Manos al Agua
Gestión Inteligente del Agua

INTEGRATED MODEL OF COFFEE RIVER BASIN MANAGEMENT IN COLOMBIA - MANOS AL AGUA EXPERIENCE

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INTEGRATED MODEL OF COFFEE RIVER BASIN MANAGEMENT IN COLOMBIA

MANOS AL AGUA EXPERIENCE

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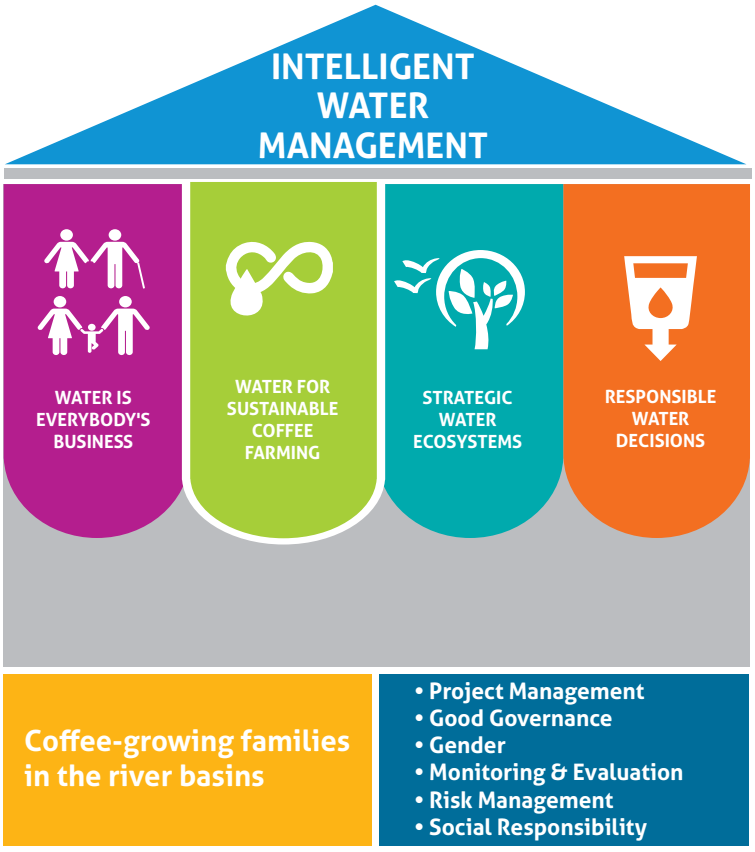
Manos al Agua.



Intelligent Water Management (IWM)-Manos al Agua is a Public-Private Partnership that developed a model to enable and improve systems for intersectoral cooperation, sustainable coffee farming, environmental protection and decision-making; it has contributed to dealing with water imbalance challenges in the coffee sector and its value chain, creating environmental, social and production conditions for: alleviating poverty, improving rural welfare, contributing to peace, and achieving sustainable development in Colombian rural areas.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

Manos al Agua-Intelligent Water Management (IWM) is an innovative project with a coffee river basin management approach that took place in the territory, seeking to improve water management to support the Colombian coffee industry. It was a five-year effort by different stakeholders developed in five coffee departments: Antioquia, Caldas, Cauca, Nariño and Valle del Cauca, designed to address significant risks posed by climate change and water-related situations in Colombia. It used innovative technologies to reduce production losses due to climate hazards and mitigate coffee production impacts on the environment.

A **strategy designed to impact regions and transcend beyond smallholder farms in an isolated way**, with capacity for environmental recovery and soil and water protection, involving communities and different institutional players to promote rural development and improve their well-being and quality of life.

The global agenda recognizes the importance of water for the future of the planet. The members of the Manos al Agua-IWM public-private partnership, **the Colombian Coffee Growers Federation (FNC), the National Coffee Research Center (Cenicafé), Nespresso, Nestlé, Wageningen University and Research (WUR), the Presidential Agency for International Cooperation of Colombia (APC-Colombia), the Ministry of Foreign Affairs of the Netherlands and the Netherlands Enterprise Agency**, have the knowledge and systems necessary to implement effective solutions and lay the foundation for a better future. Communities and institutions are committed.

With a 5-year time horizon, the stages of start, planning, operational capacity building, implementation and closing of the Project were performed with outstanding results in 25 coffee river basins, establishing Manos al Agua-IWM as a model project that generated tools and lessons learned to be replicated in any production sector in Colombia and the world.

Articulation of different stakeholders to build spaces of dialogue, communication and cooperation at local, national and international levels, in order to generate water governance mechanisms and strengthen community participation with a territorial and landscape management approach, was possible.

Systems were developed for sustainable coffee farming based on training and transfer of technological water solutions and best practices. Continuous improvement plans that responded to the needs of coffee growers and their potential production were adopted, taking care of ecosystems where coffee production takes place -- ecosystems that protect the production environment but are vulnerable to impacts of inadequate practices by producers and communities. Addressing the environment to protect water resources and promote tools that encourage their protection was a Project task.

Decisions related to climate impacts on coffee farming and reasonable use of natural resources were advised to mitigate coffee production impacts. Widely promoted, Good Governance and Social Responsibility guided IWM key elements to be appropriated by all the stakeholders, in order to achieve expected results and benefits in a sustainable, ethical and responsible way.

At the end of the Project, **92%** of the river basins showed better water quality in their surface water bodies, and **167 million m^3/year** of unpolluted water was **made available** as a result of all the IWM Project actions.

This publication summarizes the experience of this intervention model called **Intelligent Water Management-Manos al Agua**, a document divided into different chapters describing conceptualization and general guidelines of Manos al Agua, integrated coffee river basin management, intervention model phases and implementation results, aiming to show a path towards integrated management in other territories, impacts achieved, and a path to coffee river basin management.

List of publications complementary to the *Integrated model of coffee river basin management in Colombia-Manos al Agua Experience:*

The following list specifies the topics of publications that expand on what has been carried out in the Project under an integrated initiative that defined all actions through work plans at technical-economic, social, environmental and good governance levels. These complementary publications will show in more detail the most relevant elements of most work plans that supported the strategy.

No,	Publication topic	Component
1	Integrated model of coffee river basin management - Manos al Agua experience	
2	Coffee communities for good water governance	
3	Technology transfer and rural extension	
4	Multilevel rural extension training	
5	Economic impact on coffee farms in Colombia	
6	Analysis of Social Return on Investment of the Manos al Agua Project	
7	IWM systematization, transfer and sustainability	
8	The experience in IWM community ecological wet milling	
9	Appropriate technologies for water treatment on coffee farms	
10	Forest management plan in coffee river basins	
11	Soil and water conservation	
12	Landscape analysis in an IWM river basin	
13	Climate monitoring: tool at the service of Colombian coffee farming	
14	Guide to evaluation of quality of surface water in coffee river basins of Colombia	
15	Technical guide to coffee water footprint in Colombia	
16	QuickScan	

Color code	IWM component
	C1. Water is Everybody's Business
	C2. Water for Sustainable Coffee Farming
	C3. Strategic Water Ecosystems
	C4. Responsible Water Decisions

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Manos al Agua. Gestión Inteligente del Agua

