

OBSERVATIONS FROM COFFEE-SECTOR ENGAGEMENT IN NARIÑO, COLOMBIA

Using Scientific Evidence to Link Private and Public Sectors in the Planning Process

MICHAEL SHERIDAN AND ANDRÉS MONTENEGRO¹

FERNANDO RODRÍGUEZ-CAMAYO, MARK LUNDY, CAROLINA GONZÁLEZ, JULIÁN RAMÍREZ-VILLEGAS AND ANTON EITZINGER²

¹Catholic Relief Services

²International Center for Tropical Agriculture

ABSTRACT

Coffee farming is an important source of income for an estimated 40,000 farming families in the Department of Nariño in southwestern Colombia. Nariño is widely recognized as one of the world's leading origins of fine coffee, as measured by both the subjective preferences of leading specialty coffee companies and the objective standards of Nariño's Denomination of Origin. Despite the commercial success of Nariño's coffee in the marketplace, household-level data collected by CRS and CIAT suggest that most of Nariño's coffee farmers likely live in poverty, and recent investments of public resources to help growers create and capture additional value have not achieved their poverty-reduction goals.

This policy brief describes how a participatory multi-stakeholder planning process in Nariño's coffee sector in 2012-2013, facilitated by credible third parties, succeeded in both introducing results-based evidence into the decision-making process and aligning the interests of the public sector, private sector and civil society around a shared strategy to increase the sector's competitiveness. That strategy formed the basis of both a new policy approach toward the coffee sector and significant new public investment in the coffee sector that involves key actors from the public, private and non-profit sectors.

The process documented here is worthy of careful consideration by policymakers and private-sector firms interested in channeling scarce public resources toward market-responsive poverty-reduction investments, development agencies seeking to contribute to lasting impact in the field and research institutes seeking high-leverage applications of scientific evidence.

CONTEXT

Agroecological conditions in the Department of Nariño, Colombia, are ideal for producing two high-value crops with stimulant properties: coca and coffee. Since 2007, Nariño has been the leading coca-producing department in Colombia, and production has increased annually over each of the past three years despite the government's commitment to eradication.¹ Coca production, processing and transport in Nariño is both the cause and effect of the presence of armed actors in the department, both legal and illegal. These include units of the Colombian Army, two guerrilla movements—the Fuerzas Armadas Revolucionarias de Colombia and the Ejército de Liberación Nacional—and *bacrim*s, short for *bandas criminales*, devoted to various illicit activities. Violence between and among these actors displaced more than 80,000 people in Nariño between 2008 and 2010.² Many of those displaced fled from the low-lying areas on Nariño's Pacific Coast where coca thrives to communities at higher elevations in Nariño's Andean region where some of the world's finest coffee is grown.

The coffee-growing municipalities of northern Nariño have been affected by violence both directly and indirectly: some have been the scene of violence that has displaced smallholder farmers while others have seen smallholders displaced by violence elsewhere arrive in search of a new start. All of this occurs in the context of widespread poverty: in 2012, coffee growers in Nariño had a 53% probability of falling below the national poverty line, and farmed, on average, less than one hectare of coffee.³ To complicate matters even further, market conditions are uncertain, climatic conditions are progressively changing and risk factors will potentially increase in coming decades.

Against this backdrop, Catholic Relief Services (CRS) introduced the Borderlands Coffee Project in Nariño in 2011 with support from the Howard G. Buffett Foundation and in partnership with the International Center for Tropical Agriculture (CIAT) and a range of local institutions. The project is working to facilitate inclusive value chains that unlock coffee's potential as a licit strategy to increase family incomes, reduce poverty and improve the quality of life for smallholder coffee farmers in Nariño.

Borderlands is a five-year initiative (2011-2016). It is coordinated by CRS and implemented by three local partners in Nariño: Fundación Carcafé, a non-profit organization related to the Colombian coffee exporter Carcafé, the Pastoral Social of the Catholic Diocese of Ipiales (Cáritas Ipiales) and the Pastoral Social of the Catholic Diocese of Pasto (Cáritas Pasto). The project serves 1,600 smallholder coffee-growing families in eight municipalities.

1 See Colombia: Coca cultivation survey 2014. United Nations Office on Drugs and Crime, 2015 at www.unodc.org/documents/crop-monitoring/Colombia/censo_INGLES_2014_WEB.pdf

2 See web page Síntesis de la violencia y la confrontación armada en Colombia 2010-2011 in "Observatorio Derechos Humanos (DDHH) y Derecho Internacional Humanitario (DIH)" at <http://www.historico.derechoshumanos.gov.co/Observatorio//Paginas/Sistema-de-Información-Geográfico---SIG.aspx>

3 According to the reports made by the Departmental Coffee Growers Committees to the National Congress; see years 2009 to 2013 at www.federaciondecafeteros.org/particulares/es/quienes_somos/publicaciones/.

