

Brief of the ex post case: **BROCAP, coffee berry borer trap in the Dominican Republic**

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1. The innovation story

On the initiative of CIRAD, research on trapping coffee berry borers began in 1997 in El Salvador, in collaboration with the PROCAFE foundation. The goal was to develop an alternative to chemical control and to emerging biological control methods whose effectiveness was proving to be low and the production of biological agents relatively costly.

After two years of testing trapping methods, an experimental trap, a powerful attractant mixture and a mechanism aimed at optimising trapping in coffee plantations were developed, followed by the installation of a first efficiency test and the development of a prototype trap combining all the parameters conducive to mass trapping. The success of the first tests with the prototype led to the industrial production of 8 000 traps in early 2000. The goal was to provide large quantities of traps in order to pursue research, to launch validation tests in different coffee production sites and to establish demonstration operations in six Central American and Caribbean countries. Several companies contributed to the development of the trap, including the manufacturer of the trap structure and the laboratory producing the attractant mixture. A full trap is made up of six polypropylene parts, a metal hook and two labelled dispensers filled with attractant. The traps are packaged in printed cardboard boxes containing 36 units, and the dispensers in packs of 36 units themselves packaged in boxes each containing 18 packs.

The years 2000 and 2001 were dedicated to testing, validating and demonstrating the trap. At the same time, a patent application was filed in Paris along with patent extension applications in San Salvador, and then the procedure to register the "BROCAP" trademark was launched.

In early 2002, the PROCAFE/CIRAD cooperation agreement for commercial exploitation of the trap was signed. It provided that PROCAFE could only sell the traps in El Salvador and CIRAD in the rest of the world. BROCAP was the only coffee berry borer trap on the market at the time. A first order in the Dominican Republic was delivered by CIRAD, which became an exporter under the PROCAFE licence. Together, the two institutions launched the first BROCAP promotional leaflets. Trapping experiments continued. A timely announcement was made for the future of BROCAP: the emergence of trapping as a new method to control coffee berry borers was approved by participants of the second international seminar on the coffee berry borer in Costa Rica on 26 July 2002.

From 2003 onwards, CIRAD transferred its operating licence to ECOM, which created a business platform in Mexico managed by its subsidiary AMSA. The traps were then distributed outside the Mesoamerican region. In 2005, ECOM/IndoCafCo created a second business platform in Indonesia aimed at the Asian market. From 2005 to 2008, research on trapping resulted in the development of an integrated management system combining trapping and simple agricultural activities. The effectiveness of the so-called "triple-action" method was then on a par with that of chemical control, and in this context trapping was adopted throughout the world.

Within the framework of this study, we focused on monitoring the innovation in just one country: the Dominican Republic. It was in 1995 that the coffee berry borer was first detected in this country. However, the over-infestation of the primary outbreak indicates that the pest must have been introduced several years earlier (Campos and Dufour, 1995). The State Secretariat for Agriculture (SEA) launched an eradication programme based on widespread insecticide applications with the goal of treating infested plantations and protecting those most exposed to coffee berry borer colonisation. Quarantine measures were also implemented to limit the progression of infestations. Finally, with the decline in coffee prices in 1997 and the damage caused by Hurricane Georges in 1998, many plantations were abandoned, fostering the proliferation of the coffee berry borer (Gouache, 2004).

Created in 2001, CODOCAFE undertook a coffee berry borer management project. CIRAD organised trapping demonstrations. Producers rapidly came to see the trap as an "ideal" tool with

which they could wipe out this pest. As part of the PROMIB project (from 1999), training for growers in trapping and complementary agricultural practices began with voluntary growers (through the Farmer Field School over two trapping seasons). Dominican mobilisation for coffee berry borer management and the improvement of coffee production thus served as a springboard for the development and organisation of the coffee sector.

In 2002, the company FERQUIDO (*Fertilizantes y Químicos Dominicanos*) introduced the BROCAP trap into the Dominican Republic with the aim of selling it to growers. For CIRAD, this was the first export sale. However, for FERQUIDO, sales proved very difficult because of the high cost of traps.