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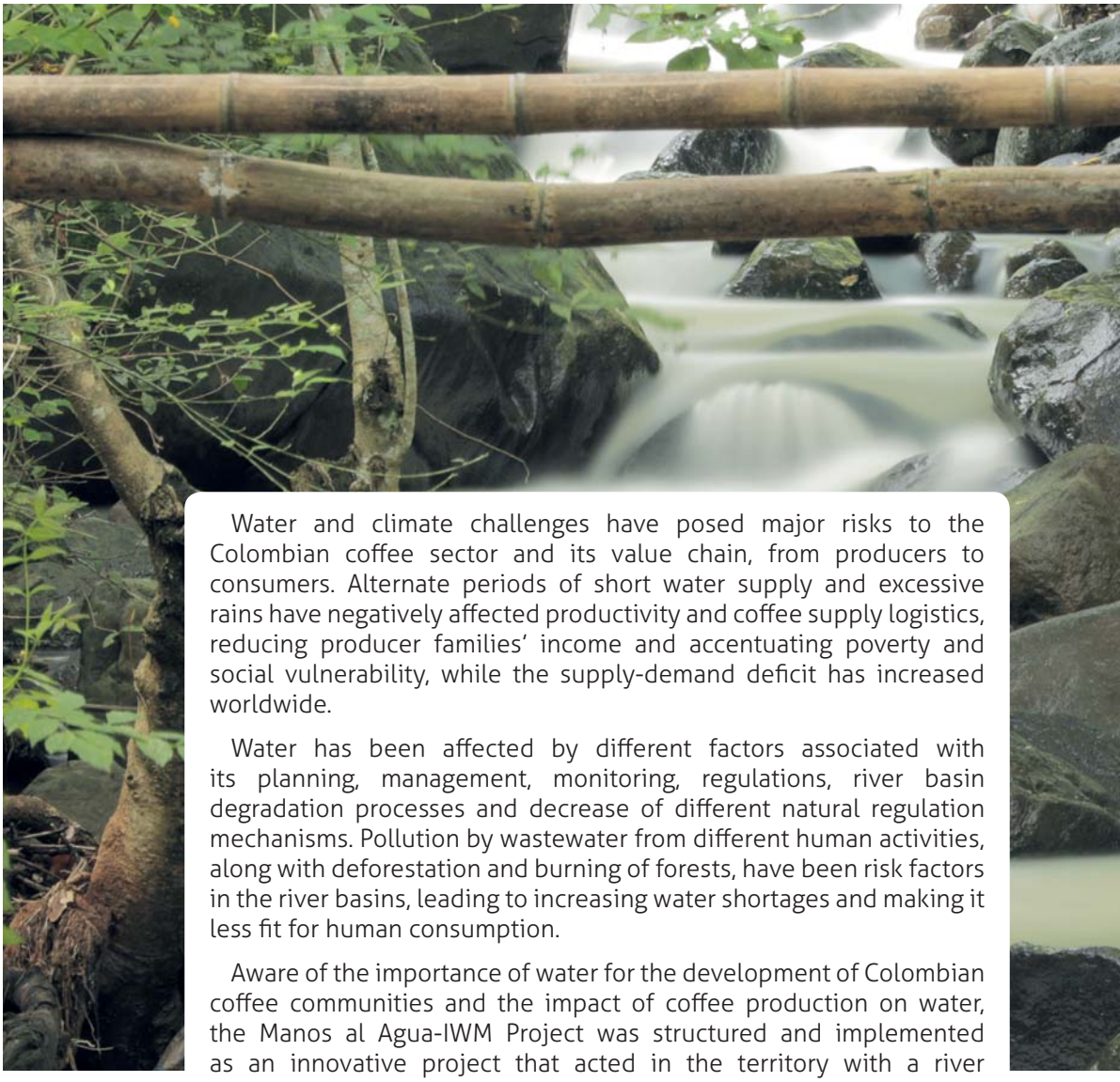
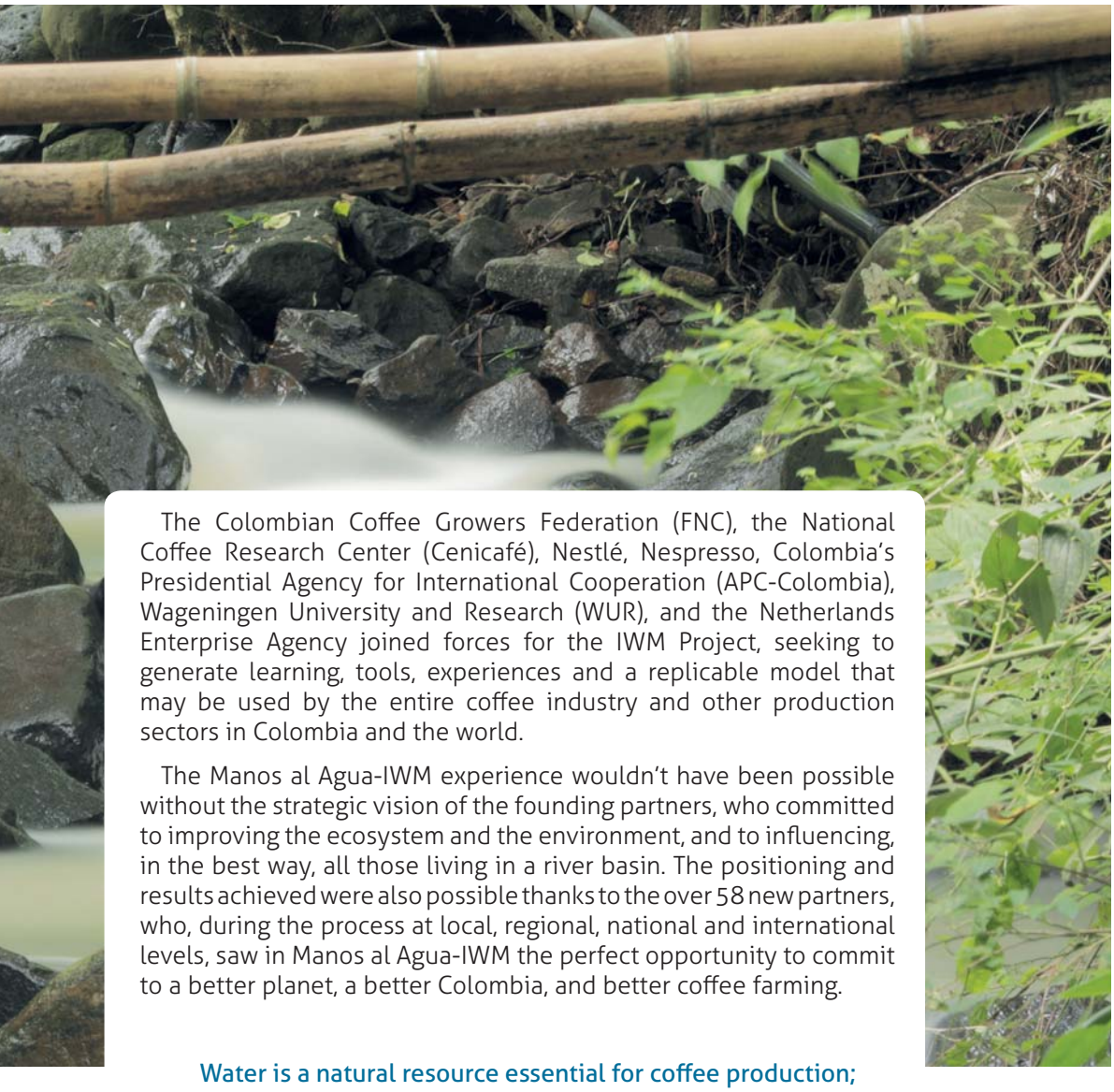
INTRODUCTION



Water and climate challenges have posed major risks to the Colombian coffee sector and its value chain, from producers to consumers. Alternate periods of short water supply and excessive rains have negatively affected productivity and coffee supply logistics, reducing producer families' income and accentuating poverty and social vulnerability, while the supply-demand deficit has increased worldwide.

Water has been affected by different factors associated with its planning, management, monitoring, regulations, river basin degradation processes and decrease of different natural regulation mechanisms. Pollution by wastewater from different human activities, along with deforestation and burning of forests, have been risk factors in the river basins, leading to increasing water shortages and making it less fit for human consumption.

Aware of the importance of water for the development of Colombian coffee communities and the impact of coffee production on water, the Manos al Agua-IWM Project was structured and implemented as an innovative project that acted in the territory with a river basin management approach, seeking to improve water resources management in a sustainable context to support the Colombian coffee industry, provide elements for viability of the coffee business, and contribute to the development and well-being of communities: A five-year multi-stakeholder effort, designed to address significant risks posed by climate change and water-related situations in Colombia.



The Colombian Coffee Growers Federation (FNC), the National Coffee Research Center (Cenicafé), Nestlé, Nespresso, Colombia's Presidential Agency for International Cooperation (APC-Colombia), Wageningen University and Research (WUR), and the Netherlands Enterprise Agency joined forces for the IWM Project, seeking to generate learning, tools, experiences and a replicable model that may be used by the entire coffee industry and other production sectors in Colombia and the world.

The Manos al Agua-IWM experience wouldn't have been possible without the strategic vision of the founding partners, who committed to improving the ecosystem and the environment, and to influencing, in the best way, all those living in a river basin. The positioning and results achieved were also possible thanks to the over 58 new partners, who, during the process at local, regional, national and international levels, saw in Manos al Agua-IWM the perfect opportunity to commit to a better planet, a better Colombia, and better coffee farming.

Water is a natural resource essential for coffee production; producers have been the main users of fresh water and are seriously threatened if water runs out. Colombia's coffee production has suffered from climate variability, but this sector has worked tirelessly, with the support of several institutions.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

PRESENTATION AND ACKNOWLEDGEMENTS

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PRESENTATION

It is an honor to have been part of change management in Colombia and especially of a process so important and transcendental for the country, the Manos al Agua-IWM Project, the largest initiative in the coffee sector to address water problems and climate variability, acting to mitigate negative impacts on our environment. Manos al Agua is an example of how to deal with water imbalance challenges.