Its overall goal of increasing household incomes is anchored by efforts to expand smallholder access to high-value segments of the coffee market and consolidate inclusive coffee value chains. The project also invests in efforts to diversify farm production, smooth income streams, and improve the adaptive capacity of households confronting climate change. Finally, the project features a multi-faceted collaboration with CIAT aimed at improving outcomes for project participants and generating results-based evidence that improves decision-making on the farm, in the policymaking process and in the industry. This “research for influence” collaboration between CIAT and CRS has delivered technical and scientific information to key regional actors in the public and private sectors to inform their decision-making in the coffee sector and facilitated a cross-sector planning process that achieved broad alignment among multiple actors on shared strategies to make Nariño’s coffee sector more competitive. The Government of Nariño not only adopted those strategies as public policy toward the coffee sector, but it also invested COP \$13.538.084.954 (approximately US\$4.5 million as of this writing) to support the implementation of those strategies to strengthen the coffee value chain and COP \$1.7 trillion (approximately US\$567 million as of this writing) in related projects including road infrastructure, irrigation, and food security.

KEY MESSAGES

- Participatory processes and facilitated dialogue can improve policy and support the efficient use of scarce public resources for poverty reduction by introducing results-based evidence into the decision-making process. Platforms for cross-sector engagement, whether temporary or permanent, can be effective in achieving alignment between the public sector, private sector and civil society on sectoral plans.
- The development of policies and project interventions based on multidimensional analyses of production systems is essential for optimizing the impact of public and private investments. Such analysis permits efforts to optimize outcomes across multiple categories of impact (economic, environmental, social) and over time.
- Partnership between research institutes and development agencies rooted in an “intent to influence” hold the potential to help both be more effective: by contributing to public policies based on technical and scientific evidence, research institutes can leverage the public goods they create through their research for broad impact; by contributing to more inclusive public policies, development agencies whose projects may have limited numbers of direct participants can achieve “lower-intensity” impact at a much larger scale.
- Multi-stakeholder engagement in the development and adoption of sectoral plans was effective in this case due to the ability of the facilitation agents, the perception of their credibility among participants in the process, their status as disinterested actors and their ability to support and inform decision-making through the provision of results-based evidence. The swift adoption of the measures recommended by participants in this process, and public financing to implement those measures, was due to the existence of an enabling environment in Nariño open to cross-sector collaboration and results-based evidence.
- The most effective interventions in the coffee sector will be customized for different growers based on farmer typology and the agroecological, economic and social variables of different geographies. Of particular importance in developing differentiated interventions are rigorous baseline surveys, careful value-chain analyses and qualified technical assessments of the suitability of specific communities for the production of coffee in general and high-quality coffee in particular.
- New types of institutional organization and governance structures may be needed to develop strategies for adequately managing the risks and threats related to climatic variability and climate change, which will affect crop production in coffee-growing zones. It is important to note for policymaking purposes that these impacts will be geographically differentiated across communities based on environmental variables, production system and livelihood strategies; effective policies will be customized for different segments of the population. The reasons for which the Government of Nariño failed to include provisions for climate change adaptation in its coffee-sector investments despite funding all other aspects recommended by this process must be further analyzed. Preliminary analysis suggests it may be a function of misaligned time horizons, including the long time horizons of projected changes in coffee suitability on one hand and the short time horizons of electoral and policymaking processes on the other.

LINKING THE PUBLIC AND PRIVATE SECTORS

Within the Borderlands project’s “research-for-influence” framework (Figure 1, column C), CRS and CIAT joined efforts with the Government of Nariño (GON) and diverse local institutions (Figure 1, column B) with the objective of developing a strategy to improve the competitiveness and inclusiveness of the department’s coffee chain.⁴ The process focused on improving incomes for smallholder coffee growers by taking advantage of the coffee chain’s latent potential and overcoming its limitations. Participating local institutions included: the Agency for Local Development in Nariño (ADEL); Fundación Carcafé, a non-profit organization related to the Colombian coffee exporter Carcafé; the National Coffee Growers Federation (FNC), which was represented by its Departmental Committee for Nariño; the Pastoral Social of the Catholic Diocese of Ipiales (Cáritas Ipiales); the Pastoral Social of the Catholic Diocese of Pasto (Cáritas Pasto); Suyusama, a rural development institute run by a Catholic religious order, the Society of Jesus, or Jesuits; and farmer associations from different coffee-growing regions of Nariño