In 2003, in order to reduce the cost of trapping and to extend its area of use, CODOCAFE and IDIAF produced an artisanal trap and distributed it free of charge to producers, within the framework of national trapping programmes. Then in 2007, a triple-action integrated management programme, as part of the joint CIRAD/PROMECAFE initiative, reinforced the coffee berry borer management programme that was already well underway in the country.

In 2004, the Dominican company *Industrias Químicas San Francisco* began producing dispensers, purchased by CODOCAFE and several large producers, with the goal of using the traps in each trapping period.

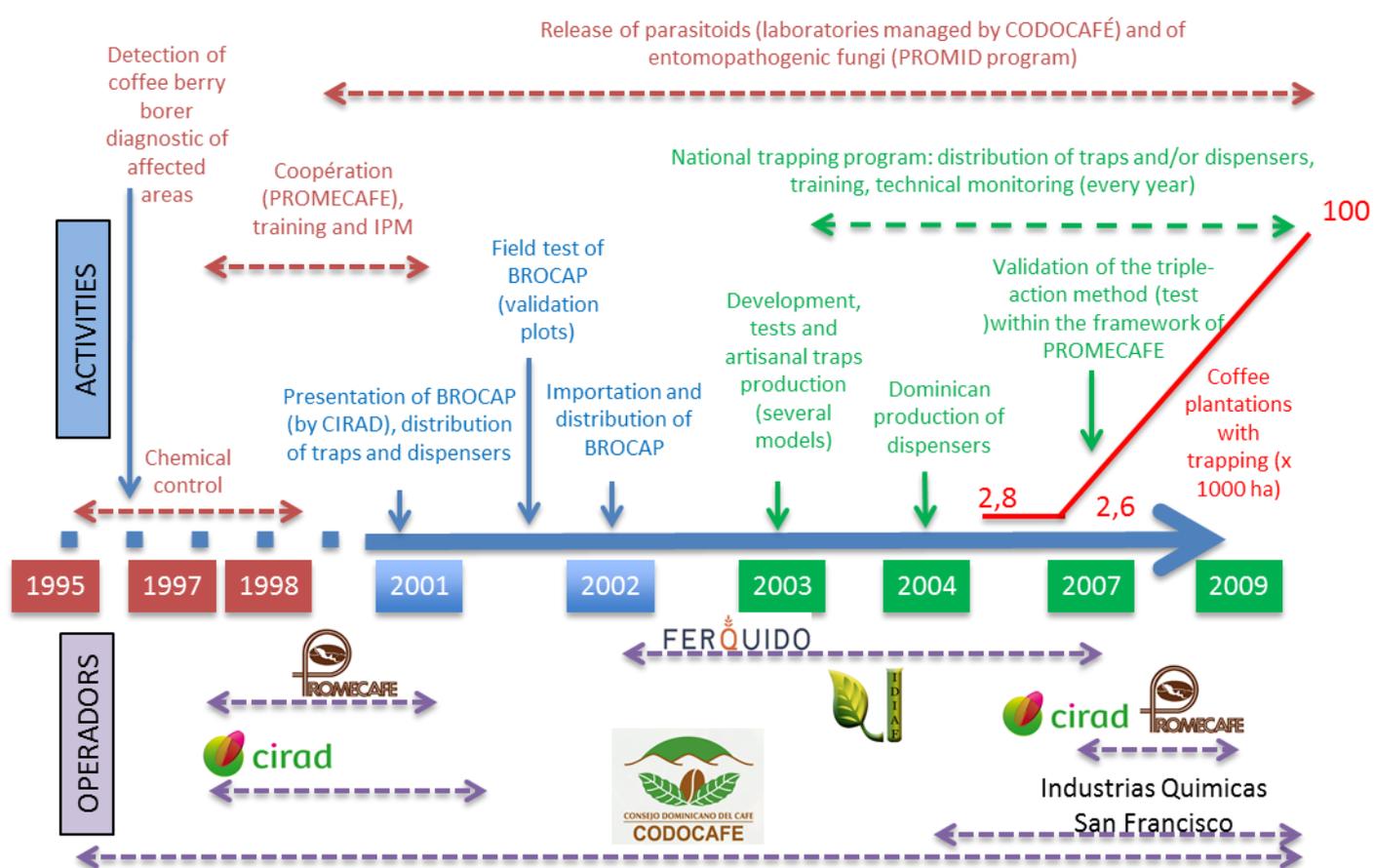


Figure 1: Timeline of the BROCAP case at the Dominican Republic level

The network of stakeholders is composed of people involved in the design and promotion of the innovation (category 1), those who influence the innovation (category 2) and/or those impacted by the innovation (category 3), and the linkages between them (Fig. 2). The mapping concerns stakeholders involved at the Latin American level (especially top left), but also at the Dominican