None of this would have been possible without the will and commitment of the founding partners, of which we are part (the Netherlands Enterprise Agency, Colombia's Presidential Agency for International Cooperation, Nestlé, Nespresso, Wageningen University and Cenicafé), and of all those who believed in the project and joined this initiative, during the five years of implementation, through the Manos al Agua Platform, working together to establish environmental, social and production conditions to reduce poverty and promote peaceful coexistence and sustainable development in Colombian rural areas.

The project contributed to construction of resilient territories with integrated water resources management, positively impacting nature, landscape and communities. As a pilot, 25 river basins were intervened to generate a model of natural capital preservation and territorial development in Colombia, in the departments of Antioquia, Caldas, Cauca, Valle del Cauca and Nariño.

It is no secret to anyone that climate variability has been affecting Colombia and, for this reason, it is time to act; the moment to change habits is now; the moment to go beyond the environmentalist rhetoric and take action is now!

We are not going to be here to see the consequences of our acts or the lack of them; those who are going to suffer are our children and the children of our children. With Manos al Agua we encouraged a culture in each coffee household, including each family member, to raise awareness about caring for water resources with real water solutions on farms, environmental management and good governance, so that future generations have an environment that is worth living in.

These initiatives would not be truly successful if the experiences and lessons learned were not shared so that future projects are able to generate increasingly positive impacts. For this reason, we have understood the duty to Colombia and the world to share and spread a model that can be replicated in any production sector.

We have prepared 16 publications describing the actions performed in the 24 work plans of the components Water is Everybody's Business, Water for Sustainable Coffee Farming, Strategic Water Ecosystems, and Responsible Water Decisions.

The future exists if we take care of our present, so we all are Manos al Agua!

Roberto Vélez Vallejo
CEO
Colombian Coffee Growers Federation

ACKNOWLEDGEMENTS

Let me express my most sincere thanks to all the team of this important project, Manos al Agua-Intelligent Water Management (IWM), a five-year initiative of hard planning and implementation work by a professional and scientific team, by the management and coordination team, made up of men and women from the Colombian Coffee Growers Federation, Cenicafé, Wageningen University (WUR), Nestlé, Nespresso, the Netherlands Enterprise Agency (RVO), and the Presidential Agency for International Cooperation of Colombia (APC-Colombia), who managed to complete successfully this important process, worthy of being replicated to continue positively impacting coffee regions, not only in our country, but in the world.

On behalf of Colombia's coffee-growing families, our most sincere thanks to all the founding partners and partners, the Project coordination team, rural development promoters responsible for implementation, research assistants, and all the staff of the FNC and Coffee Growers Committees that worked in and supported this great initiative of Manos al Agua.

Rodrigo Calderón Correa

IWM Project Director - National Program Coordinator, Technical Division

Colombian Coffee Growers Federation

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

CONCEPTUALIZATION AND GENERAL GUIDELINES OF MANOS AL AGUA-IWM

3

"For Integrated Water Resources Management to work, communities should not only be involved or engaged in local practices, but also be empowered by them."

Akiko Yamamoto. Regional Technical Advisor for Africa, UNDP. UN Chronicle

This chapter describes aspects that supported structuring of the Manos al Agua-IWM Project, water problems in the sector, the public-private partnership as interaction mechanism, alignment with sustainability and water strategies in different fields, vision and purpose of the Project, the geographical context where it took place, and the structure of the model proposed.

Water problems

"Large human settlements and the poles of industrial, agricultural, livestock and hydro-energetic development in the country have occurred in regions where water supply is less favorable, generating stress on the resource and worrying signs about water availability problems in some municipalities and urban areas, especially during periods of extreme weather, such as dry seasons and those with presence of the warm event in the Pacific (El Niño)." (Colombia's former Ministry of the Environment, Housing and Territorial Development, MAVDT, 2010).

In Colombia, water is a natural resource essential for coffee production; producers are the main users of fresh water and are seriously threatened if water runs out. Drought, heavy rains and erosion cause crop, soil and biodiversity losses. Coffee productivity falls 30% due to water variations. Crop yields decrease and income of producers is uncertain; healthcare, housing and livelihoods have been affected by contaminated water sources and unstable ecosystems. Damages and conflicts in communities have a high economic and social cost. All this shows how Colombia's coffee production is suffering due to climate variability (Figure 1).

Climate variability has affected coffee productivity and quality in Colombia; for example, the La Niña event in 2010-11 was rated as the strongest event in the last 60 years, with rainfall 37% above the historical average. Significant increases in humidity, little sunlight and low temperatures had important consequences on coffee flowering, development of cherries, and growth of trees, causing a 12% drop in production compared to the previous year (Cenicafé, 2011). Heavy rains accelerated soil erosion, with estimated losses of 939,844 production hectares due to floods and landslides in 2011 (DANE-DIMPFE 2012).

On the other hand, this phenomenon was followed by a strong El Niño in 2012, with a serious lack of rain and humidity, causing a 30-40% reduction in annual crop and a fall of up to 40% in rural families' income (Cenicafé, FNC, 2012).

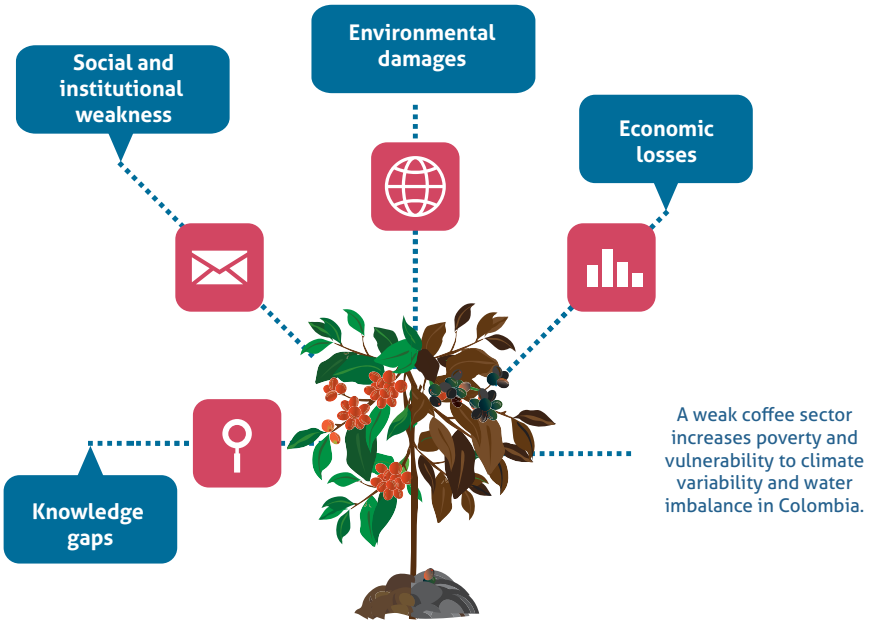


Figure 1. Water problems in the rural coffee sector.

The National Policy for Integrated Water Resources Management in Colombia (MAVDT, 2010) has identified water-related problems and conflicts in Colombia from the point of view of supply, demand, quality, risks and resources management that make initiatives like Manos al Agua-IWM necessary (Figure 2).

