	Target YR8 (RF)	End Target (RF)	%	PDO Indicators (2018)	Observed	Target (EF)	%
	ral lands under improved production systems	improved production systems					improved production systems					improved production systems					restructuring			
5	1,300 kms of tertiary roads restored and maintained	Extent of tertiary roads restored and maintained	65	0	1,300	Exceeded	Moved to intermediate outcomes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

October 2012 Restructuring (AF)					September 2017 Restructuring (partial cancellation)					November 2018 Project Closing			
PDO Indicators (2012)	**Observed**	**Target YR3 (RF)**	**End Target (RF)**	**%**	**PDO Indicators (2017)**	**Observed**	**Target YR8 (RF)**	**End Target (RF)**	**%**	**PDO Indicators (2018)**	**Observed**	**Target (EF)**	**%**
PDO Indicators into Intermediate Indicators					**PDO Indicators into Intermediate Indicators**					**PDO Indicators into Intermediate Indicators**			
Extent of tertiary roads restored and maintained	65	400	2,500	16.25	Rural roads rehabilitated	4,745	n.a.	6,000	79.08	Rural roads rehabilitated	7,127	6,000	118.78
Improved product quality in at least 50% of beneficiaries receiving investment support					Dropped	n.a.	n.a.	n.a.	n.a.	Dropped	n.a.	n.a.	n.a.
(i) Dropped	n.a.	n.a.	n.a.	n.a.	Dropped	n.a.	n.a.	n.a.	n.a.	Dropped	n.a.	n.a.	n.a.
(ii) Number of small farmers or enterprises certified	5	100	1,000	5.00	Dropped	n.a.	n.a.	n.a.	n.a.	Dropped	n.a.	n.a.	n.a.
(iii) Number of agro-processing and artisanal enterprises adding value	11	30	120	36.67	Dropped	n.a.	n.a.	n.a.	n.a.	Dropped	n.a.	n.a.	n.a.

ANNEX 8. LIST OF PUBLICATIONS FINANCED UNDER PARTICIPATORY RESEARCH 2010–2018

SANTOS, M. W. dos; CARVALHO, L. S.; AYUKAWA , M. L.; OLIVEIRA, L. A. A. de; BARCELOS, B. J. C. de S. **Criação de galinha caipira em sistema semi-intensivo**. Niterói: PESAGRO-RIO: RIO RURAL, [2011]. 5 f. Resumo expandido.

ANDRADE, W, E, de B.; AYUKAWA, M. L.; OLIVEIRA, L. A. A. de; FERREIRA, J. M.;VALENTINI, L.; BARCELOS, B. J. C. de S. **Banana e caqui - sistemas sustentáveis.** Niterói: PESAGRO-RIO: RIO RURAL, [2008]. 5 f. Resumo expandido.

ANDRADE, W, E, de B.; AYUKAWA , M. L.; OLIVEIRA, L. A. A. de; FERREIRA, J. M.; VALENTINI, L.; BARCELOS, B. J. C. de S. **Adubação verde em subsistema de produção de mandioca**. Niterói: PESAGRO-RIO: RIO RURAL, [2010]. 8 f. Resumo expandido.

FERREIRA, J. M.; IDE, C. D. ; FREITAS, I. M. de; OLIVEIRA, L. A. A. de; BARCELOS, B. J. C. de S. **Barragem subterrânea**. Niterói: PESAGRO-RIO: RIO RURAL, [2009]. 7 f. Resumo expandido.

FERREIRA, J. M.; SILVA, L. G. J. S.; VALENTINI, L.; ANDRADE, W. E. de B. A.; OLIVEIRA, L. A. A. de; BARCELOS, B. J. C. de S.; **Adubação Orgânica em Olerícolas.** Niterói: PESAGRO-RIO: RIO RURAL, 2011. 5 f. Resumo expandido.

ANDRADE, W. E. de B.; FERREIRA, J. M.; POSSES, J. H. P.; OLIVEIRA, L. A. A. de; BARCELOS, B. J. C. de S. **Alternância de áreas de produção de aipim utilizando o sistema de fileiras duplas com culturas intercalares**. Niterói: PESAGRO-RIO: RIO RURAL, 2011. 5 f. Resumo expandido. 9 f. Resumo expandido.