Republic level (especially bottom right). A colour code distinguishes the nature and activities of the key players. The thickness of the arrows is “proportional” to the importance of the linkage between the stakeholders concerned. Some stakeholders represented no longer contribute. The “or” between FERQUIDO and *Industrias Químicas San Francisco* reflects the fact that the dispensers were previously distributed by FERQUIDO, and since 2004 by the other company.

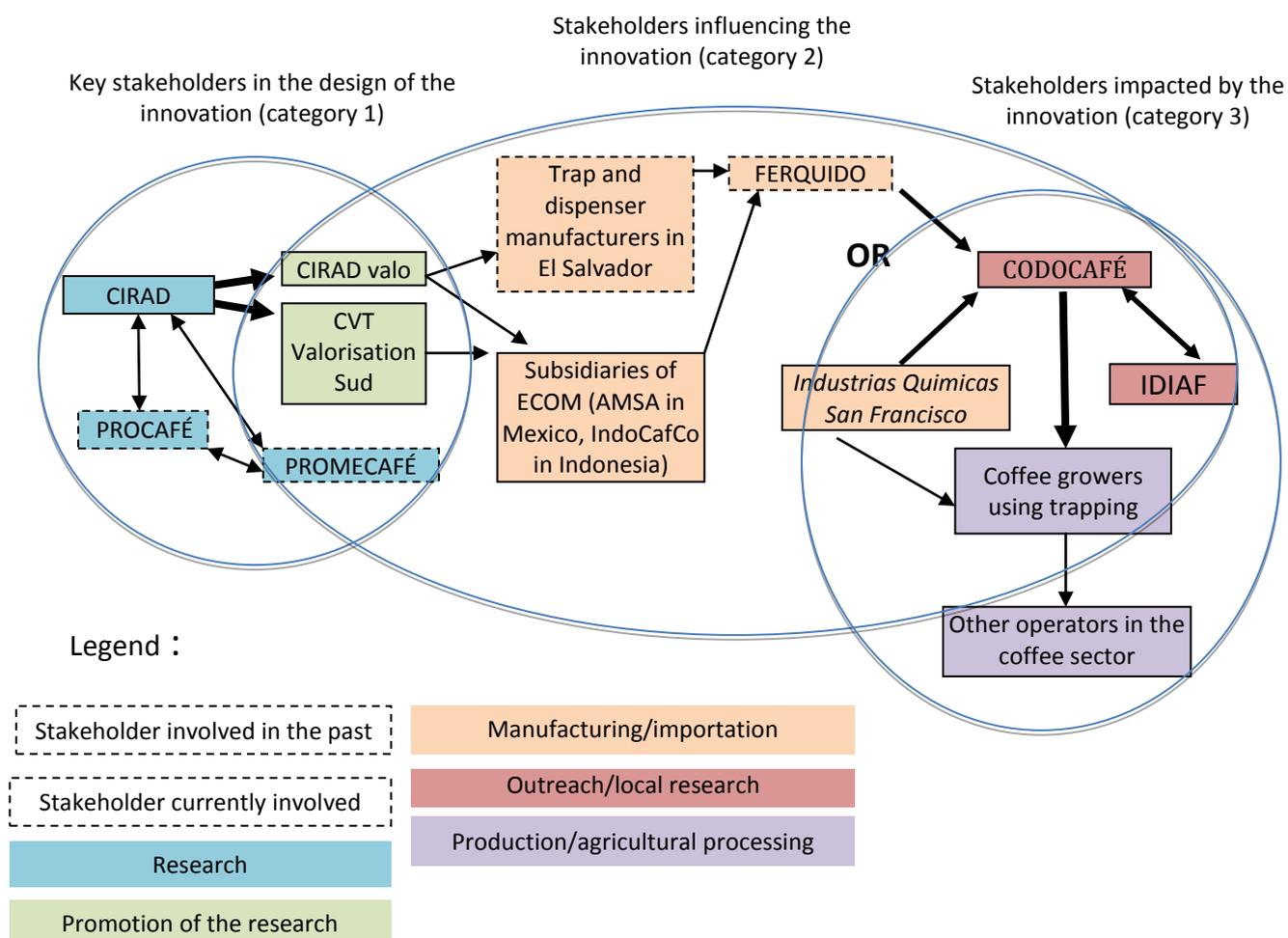


Figure 2. Mapping of stakeholders

2. Lessons from an analysis of the impact pathway

Some of the most significant and most predictable impacts include: reduced coffee berry borer infestations and reduced insecticide applications, with both being linked to long-term changes in agricultural practices (characterised as an outcome). These two impact categories are among the initial goals of the research on trapping that have been achieved.

Analysis of the impact pathway shows that the contribution to improving livelihoods for producer households is a strong impact, unanimously expressed by participants in workshops. This impact therefore influences access to education and culture for young people, and improves comfort and dietary diversity.

The unexpected impact undoubtedly concerns environmental protection, within the framework of the production of artisanal traps. Indeed, users have become accustomed to recycling empty soft drink bottles to use as material for the production of these traps.