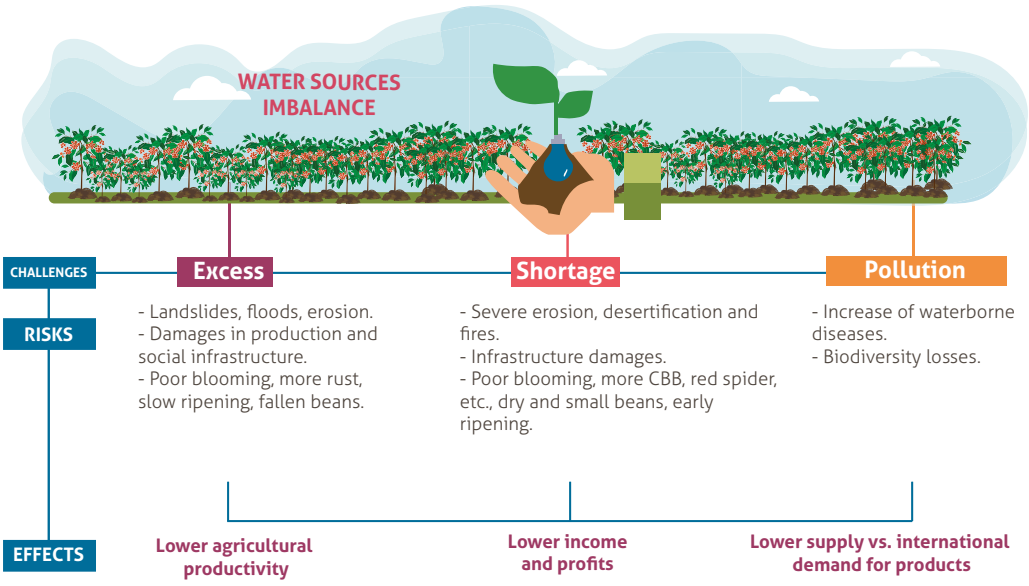
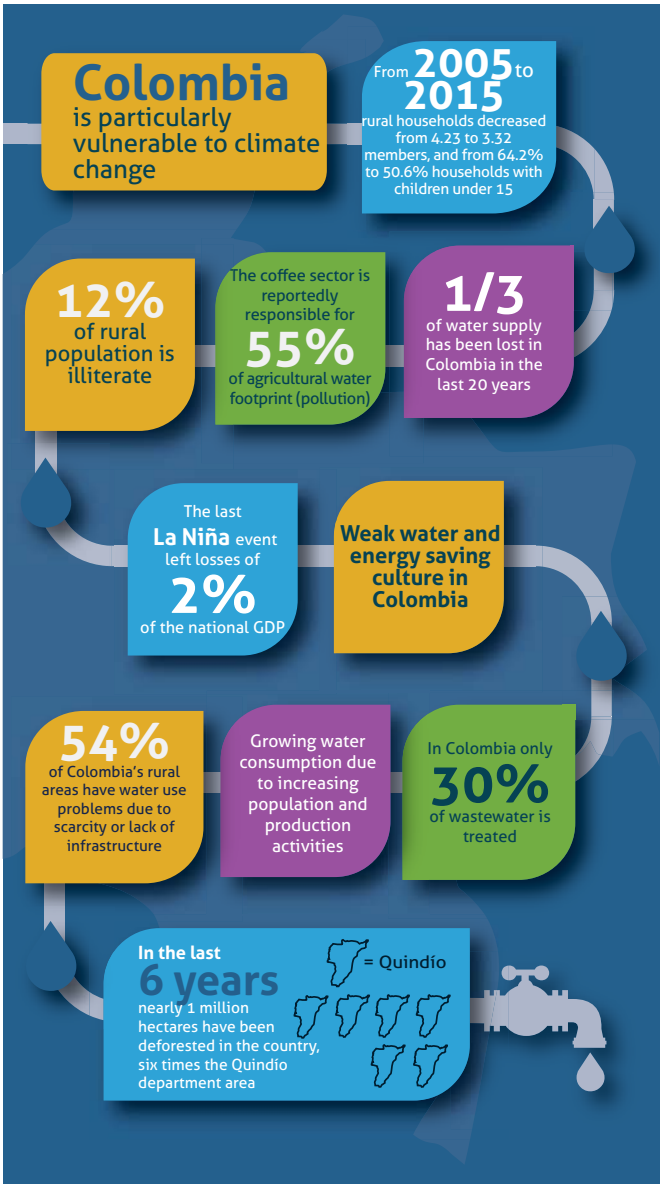


Figure 2. Water challenges - Obstacles to development and poverty reduction.

Coffee growing, harvesting and processing depend on fresh water for good production and ensuring appropriate processing; water quality and quantity influence productivity and bean quality and, therefore, coffee quality in the cup. Recent studies have shown that environmental management levels are lower, particularly in postharvest and domestic wastewater management. Most smallholder farmers use low-technology systems that are very inefficient, using over 20 L of water per kilogram of dry parchment coffee (dpc). They also lack water treatment systems, discharging coffee wastewaters directly to soil and water sources (Cenicafé, 2011). These issues were recurrent in the areas where the Manos al Agua-IWM Project was implemented, according to a diagnosis made in 2013-2014.



Background of Colombian coffee institutions towards water resources management

Since 1927, efforts of the Colombian coffee institutions have aimed not only at strengthening the productive apparatus of coffee farming, but also at fostering sustainability of the sector and improving quality of life and well-being of the country's coffee-farming families.

The creation of Cenicafé (1938) and of the Extension Service (1959) became milestones as institutional services to support production, coffee farming development and strengthening of the coffee sector in Colombia (Figure 3).

In pursuit of integrated development of coffee regions, the FNC has, since 1980, incorporated into its planning and implementation activities research on water solution technologies at farm level, development of varieties resistant to rust, the Coffee Information System (SICA), and the river basin concept and its management as a geographical unit.

Commitment to sustainable development has been an integrated part of the FNC value proposition to coffee-growing families and communities since 2000, with the Sustainability that Matters policy and promotion and positioning of origin and sustainable specialty coffee. The decade beginning in 2000 is when the FNC started to work with strategic partners, such as Nestlé and Nespresso, to support sustainability, quality and productivity in the coffee value chain.

Since 2010, work for climate-adaptable coffee farming with a quality and sustainable production approach paved the way to consolidation of Colombian coffee, produced in an ecofriendly way and focusing on adaptation to climate variability.

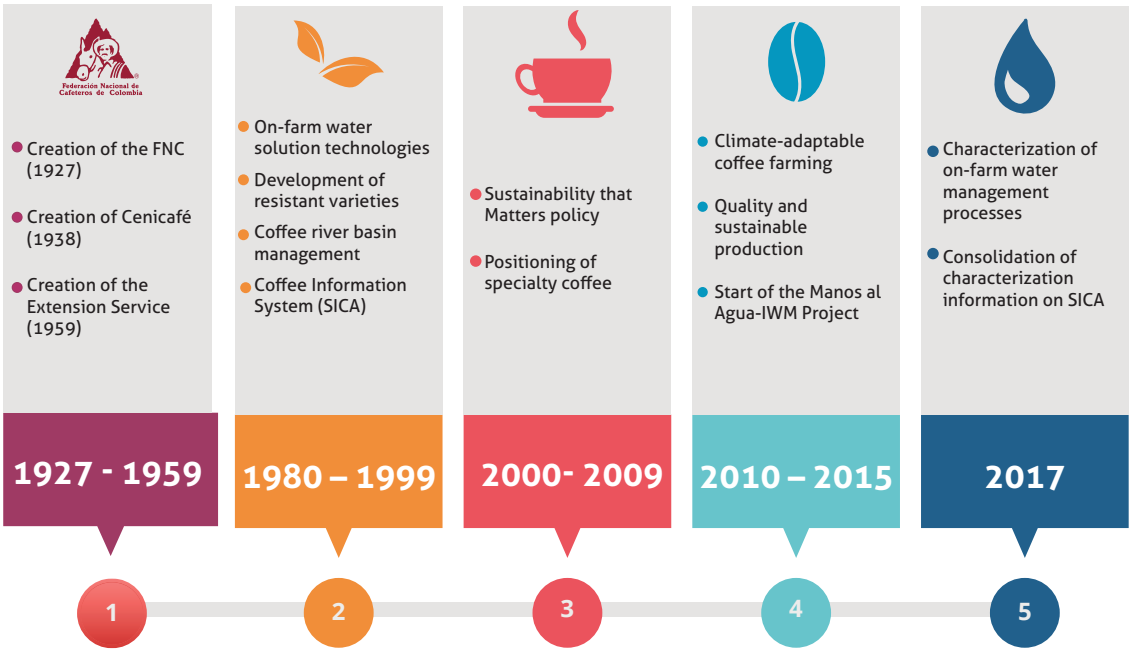


Figure 3. Important milestones of coffee institutions towards water resources management.

Year 2013 was important because the FNC proposed the public-private partnership **Manos al Agua-IWM**, an important milestone in the Colombian coffee sector that catalyzed collective efforts through an integrated process, promoting a new work approach in the rural sector.

Since 2017, Manos al Agua generated a legacy where tools, procedures and knowledge achieved have laid the foundation for a strategic intervention model focused on environmental issues. Characterization of on-farm water management processes and consolidation of this information on the SICA will determine positive impacts, both on water saving and pollution management in coffee river basins across the country, further positioning the sector as a leader in work for sustainable rural development.

Awareness, the moment to act. The Colombian coffee sector has recognized the importance of water for the future and well-being of the rural population, and that's why this initiative plotted a roadmap to action around integrated water resource management in the territories, the river basins. The FNC and its partners had the resources, knowledge and systems to implement effective solutions and lay the foundation for a better future. Communities and institutions committed themselves, the government sector provided support and took measures, the members of the public-private partnership (PPP) Manos al Agua-IWM invested, and coffee growers decided to take action, a coffee mandate.