For this project, CRS also created a private-sector advisory body called the Borderlands Advisory Council (Figure 1, column D), comprised of six U.S.-based specialty coffee companies that deliver best-in-class market-based advisory services to project staff, partners and participants while supporting its commercial objectives through the purchase of coffee from project participants. The activities of the Borderlands Advisory Council may also be considered part of the project’s influence over public policy and spending. The project brought members of the Advisory Council into direct contact with policymakers as part of their annual visits to origin, during which they were able to offer perspectives and issue recommendations on ways to more effectively foster the creation of a competitive and inclusive coffee sector. CIAT and CRS will analyze the Borderlands Advisory Council construct more thoroughly in a separate and forthcoming policy brief, including sections on lessons learned and recommendations.

Immediately prior to the start of the Borderlands project, GON had adopted as a matter of public policy the Agreement on Competitiveness of the Coffee Production Chain, embodied in public guideline no. 2 of 30 March 2011. The policy calls for the establishment of a Regulating Council, comprised of representatives of local institutions involved in the coffee sector and charged with advising the government on policies that would make the region’s coffee value chain more competitive. The Agreement calls explicitly for the participation of diverse actors from the region’s coffee sector. GON, in other

4 A strategy for competitiveness comprises a group of activities planned and executed with the active participation of the diverse actors of a chain. The goal is to achieve common objectives, around which are articulated one or more business organizations and interest groups, with their focus broadened to the production chain. This strategy is executed across the short, medium, and long term; and, depending on the analyses of the production chain’s critical points, can be directed at development and research on production operations, postharvest handling and processing, marketing, and business organization. Thus, competitiveness is improved (Lundy et al. 2004), available at https://cgspace.cgiar.org/bitstream/handle/10568/53983/Diseno_estrategias_aumentar_competitividad_cadenas_productivas.pdf.

words, had already created a general enabling environment for cross-sector collaboration processes by the time Borderlands began and called more specifically for such a process in the coffee sector (Figure 1, column A).