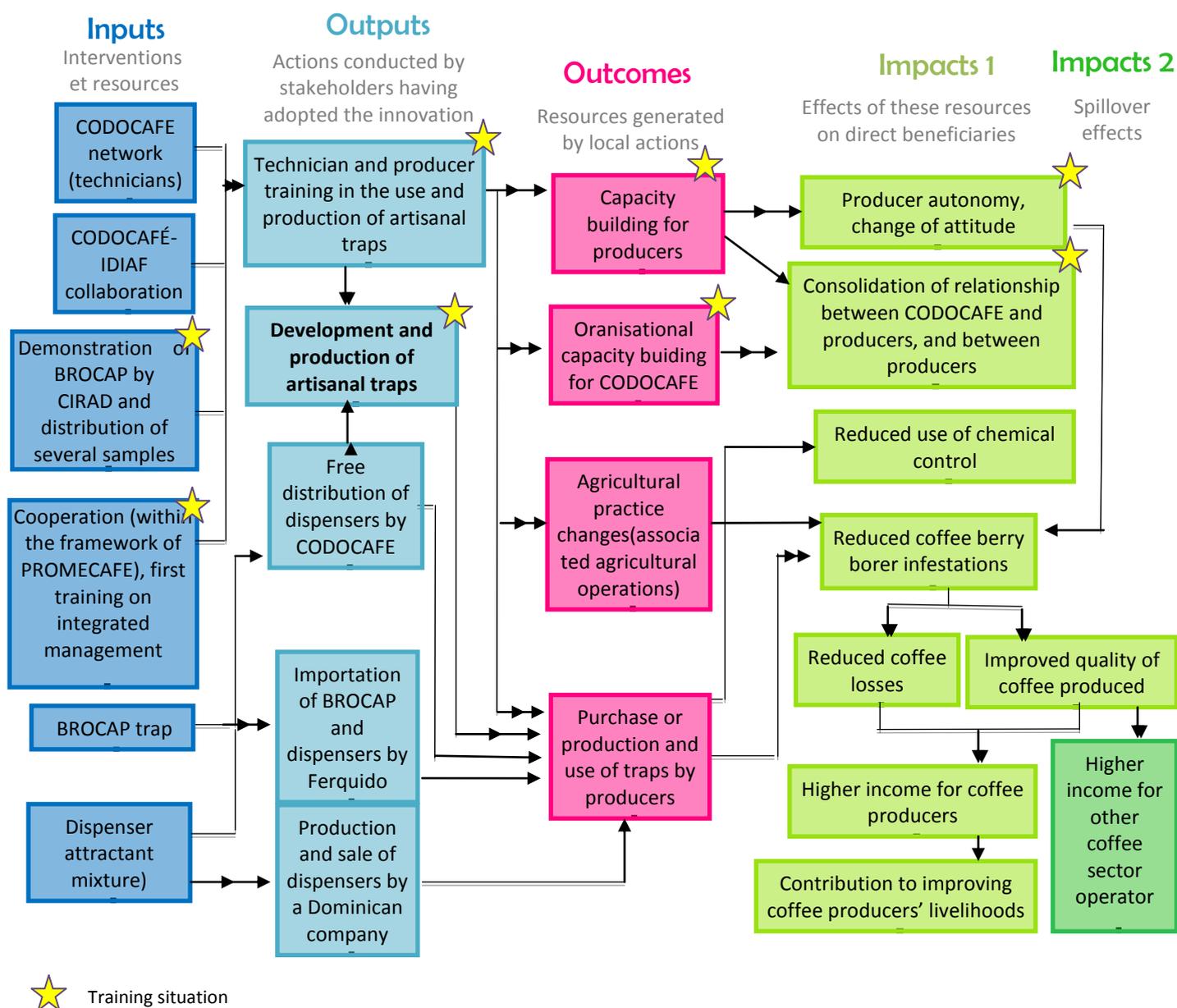


Figure 3. Impact pathway (case of the Dominican Republic)

3. Measurement and accuracy of impacts

At the Latin American level, it was impossible to make a detailed analysis of the effects of the innovation in terms of the measurement of impacts. All information found in the “Measurement of impacts” section therefore concerns only the geographical area of the in-depth study conducted in the Dominican Republic. Before proceeding to their measurement, the impacts were identified as part of a participatory process.

During the first workshops, the descriptors were identified, then grouped according to impacts. Next, similar descriptors were grouped together, before being submitted to participants of the third and final workshop. These descriptors are presented in table 1.

The intensity of impact descriptors was measured in a participatory manner during the final workshop. However, the ranking of impacts was rejected.

During interviews, it was often difficult to obtain clear answers from coffee growers. This was true, for example, when attempting to determine the role of coffee growing in their activities, their income, or coffee production costs. This data collection was aimed at establishing the profile of the people interviewed (type of farm: family, capitalist, etc.).

Some quantitative data required for the compilation of indicators and thus for the measurement of impacts should have been produced and held by CODOCAFE (the number of traps distributed, the price of traps, etc.), but this data was not accessible and represented an obstacle to the study.

Impact category	Impact	Descriptor	Indicator	Values (producers interviewed)	Values (other sources)
Environmental	Evolution of the environmental impact of management	Reduction in insecticide use	Quantities of insecticides used in 2016 on coffee berry borers	None	
		Recycling of plastic bottles (trap production)	Number of plastic bottles used in 2016	?	