> ***"To ensure sustainability of water resources through efficient and effective water management and use, articulated with management and use of the territory and conservation of ecosystems that regulate water supply, considering water as a factor of economic development and social well-being, and implementing equal and inclusive participation processes."***
>
> ***(Former Ministry of the Environment, Housing and Territorial Development, MAVDT, 2010).***

The Manos al Agua-IWM Public-Private Partnership (PPP)

Since July 1, 2013 the Colombian Coffee Growers Federation (FNC) and the National Coffee Research Center (Cenicafé), partnering with Nestlé, Nespresso, Colombia's Presidential Agency for International Cooperation (APC-Colombia), Wageningen University and Research (WUR), and the Netherlands Enterprise Agency started the activities established as part of the Manos al Agua-Intelligent Water Management (IWM) Project. The strategy developed a methodological process to improve environmental performance on coffee farms and in river basins, implementing water management plans according to local needs and circumstances.

The Manos al Agua-IWM PPP was a great instrument for cooperation between public institutions and private companies, aimed at developing this process through a strategic cooperation agreement. The PPP founding partners provided financing for the Project implementation, each playing their role with the seriousness and commitment that a work of this size requires. The PPP was based on cooperation agreements, years of joint experience and common interests, generating a replicable model for other regions and sectors to adopt new strategies that promote sustainable development and peaceful coexistence around river basins in Colombia.

The Project was crucial to achieving the objectives and commitments of all the founding partners, who sought to create a strategy around intelligent water management in Colombia.

Public partners

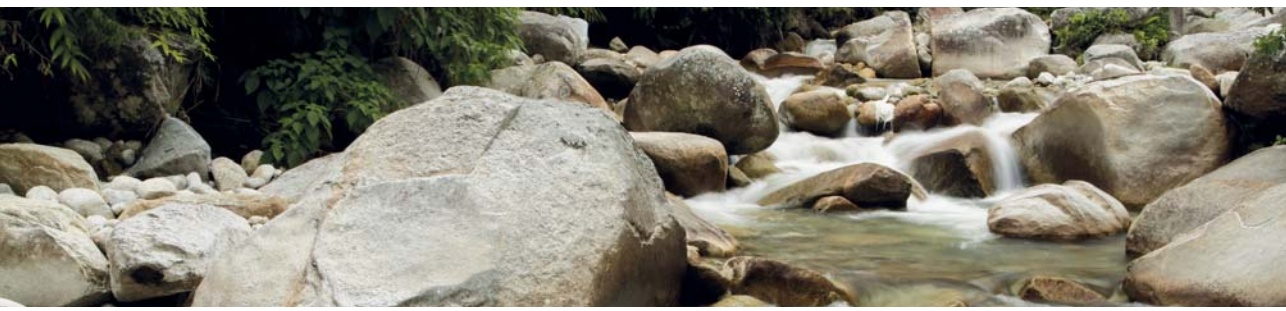
1. To promote community participation and good governance.
2. To develop public policies and actions for water management, anticipating climate change.
3. Financial investment in rural development and protection of the environment.

Private partners

1. Experience in programs to improve the coffee supply chain.
2. Project management and implementation capacity.
3. Financial investment for sustainability of the sector.
4. To ensure business cases for farmers with development of coffee markets.

Knowledge (academia & science)

1. Technology and knowledge transfer.
2. Knowledge generation.
3. Development and implementation of learning networks.



Towards Integrated Water Resources Management (IWRM)

In Colombia, coffee goes beyond being the main agricultural product: it is the basis for the rural economy and social fabric in the Andean region. But coffee is intrinsically linked to water both for its cultivation and processing, coffee farmers being the most important water users in mountain areas. Increasing uncertainty about water availability due to climate variability and negative impacts of coffee production on water quality put water conditions at the center of attention.

> ***"Integrated water resources management in Colombian coffee farming refers to conservation and rational use of the precious liquid in the coffee regions and comprises surface water and groundwater management, involving quantitative, qualitative and ecological aspects and incorporating sustainable practices for efficient water use and water pollution prevention and control, as well as water-related risk management through integrated pest and soil management, minimizing water pollution due to agrochemicals and pesticides and soil fertility losses by action of rains."***
>
> ***(Cenicafé, 2011)***

Manos al Agua-IWM arose as an initiative to promote and lead an Integrated Water Resource Management model in the coffee sector. Critical success factors for implementing the project approach were: organized farmers, the FNC's implementation capacity and institutional leadership, and participation of the private sector (Nestlé and Nespresso), of the Colombian and Dutch governments, and of science (with the involvement of Cenicafé and WUR).

Manos al Agua-Intelligent Water Management (IWM)

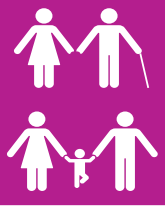
Vision. By 2018, the Manos al Agua coffee departments have achieved an integrated river basin management model that is scalable, sustainable and replicable, with evident positive impacts on production, social, environmental and good governance dimensions in coffee regions, with the ability to transcend to other sectors.

Purpose. Manos al Agua sought to enable and improve systems for intersectoral cooperation, sustainable coffee farming, environmental protection, and decision-making in order to help deal with water imbalance challenges in the coffee sector and its value chain, establishing environmental, social and production conditions for: alleviating poverty, improving rural welfare, contributing to peace, and achieving sustainable development in Colombian rural areas.

Manos al Agua-IWM in figures

Manos al Agua-IWM alignment with sustainability and water strategies

Manos al Agua-IWM, as an innovative model, was aligned with Colombia's National Policy for Integrated Water Resources Management, the sustainability and water strategies of each of the founding partners, and the main international sustainability initiatives, such as the Global Climate Agreement (COP21) and the UN Sustainable Development Goals (SDGs), with the FNC acting as integrator and leader of the partnership.

Goal	Target	Type of alignment	IWM alignment with SDGs
1 NO POVERTY End poverty in all its forms everywhere 	By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.	Total alignment	Access to basic services, natural resources and appropriate new technology.
	By 2030, build resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.	Total alignment	General goal, all components of the Project.
2 ZERO HUNGER End hunger, achieve food security and improved nutrition and promote sustainable agriculture 	By 2030, double agricultural productivity and income of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers through secure and equal access to land, other production resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment, among others.	Partial alignment	Increase productivity of women and family farmers through secure and equal access to knowledge and opportunities for value addition.
	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters, and that progressively improve land and soil quality.	Total alignment	General goal, all components of the Project.
	By 2020, maintain genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from utilization of genetic resources and associated traditional knowledge, as internationally agreed on.	Partial alignment	Maintain genetic diversity of seeds and cultivated plants through soundly managed and diversified seed and plant banks at national and regional levels.
	Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural production capacity in developing countries, in particular least developed countries.	Total alignment	Increase investment, including through international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant gene banks.

Goal	Target	Type of alignment	IWM alignment with SDGs
3 QUALITY EDUCATION **Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all**	By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.	Partial alignment	Increase the number of youth and adults who have technical skills.
	By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including through education for sustainable development and sustainable lifestyles, human rights, gender equity, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development, among others.	Total alignment	Learners acquire the knowledge and skills needed to promote sustainable development through education for sustainable development and lifestyles, human rights and gender equity.
4 GENDER EQUITY **Achieve gender equity and empower all women and girls**	End all forms of discrimination against all women and girls everywhere.	Total alignment	Reduce forms of discrimination against women.
	Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life.	Total alignment	Women's participation with equal opportunities for leadership at decision-making levels in political, economic and public life.
5 CLEAN WATER AND SANITATION **Ensure availability and sustainable management of water and sanitation for all**	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	Total alignment	Improve water quality throughout the production process, based on river basin management.
	By 2030, substantially increase water use efficiency across all sectors and ensure sustainable abstraction and supply of fresh water to address water scarcity and substantially reduce the number of people suffering from water scarcity.	Total alignment	Increase efficient use of water resources.