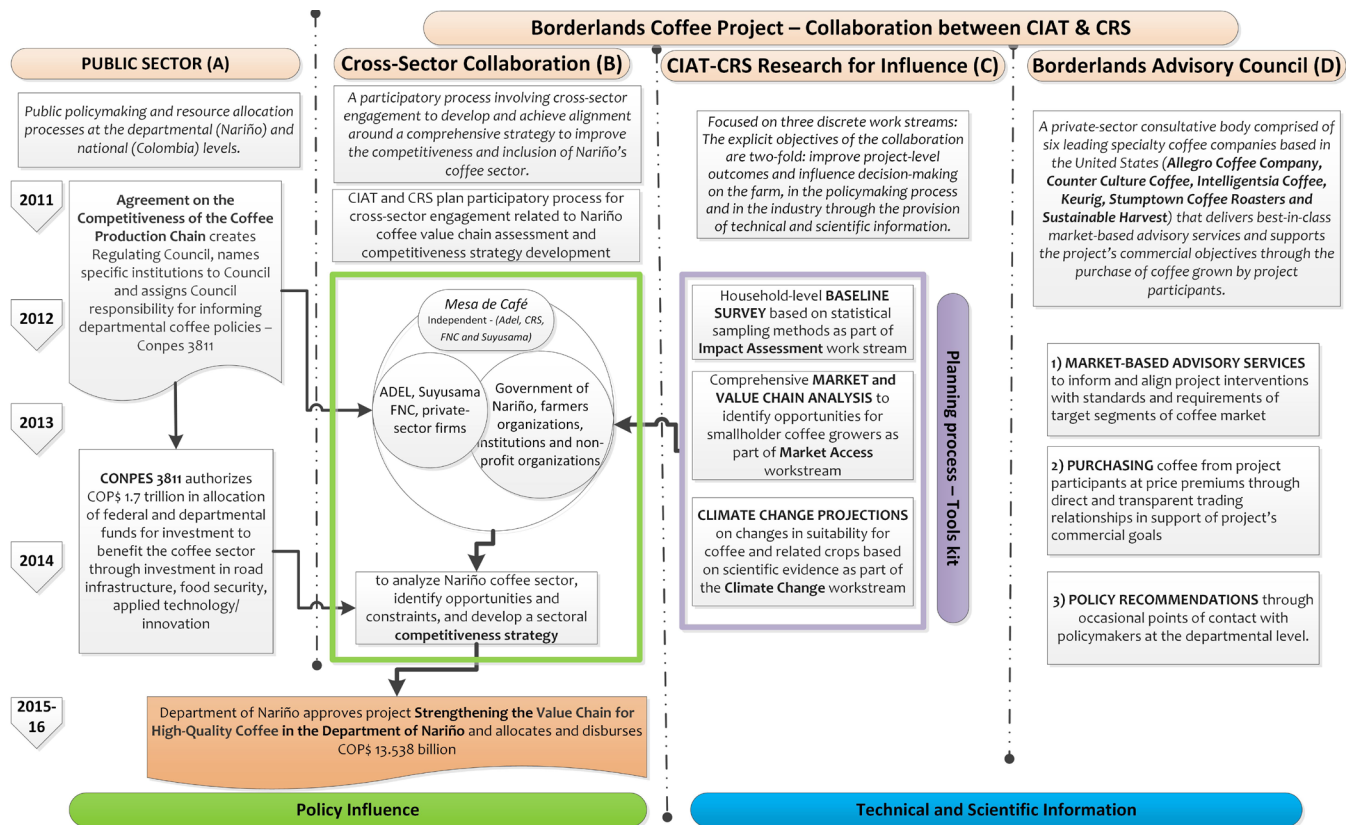


Figure 1. Models of influence in public policy, including timelines, key activities and milestones in: (A) coffee-related commitments made by the public sector: Department of Nariño and Colombian National Council on Social and Economic Policy; (B) cross-sector engagement related to the Nariño coffee sector planning process; (C) the research-for-influence collaboration between CIAT and CRS in the context of the Borderlands Coffee Project; and (D) the work of the Borderlands Advisory Council, a process separately documented in a forthcoming CIAT Policy Brief on private-sector engagement in value-chain programming

TECHNICAL AND SCIENTIFIC CONTRIBUTIONS TO SECTORAL PLANNING

CIAT and CRS used three separate tools and processes to support decision-making in the development of these public policies. First, the collection of detailed household-level data through a rigorous baseline survey of smallholder coffee growers that included both farmers participating in the Borderlands project and non-participants.

Second, the facilitation of a participatory value chain analysis that involved key actors from the public, private and nonprofit sectors. This process assessed the current state of the coffee sector in Nariño, identified key constraints and opportunities, and advanced recommendations to make the sector more competitive and inclusive. The key results of the baseline survey were shared as part of the participatory coffee sector planning process, and contributed significantly to a clear and shared understanding of the current situation of coffee growers in Nariño.

Third, the generation of up-to-date analysis of potential climate change impacts on the agriculture sector to support decision-making on the farm and in the policy process.

THE HOUSEHOLD-LEVEL BASELINE SURVEY

Colombia's coffee institutions report that 39,423 families in the Department of Nariño is currently work 56,000 coffee farms covering about 39,000 ha.⁵ These findings suggest an average area of 0.7 ha per coffee farm, meaning that most coffee growers in this region are smallholders.

The Borderlands baseline survey was designed to complement these department-level data and deliver more precise figures for the eight municipalities in which the project is being implemented: Buesaco, Chachagüi, El Tambo, La Florida, La Unión, Linares, Samaniego and Taminango. According to the National Coffee Census of 2012, the total population of coffee growers in those eight municipalities in) was 14,414. Of these, 1,597 were project participants at the time the baseline was designed.

Interviews were conducted with 510 farmers for the baseline survey. Of these, 228 were participants in the Borderlands project and 282 were non-participants. The 110-question interview was divided into the following thematic sections: geographic location, family composition, connectivity, level of poverty, food security, farm characterization, non-coffee-based income and production, services, access to capital, coffee production system, coffee sales, and division of labor. The data collected represented baseline values for key performance indicators the project is tracking to measure its own progress, as well as data being mined in connection with the project's research agenda.

The baseline survey led to the identification of three distinct types of farmers growing coffee based on their principal livelihood strategies. These were categorized as: (1) off-farm income-earners: rural-dwelling families that derive most of their income from off-farm activities, including non-agricultural activities; (2) diversified farmers whose income is generated through a range of agricultural activities including coffee-growing; and (3) coffee specialists whose income comes primarily from coffee marketing.

The off-farm income group (32% of farmers) is made up of households whose main source of income comes from agricultural wages earned off the farm, including non-agricultural income, self-owned businesses, public transfers,

⁵ Congreso Nacional Cafetero 2014 http://www.federaciondecafeteros.org/static/files/Informe_Comites_2014p.pdf

and remittances. For off-farm income households, 85% of income comes from non-coffee sources, making them less vulnerable to the income impacts of loss of coffee suitability due to climate change. This group has the smallest average farm size at 1.66 ha and the lowest income of the three groups.

The diversified coffee farmer group (51%) comprises households where most of the income comes from livestock production, agriculture, and coffee. Diversified coffee farmers derive 45% of their income from coffee and have a 53% chance of falling below the national poverty line. Farmers in this group are also the most exposed to climate change, with a 27% decline in the climatic suitability for coffee.