Capacity building	Producers' knowledge and technical skills	New technical capacities	Number of training courses: trapping and production of artisanal traps	Several training courses	
		Expertise in trapping and associated techniques	Expertise in trapping and associated techniques	< 40%	
	Change of attitude among producers	Producer autonomy for coffee berry borer management	% of producers making their own traps	90%	
			Perception of autonomy acquired	> 80%	
CODOCAFE capacities	Improving CODOCAFE capacities, outreach strategies and organisation	Application of skills acquired to other types of management (blight)	?		
Agriculture	Shift towards integrated management	Maintenance of coffee plantations	Adoption of branch stripping and sanitation harvesting	94%	
	Increase in the quality and quantity of coffee harvested	Increase in the sanitary quality of coffee	Real reduction in infestation levels from 1995 to 2012 (coffee berry borer)	From 32 to 4.6%	
			Perception of infestation levels with traps (WT) and without traps (WOT) (by producers)	WT <1 0% WOT > 20%	
		Increase in coffee bean density	Difference in coffee bean density with and without trapping	-	
Increase in yields	Difference in production with and without trapping	-			
Economic	Increase in income for producers and operators in the sector	Increase in income (production)	Amount of additional revenue (producers)	?	
		Increase in income (processing)	Amount of additional revenue (downstream sector)	?	
	DR autonomy for the production of dispensers	Supply of dispensers	Turnover generated by sale of dispensers	?	
			Quantity of dispensers produced (between 2005 and 2015)		425 000
	Royalties for CIRAD	Financing for research on attractants	Price difference between "local" and "imported"	?	
Total fees collected between 2004 and 2016 in the form of royalties			-	146 500 €	
		Fees collected by the DR	-		

Table 1: Impacts, indicators and measurements