Goal	Target	Type of alignment	IWM alignment with SDGs
5 CLEAN WATER AND SANITATION **Ensure availability and sustainable management of water and sanitation for all**	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation, as appropriate.	Total alignment	Implement integrated water resources management.
	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.	Total alignment	Protect and restore ecosystems in the river basins.
	By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, and recycling and reuse technologies.	Total alignment	Expand international cooperation to build capacities in activities and programs related to water and sanitation.
	Support and strengthen participation of local communities in improving water and sanitation management.	Total alignment	Community participation in leading improved water and sanitation management.
6 DECENT WORK AND ECONOMIC GROWTH **Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**	Improve progressively, by 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programs on sustainable consumption and production, with developed countries taking the lead.	Total alignment	Endeavor to decouple economic growth from environmental degradation.
	Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular migrant women and those in precarious employment.	Total alignment	Protect labor rights and promote safe working environments.
7 REDUCED INEQUALITIES **Reduce inequality within and among countries**	By 2030, empower and promote social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.	Total alignment	**Promote inclusion while respecting ethnic, social or religious diversity or other status.**

Goal	Target	Type of alignment	IWM alignment with SDGs
8 SUSTAINABLE CITIES AND COMMUNITIES **Make cities and human settlements inclusive, safe, resilient and sustainable**	Support positive economic, social and environmental links between urban, per-urban and rural areas by strengthening national and regional development planning.	Total alignment	Support creation of partnerships to strengthen national and regional development planning on water resources.
	By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation of and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.	Total alignment	Protect and restore ecosystems in the river basins.
9 RESPONSIBLE CONSUMPTION AND PRODUCTION **Ensure sustainable consumption and production patterns**	By 2030, achieve sustainable management and efficient use of natural resources.	Total alignment	General goal, all components of the project.
	By 2020, achieve environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.	Partial alignment	Environmentally sound management of chemicals and wastes to minimize adverse impacts on the environment.
	By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	Total alignment	Participation in policy-making spaces to reduce waste and to reuse.
	By 2030, ensure that people everywhere have relevant information and awareness for sustainable development and lifestyles in harmony with nature.	Total alignment	Training and generation of knowledge and information for participants.
10 CLIMATE ACTION **Take urgent action to combat climate change and its impacts**	Strengthen resilience and capacity of adaptation to climate-related hazards and natural disasters in all countries.	Total alignment	Resilience and capacity of adaptation to climate-related risks.
	Integrate climate change measures into national policies, strategies and planning.	Total alignment	Take part in policy-making spaces to contribute to adopting climate change measures.
	Improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.	Total alignment	Training, awareness raising and local capacity building.

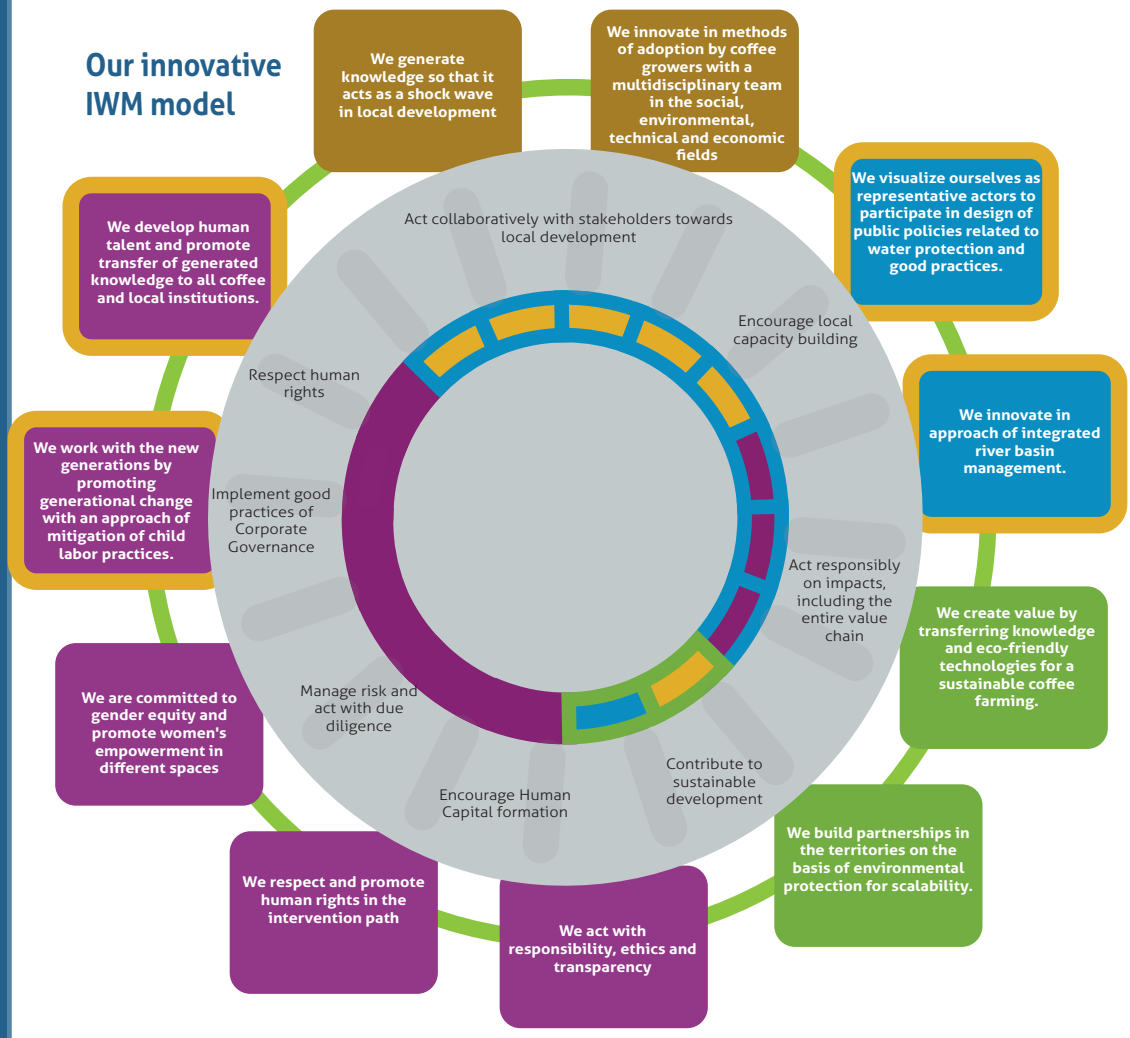
Goal	Target	Type of alignment	IWM alignment with SDGs
10 CLIMATE ACTION **Take urgent action to combat climate change and its impacts**	Promote mechanisms to increase capacity for effective climate change-related planning and management in least developed countries and small insular developing States, including focusing on women, youth and local and marginalized communities.	Total alignment	Mechanisms to increase capacity, focused in particular on women, youth and local communities.
11 LIFE ON LAND **Protect and promote sustainable use of terrestrial ecosystems, combat desertification, halt and reverse land degradation and halt biodiversity loss**	By 2020, ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.	Total alignment	Ensure conservation, restoration and sustainable use of water resources and protection of ecosystems.
	By 2020, promote sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.	Total alignment	Reforestation in river basins with native species.
	By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.	Total alignment	Bioengineering plan to recover degraded soil.
	By 2030, ensure conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.	Total alignment	Conservation of mountain ecosystems in river basins, starting with water resources.
	By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.	Total alignment	Integrate environmental services.
	Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.	Total alignment	Increase financial resources leveraged on public-private partnerships for water conservation.
	Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to promote such management, in particular for conservation and reforestation.	Total alignment	Mobilize resources to finance forest management and agroforestry incentives.

Goal	Target	Type of alignment	IWM alignment with SDGs
12 PARTNERSHIPS FOR THE GOALS **Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development**	Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.	Partial alignment	Triangular international cooperation with knowledge sharing through technology facilitation mechanism.
	Promote development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favorable terms, including on concessional and preferential terms, as mutually agreed.	Partial alignment	Environmentally sound technologies, and transfer and dissemination.
	Enhance international support for implementing effective and targeted capacity building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation.	Partial alignment	International support for effective and targeted capacity building through cooperation.
	Enhance policy coherence for sustainable development.	Total alignment	Participation in public policy-making spaces for policy coherence.
	Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.	Total alignment	Participation in public, public-private and civil society spheres to create synergies.

SUSTAINABILITY PRINCIPLES AND THEIR ALIGNMENT

"Sustainability requires direct action to conserve, protect and enhance natural resources."

FAO. Principle 2, Building a common vision for sustainable food and agriculture.