The coffee specialist group (17%) corresponds to households whose income derives mostly from coffee, with more than 65% of land devoted to the crop and more than 10 years of experience in coffee growing, and possessing their own wet-processing equipment (Vellema et al. 2015). The coffee specialist group has a 45% probability of falling below the national poverty line⁶ (Table 1). Coffee specialists are more exposed to fluctuations in the international price of coffee than that of the other farmer types since they depend on coffee for 74% of their income, on average. However, this group also has the opportunity to take advantage of the farm's total area for climate adaptation as it possesses the largest average farm size at 2.32 ha.

The high rates of probability that farmers in each group fell below the poverty line (45%-52%) suggest that the region's coffee sector is not effectively creating pathways out of poverty for smallholder farmers. Similarly disconcerting is the presence of food scarcity across all three groups. Baseline data collected on months of adequate household food provisioning (MAHFP) suggest very little difference on average across the three groups, with the highest average of months of food scarcity (2.05 for diversified farmers) differing relatively little from those of the other groups (2.02 for off-farm income and 1.85 for specialized coffee farmers).

See Table 1 for a summary of key data points for each of these three farmer types.

⁶ According to DANE, in 2013, the percentage of poverty in Colombia was 30.6% (www.dane.gov.co/files/investigaciones/condiciones_vida/pobreza/cp_pobreza_13.pdf).

Table 1. Summary of key data points from Borderlands baseline survey, by farmer type

FARMER TYPE		Off-farm income (32%)	Diversified farmers (51%)	Coffee Specialists (17%)	AVERAGES	
PRODUCTION	Average Farm Size (ha)	1.66	2.32	1.96	2.05	
	Average Area Planted with Coffee	0.63	0.97	1.66	0.98	
	Average Production per Farm (kg CPS)	227	763	1,503	0.98	
INCOME + WELLBEING	Average % of Income From:	Coffee	15%	45%	74%	40%
		Non-coffee Sources	85%	55%	26%	60%
	Average Income from Coffee (\$ COP)	1,504,312	5,554,757	11,800,000	5,322,857	
	Probability of Falling Below Poverty Line	51%	53%	45%	51%	
	Months of Adequate Household Food Provisioning (MAHFP)	9.98	9.95	10.15	9.99	
CLIMATE CHANGE	% of Farms Likely to Lose Suitability for Coffee Production	25%	27%	13%	24%	

These findings were used by Nariño's Mesa de Café as it worked from 2012-2013 to develop a competitiveness strategy for the region's coffee sector and continues to inform policy in Nariño vis-à-vis the coffee sector.

PARTICIPATORY VALUE CHAIN ANALYSES

In 2012, GON convened the Mesa de Café, a cross-sector working group charged with identifying and analyzing the strengths, weaknesses, opportunities and threats in the region's coffee sector, and issuing concrete recommendations to make the sector more competitive. The Mesa de Café included delegates from: the Carcafé Foundation; Cáritas Ipiales; Cáritas Pasto; CRS; the Departmental Committee for Nariño of the National Coffee Growers Federation, GON, the Local Development Agency of Nariño (ADEL); Suyusama; and farmer organizations.

CIAT facilitated the work of the group using a methodology called Participatory Analysis of the Chain (Lundy et al. 2004) it had previously

developed for multi-stakeholder processes. This process is summarized in Figure 1, column B. Through 10 separate multi-stakeholder meetings over a period of six months, and with support from CRS and Borderlands project partners, CIAT helped the Mesa de Café generate the inputs for what would become the Nariño Coffee Value Chain Competitiveness Strategy.

This process of participatory analysis involving multiple value-chain actors and other relevant stakeholders led to deep alignment among participants around the identification of five principal weaknesses of the Nariño coffee chain:

- 1. Low productivity** due to deficient production infrastructure, weak farm-level business management, poor adaptability of existing research to conditions of Nariño, and lack of management of climatic risks;
- 2. Inconsistent quality** due to deficient production processes, lack of standardized processing procedures, limited financial incentives for quality from buyers, and the farmers' own confusion around what constitutes coffee quality;
- 3. Limited market contacts** due to low segmentation of current coffee sales and a lack of information on existing and potential market channels;
- 4. Inadequate road infrastructure** due to limited public resources and limited sectoral or citizen lobbying for appropriation of public resources for transportation infrastructure upgrades;
- 5. Weak farmer organizations** due to a lack of leadership skills, inadequate training and support schemes by local institutions and NGOs, outdated commercialization models, and little clarity as to what skills a competitive producer organization should have.