VALENTINI, L.; FERREIRA, J. M.; OLIVEIRA, L. A. A. de; BARCELOS, B. J. C. de S. **Banco de sementes de milho e adubo verde**. Niterói: PESAGRO-RIO: RIO RURAL, 2011. 7 f. Resumo expandido.

ANDRADE, W. E. de B.; MURAKAMI, K. R. N.; FERREIRA, J. M.; OLIVEIRA, L. A. A. de; BARCELOS, B. J. C. de S. **Controle alternativo de pragas e doenças do cafezal**. Niterói: PESAGRO-RIO: RIO RURAL, 2011. 13 f. Resumo expandido.

MORENO, J. M.; CASTAGNA, A. A.; MOREIRA NETO, G. P.; SEIXAS FILHO, J.T. de; SOUZA, S. O. de; RODRIGUES, E.; BRETAS, A.; DILLY, R. L. **Sequestro de carbono em dois sistemas de pastoreio rotativo**. Niterói: PESAGRO-RIO: RIO RURAL, 2011. 4 f. Resumo expandido.

MOREIRA NETO, G. P.; CASTAGNA, A. A.; MORENO, J. M.; SEIXAS FILHO, J. T. de; SOUZA, S. O. de S.; RODRIGUES, E.; BRETAS, A.; DILLY, R. L. **Comparação de produtividade das pastagens sob dois sistemas de pastoreio rotativo**. Niterói: PESAGRO-RIO: RIO RURAL, 2011. 3 f. Resumo expandido.

CASTAGNA, A. A.; SOUZA, S. O. de; SEIXAS FILHO, J. T. de; RODRIGUES, E.; BARCELOS, B. J. C. de S.; FERREIRA, J. M.; OLIVEIRA, L. A. A. de; **Pastoreio racional rotacionado na microbacia médio ribeirão bonito - Miracema-RJ** (resultados parciais). Niterói: PESAGRO-RIO: RIO RURAL, 2012. 6 f. Resumo expandido.

FERREIRA, J. M.; SILVA, L. G. J. S., VALENTINI, L.; ANDRADE, W. E. de B.; RIBEIRO, L. J.; BARCELOS, B. J. C. de S.; OLIVEIRA, L. A. A. de. **Tomate: sistemas sustentáveis**. Niterói: PESAGRO-RIO: RIO RURAL, 2012. 5 f.

Resumo expandido.

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ANNEX 9. BORROWER COMMENTS

GOVERNO DO ESTADO
RIO DE JANEIRO
Secretaria de Agricultura, Pecuária, Pesca e Abastecimento

Ofício SEAPPA/SSDR nº 003/2019

Niterói, 15 de maio de 2019.

Excelentíssimo Senhor Maurizio Guadagni – Agriculture Development Specialist

World Bank – Washington DC

A Secretaria do Estado de Agricultura, Pecuária Pesca e Abastecimento, recebeu o Relatório de Conclusão da Implementação e Resultados do Projeto – ICRR, referente ao projeto Rio Rural, enviado pela equipe do Banco Mundial em 29 de abril de 2019. Após a análise de seu conteúdo realizada pela equipe da Superintendência de Desenvolvimento Sustentável, esta Pasta se manifesta de acordo com seu conteúdo e sua posterior divulgação.

Aproveitamos para agradecer à equipe do Banco Mundial o apoio recebido durante a execução do projeto, o qual, diante dos amplos resultados alcançados, trouxe inúmeros benefícios econômicos, sociais, ambientais e políticos aos agricultores e suas organizações, dentro das microbacias hidrográficas apoiadas no estado do Rio de Janeiro.

Renovamos os votos da mais estima consideração e ressaltamos que estamos a disposição para dirimir qualquer dúvida existente.

Guilherme de Freitas Ewald Strauch
Superintendente de Desenvolvimento Sustentável

Ramon de Paulo Neves
Subsecretario de Desenvolvimento Rural

Ramon de Paula Neves
Subsecretário de Desenvolvimento Rural
ID: 42582733
Decreto de 01.01.2019
Governador do Estado do RJ

Alameda São Boaventura, 770, Fonseca, Niterói - Rio de Janeiro - CEP 24.120-191

ANNEX 10. SUPPORTING DOCUMENTS

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