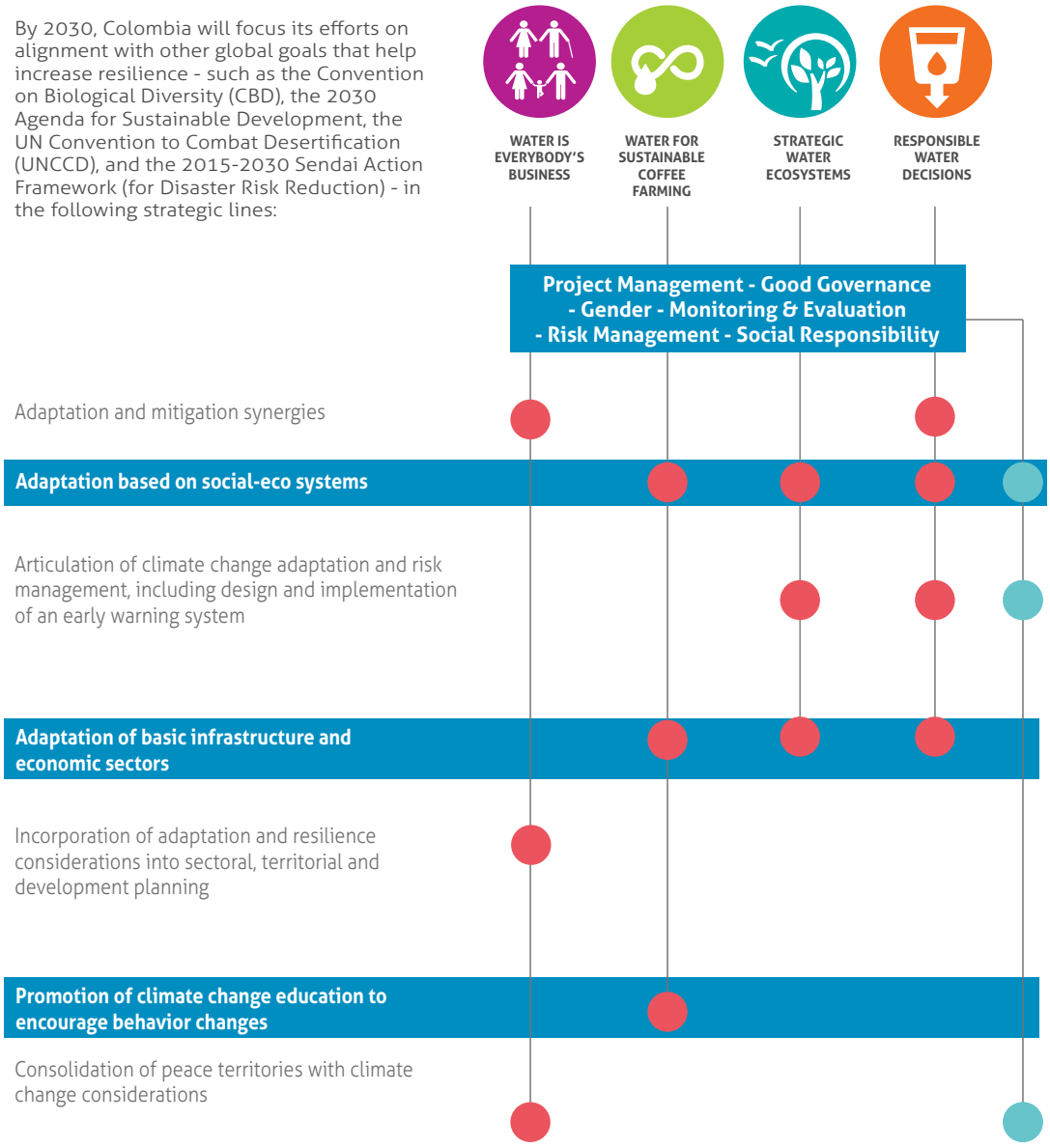
ICSR-OECD PRINCIPLES

- Our employees, human rights, and environmental compliance
- Water
- Rural development
- Environmental sustainability

ALIGNMENT WITH COLOMBIA'S COMMITMENTS TO THE PARIS AGREEMENTS

Model of IWM alignment with Colombia's commitments

By 2030, Colombia will focus its efforts on alignment with other global goals that help increase resilience - such as the Convention on Biological Diversity (CBD), the 2030 Agenda for Sustainable Development, the UN Convention to Combat Desertification (UNCCD), and the 2015-2030 Sendai Action Framework (for Disaster Risk Reduction) - in the following strategic lines:



Taken from: The ABC of Colombia's commitments to COP21, document prepared by ©Fundación Natura ©Ministry of the Environment and Sustainable Development © WWF-Colombia

ALIGNMENT WITH KEY ISSUES OF ISO26000

Approach to all relevant actors in the territory, development of skills in coffee-growing families, integration of children and youth for generational change, technology transfer, production and economic processes at farm level, social investment in skills for other fields (gender, leadership, participation, empowerment)

CSR policy and governance framework

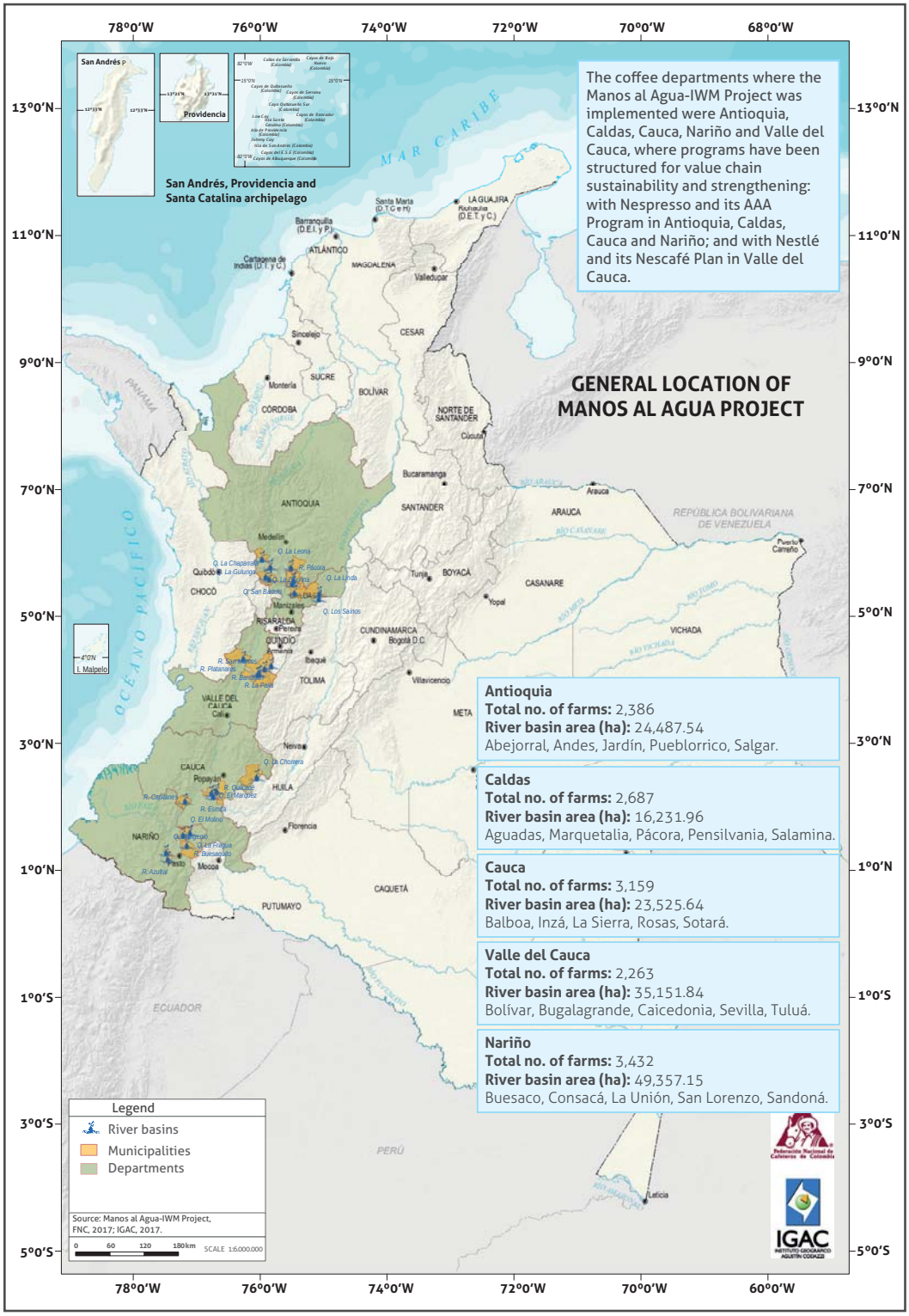
Sustainable and clean production management, promotion and awareness raising, among actors in general, of coffee marketing with a long-term view

Due diligence, risk management, code of ethics and handling of requests, complaints and claims according

Code of ethics, approach of value chain commitments, alignment with OECD CSR principles, work with coffee-growing families for fair production and marketing

Human resource management complying with regulations, maintaining active communication channels, with health and safety prevention and care processes, focused on human development of project staff