This process contributed to important outputs in the public policy process.

The Mesa de Café developed the Nariño Coffee Value Chain Competitiveness Strategy to address these five limitations on the efficiency and inclusion of the Nariño coffee sector. That strategy was presented to leaders in the public sector, the private sector, non-profit organizations and farmer associations, and embraced by GON as a blueprint for the development of the region's coffee sector. It also informed the design and budget of *Strengthening the value chain for high-quality coffee in the Department of Nariño* (Figure 1, column A), a project that invests COP \$13.538.084.954 (approximately US\$4.5 million as of this writing) in public resources to operationalize the approach advanced by the Competitiveness Strategy. The collaborative work led by CIAT, specifically the cross-sector alignment on the measures proposed in the coffee sector competitiveness plan, contributed to the approval of the proposal. The project is being implemented by a consortium of local organizations in Nariño under the leadership of CRS, including ADEL, Cáritas Ipiales, Cáritas Pasto, Cornell University, FNC, GON, Suyusama and Universidad de Nariño.

Furthermore, the actors convened by the Mesa de Café contributed on the basis of the insights generated through this process to the development of a public policy approved by the Ministry of Agriculture and Rural Development (MADR) and the Presidency of the Republic. This document, known as *CONPES 3811*, was generated by the National Council for Economic and Social Policy (CONPES) for the development of the agriculture and livestock sector in Nariño, and includes investment in the coffee sector that builds on the technical and scientific evidence introduced into the process in Nariño through the CIAT-CRS partnership.

CONPES 3811 calls for investments over a five-year period of COP\$1.7 trillion from the budget of the Government of Colombia, COP\$108,000 million by the Government of Nariño, and more than COP\$375,000 million from the federal government's program for collecting and redistributing receipts from concessions in the energy sector. These resources will be invested in the creation of credit facilities for rural capitalization, road infrastructure, irrigation systems, and food security.

MODELING IMPACTS OF CLIMATE CHANGE

CIAT researchers combined global climate models with digital elevation maps and crop models to generate models of climatic suitability for coffee, cassava, beans, maize, plantain, and sugarcane for the years 2020 and 2050.⁷ The five non-coffee crops were selected by the Mesa de Café because of their importance to local food security. The modeling was carried out under a “business-as-usual” scenario under which no greenhouse gas emissions mitigation measures are taken. This modeling was also undertaken for a scenario with no adaptation. Climatic suitability for a given crop was estimated by using an algorithm for modeling potential species distributions (MaxEnt), recorded with geographic coordinates that indicated sites carrying the crops (coordinate references taken from the project's baseline) and environmental variables of the study area.

The model found that most farms had a level of climatic suitability of more than 50% for coffee by 2050 (Figure 2), which is positive in that it shows that the farms had more than a 50% favorability for coffee production in environmental terms. The modeling for 2050 showed that the potential area of climatic suitability for coffee would rise in altitude to as much as 2500 m above sea level (masl), with the appearance of new suitable zones through increases in temperatures.

⁷ A climatic suitability model shows a suitability index (between 0 and 100) for a given crop under the specific climatic conditions of a given study site.

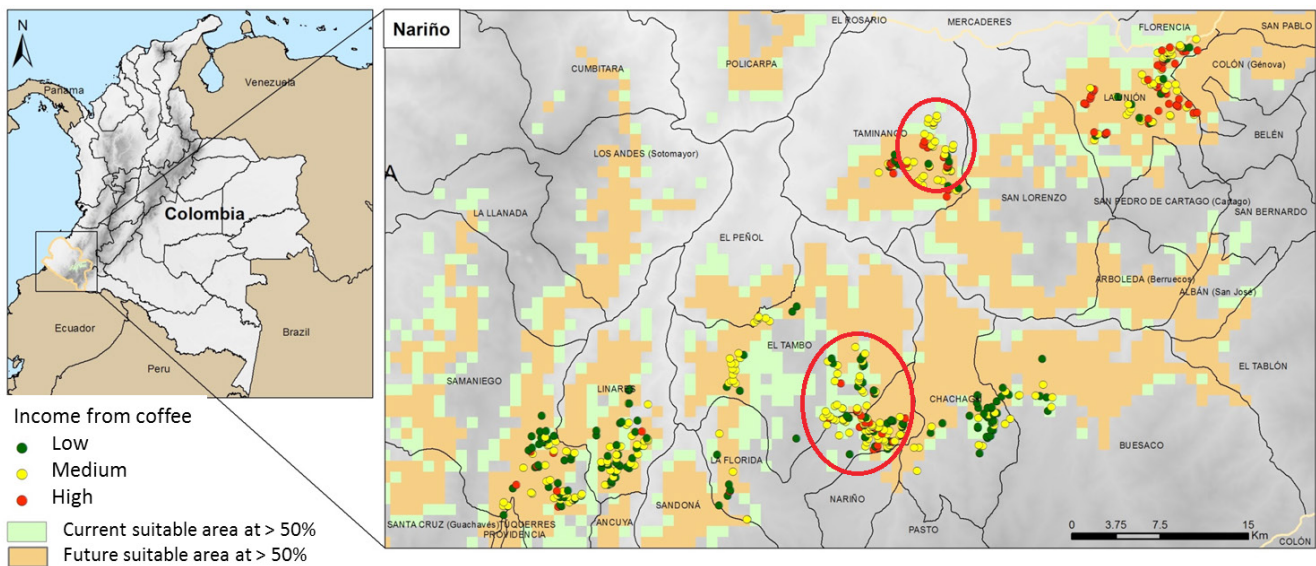


Figure 2. Map of losses and gains in climatic suitability for coffee. Red circles indicate areas with high presence of farms with diversified incomes.

Despite the possible gains in high-elevation zones (>2100 masl), net loss of area for 2050 could be a little more than 50%, as observed in Figure 3. This would affect almost 25% of current coffee farms in the department. This is equivalent to about 10,000 of the more than 40,000 coffee growers who live in the area, according to the 2013 National Coffee Congress.

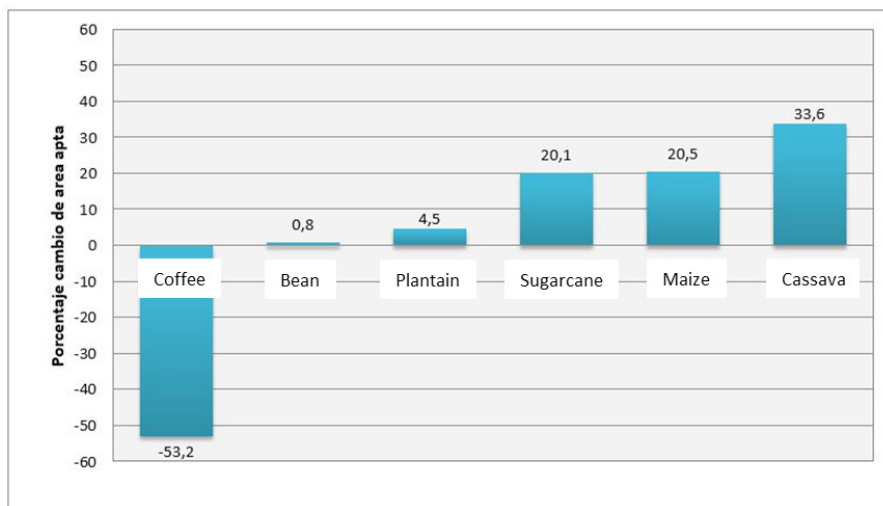


Figure 3. Percentage of loss or gain in suitable area for coffee and its crops in association, Department of Nariño, Colombia.

The group of diversified coffee farmers (Table 1) may suffer the highest loss of climatic suitability for coffee production with at 27% reduction. However, this group may also have the most capacity to respond when adapting to climate change because they possess the largest farms and are less exposed to coffee suitability reductions since roughly 50% of their incomes come from non-coffee-production activities. The coffee-specialist group may suffer the least loss of suitable area (at only 13%), compared with the other groups (Table 1). Increases in suitable cropping areas are also projected for the five crops grown in association (and important for food security in the coffee-growing region). Sugarcane and maize would each gain an extra 20% or more in suitability, while cassava would gain 33% or more. Plantain and beans both maintain present suitability levels, with potential increases of less than 5% each (Figure 3).

RECOMMENDATIONS FOR IMPROVEMENTS IN PUBLIC POLICIES FOR THE COFFEE SECTOR

The process described in this brief is worthy of careful consideration among research institutes and development agencies, and may show a new way forward for collaboration to achieve influence at scale and contribute to improved, more inclusive public sector policies and spending priorities.

INTENT TO INFLUENCE: SCIENTIFIC AND TECHNICAL INFORMATION FOR DECISION-SUPPORT

The process described above was part of an intentional effort by CIAT and CRS to support and influence decision-making on the farm, in the policymaking process and in the marketplace through the generation and delivery of results-based evidence to key coffee-sector stakeholders. The Borderlands Coffee Project's "research-for-influence" agenda was designed to enlist technical and scientific evidence in the promotion of more inclusive practices and policies at each of the levels mentioned above. The project's success in exerting influence over public policy and spending priorities for Nariño's coffee sector amplified the project's reach from the 1,600 smallholder farming families who participate in the project directly to affect the entire population of coffee growers in Nariño, who number around 40,000. At a time of dwindling investment in development programming, pairing field-based operations with "research-for-influence" partnerships could position development agencies to contribute to broad-based impact even at a time of declining investment in the sector.

A-B-C-D-E-F: ABLE, CREDIBLE, DISINTERESTED AND EVIDENCE-BASED FACILITATION

The success of the process described here was driven by the fact that its facilitation was perceived by key stakeholders as being: able: possessing the skills necessary to effectively facilitate constructive cross-sector engagement; credible: perceived as having expertise and substantive understanding of the content on which the process focused; disinterested: lacking any financial or vested institutional interest in any particular outcome besides a clear commitment to inclusion; and evidence-based: driven by technical and scientific findings generated through rigorous and participatory processes.

FARMER TYPOLOGIES: CUSTOMIZED APPROACHES FOR DIFFERENT KINDS OF FARMERS

The Borderlands project team identified three discrete farmer typologies through the project's baseline survey and analysis—specialized coffee farmers, diversified farmers who grow coffee and rural-dwellers who rely primarily on off-farm activities for income generation but also

grow coffee. Each of these groups allocates resources—principally labor, time and resources—differently across a range of activities, with different levels of efficiency in each of those activities, including coffee farming. Public policies aiming at poverty reduction in the coffee sector should reflect the differences between farmer types in their efforts to maximize net income of farmers in the coffee sector. Effective interventions will be adapted to the conditions of each farmer group.

CLIMATE CHANGE ADAPTATION: SUITABILITY AND SUSTAINABILITY

The Borderlands project team identified “winner” and “loser” crops—agricultural products that gain and lose suitability over time under likely climate change scenarios. Effective adaptation strategies for smallholder farmers currently growing coffee will take these crop-specific projections into account.

Staple crops including beans and plantain may continue to have the same degree of climatic suitability they currently do in coffee-growing regions, making continued cultivation of these high-nutrient crops viable in the study area.

Sugarcane may increase in suitability in the coffee-growing areas covered by the study, creating the possibility of an increase in the supply of products such as *panela*, a shelf-stable processed sweetener created from sugar cane through a light-industrial process. To fully capitalize on increased production of sugar cane, improvements to *panela* processing infrastructure and a comprehensive marketing strategy should be developed and directed primarily at consumers in Nariño and markets in neighboring departments.

Maize gain may more suitability in the coffee-growing region, and could help to smooth family income if it is planned for harvest or stored for sale during seasons when prices are more stable and products are better-remunerated. Cassava may also gain more suitability, improving access to this carbohydrate-rich food.

Studies involving simulations of climate change and rigorous soil mapping in zones that will suffer significant reductions of suitability for coffee can be crossed with information from studies of national and international markets to identify crops in the current coffee-growing region of southern Colombia that combine agronomic suitability and market opportunity.

In all scenarios involving changes in land-use patterns, careful consideration must be given to ecological impacts, especially in the case of transition away from shade-grown coffee to annual or short-cycle crops grown in full exposure to the sun, and in the case of any crops planted on steep hillsides. Soil degradation, soil erosion, loss of soil organic matter, loss of soil fertility, reduction of greenwater resources and sedimentation of bluewater resources are all likely negative effects of such transitions, especially in the absence of explicit soil and water conservation and management efforts.⁸

8 <http://coffeelands.crs.org/2012/09/302-the-water-footprint-of-your-coffee/>

**SMARTER AGRONOMIC EXTENSION AND PROGRAMMING:
AGROECOLOGICAL SUITABILITY FOR QUALITY-BASED DIFFERENTIATION**

Environmental or agroecological variables were shown to be critical determinants of the suitability of a particular farm for coffee production. They are also important determinants of a farm's ability to produce coffee with the specific sensory or organoleptic attributes sought in high-value segments of the coffee market. The identification of distinct agroecological or environmental niches with different levels of suitability for quality-based differentiation and would position public-sector service providers for more "intelligent" approaches to agronomic extension and programming in the coffee sector.

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ADDITIONAL READING

CONPES (Consejo Nacional de Política Económica y Social). 2014. CONPES 3811: Políticas y estrategias para el desarrollo agropecuario del Departamento de Nariño. CONPES of the Departamento Nacional de Planeación, Bogotá, DC, Colombia. Available at <https://colaboracion.dnp.gov.co/CDT/Conpes/Economicos/3811.pdf>.

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Catholic Relief Services, 228 W. Lexington Street, Baltimore, MD 21201, USA
For more information, contact michael.sheridan@crs.org.