Territory vision through integrated water resources management, pollution-reducing technology transfer, and sustainable use of resources for climate change mitigation and adaptation, with environmental protection and restoration actions in the coffee sector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3°0'S
5°0'S
San Andrés
Providencia
San Andrés, Providencia and Santa Catalina archipelago
The coffee departments where the Manos al Agua-IWM Project was implemented were Antioquia, Caldas, Cauca, Nariño and Valle del Cauca, where programs have been structured for value chain sustainability and strengthening: with Nespresso and its AAA Program in Antioquia, Caldas, Cauca and Nariño; and with Nestlé and its Nescafé Plan in Valle del Cauca.
GENERAL LOCATION OF MANOS AL AGUA PROJECT
MAR CARIBE
OCÉANO PACÍFICO
PANAMA
ECUADOR
PERÚ
REPÚBLICA BOLIVARIANA DE VENEZUELA
Barranquilla (D.E.I. y P.)
Santa Marta (D.T.C e H)
LA GUAJIRA
Riohacha (D.E.T y C.)
Cartagena de Indias (D.T. y C.)
Valledupar
Sincelejo
Montería
Cúcuta
Bucaramanga
Arauca
Puerto Carreño
Medellín
Quibdó
Tunja
Yopal
Manizales
Pereira
Armenia
Ibagué
Villavicencio
Cali
Neiva
Popayán
Florencia
Pasto
Mocoa
Leticia
ATLÁNTICO
MAGDALENA
CESAR
SUCRE
BOLÍVAR
CÓRDOBA
NORTE DE SANTANDER
SANTANDER
ARAUCA
BOYACÁ
CASANARE
CHOCÓ
RISARALDA
QUINDÍO
CUNDINAMARCA
VICHADA
TOLIMA
META
VALLE DEL CAUCA
CAUCA
HUILA
NARIÑO
CAQUETÁ
PUTUMAYO
Q. La Leona
Q. La Chapanga
Q. La Guluriga
R. Pácora
Q. La Linda
Q. San Bárbara
Q. Los Sainos
R. Supía
R. Platanares
R. La Paila
Q. La Chonera
R. Quilcace
R. Esmita
Q. El Molino
Q. Las Piragua
R. Azufral
Antioquia
Total no. of farms: 2,386
River basin area (ha): 24,487.54
Abejorral, Andes, Jardín, Pueblorrico, Salgar.
Caldas
Total no. of farms: 2,687
River basin area (ha): 16,231.96
Aguadas, Marquetalia, Pácora, Pensilvania, Salamina.
Cauca
Total no. of farms: 3,159
River basin area (ha): 23,525.64
Balboa, Inzá, La Sierra, Rosas, Sotará.
Valle del Cauca
Total no. of farms: 2,263
River basin area (ha): 35,151.84
Bolívar, Bugalagrande, Caicedonia, Sevilla, Tuluá.
Nariño
Total no. of farms: 3,432
River basin area (ha): 49,357.15
Buesaco, Consacá, La Unión, San Lorenzo, Sandoná.
Legend
River basins
Municipalities
Departments
Source: Manos al Agua-IWM Project, FNC, 2017; IGAC, 2017.
0 60 120 180km
SCALE 1:6.000.000
IGAC

95% of the participating coffee-farming population were smallholder producers, with less than 3 hectares of land and coffee crops of 1.5 hectares on average (Table 1), whose farms are managed by the family members and whose livelihood is coffee production. In general, educational and economic levels have been low. In addition, 80% of producers were +50 years old, confirming an urgent need to strengthen work with young people, who embody generational change of coffee growers.

Table 1. Consolidated information on producers, farms and intervention areas.

Department	Municipality	River basin	No. of IWM producers	Total number of farms	River basin area (ha)	Total area of farms (ha)	Coffee area (ha)
Antioquia	**Abejorral**	Q. La Liborina	477	484	9,001.42	2,614.13	769.49
	Andes	Q. La Chaparrala	688	698	6,399.46	2,363.37	1,412.07
	Jardín	Q. San Bartolo	301	305	1,921.65	783.27	487.71
	Pueblorrico	Q. La Leona	308	313	2,403.96	836.30	387.03
	Salgar	Q. La Gulunga	540	586	4,761.04	2,882.81	1,398.78
			2,314	**2,386**	**24,487.54**	**9,479.88**	**4,455.08**
Caldas	**Aguadas**	Q. Edén-Bareño	458	535	3,064.40	1,641.09	829.40
	Marquetalia	Q. Los Saínos	514	613	2,233.81	1,418.01	747.89
	Pácora	Pácora River	396	523	3,457.63	2,018.75	1,261.74
	Pensilvania	Q. La Linda	429	508	2,328.18	1,148.23	582.09
	Salamina	Q. La Frisolera	428	508	5,147.95	1,611.12	724.91
			2.225	**2,687**	**16,231.96**	**7,837.20**	**4,146.03**
Cauca	**Balboa**	Capitanes River	724	964	7,806.38	1,776.18	827.80
	Inzá	Q. La Chorrera	268	336	2,111.78	518.87	235.93
	La Sierra	Esmita River	468	686	5,456.14	770.11	360.49
	Rosas	Q. Marquez	559	701	5,559.35	922.08	408.63
	Sotará	Quilcacé River	359	472	2,591.98	945.71	396.26
		2,378	**3,159**	**23,525.64**	**4,932.95**	**2,229.11**	**2.229,11**

Continuation ->

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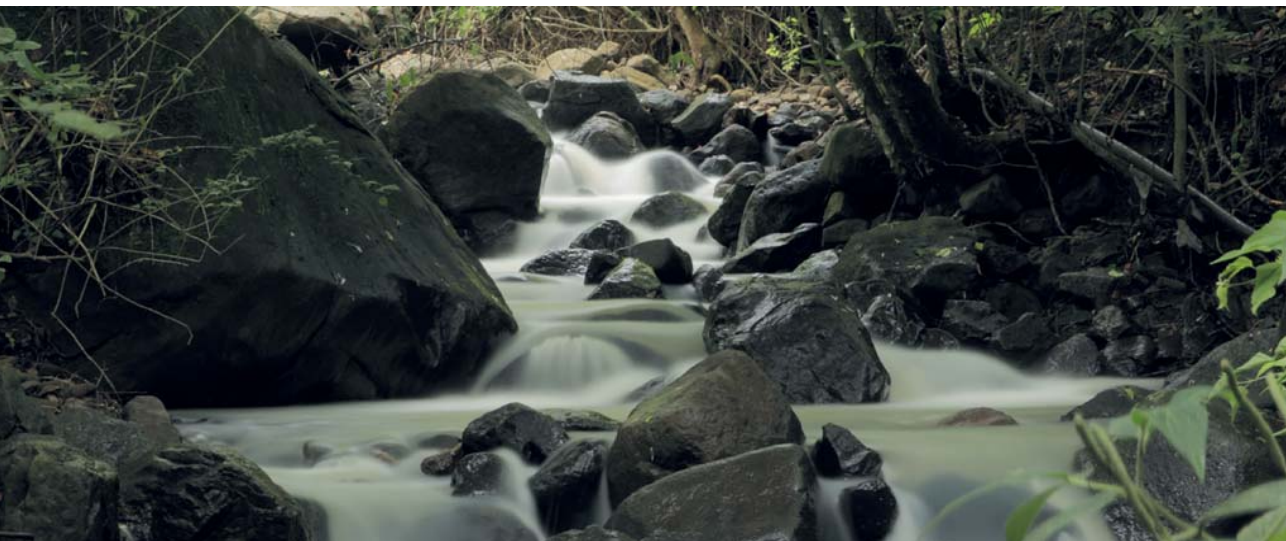
Continuation ->

Table 1. Consolidated information on producers, farms and intervention areas.

Nariño	**Buesaco**	Buesaquito River	483	617	23,899.30	1,620.85	836.41
	Consacá	Azufral River	408	443	4,149.39	1,111.27	591.33
	La Unión	Q. La Fragua	651	904	5,684.39	1,227.46	919.46
	San Lorenzo	Q. El Molino	499	530	9,819.65	722.24	483.36
	Sandoná	Q. El Ingenio	497	938	5,804.42	881.97	670.19
		2,538	**3,432**	**49,357.15**	**5,563.79**	**3,500.75**	**3.500,75**
Valle del Cauca	**Bolívar**	Platanares River	264	292	3,996.24	1,609.12	645.41
	Bugalagrande	Bugalagrande River	200	209	5,529.08	1,150.35	419.49
		La Paila River	467	476		2,150.78	980.09
	Caicedonia	Barragán River	308	314	6,020.07	3,660.47	1,444.82
	Sevilla	Barragán River	95	101	7,000.57	455.34	185.33
		San Marcos River	492	497		2,500.07	1,369.12
	Tuluá	Bugalagrande River	350	374	12,605.88	1,984.03	919.07
		2,176	**2,263**	**35,151.84**	**13,510.16**	**5,963.33**	**5.963,33**
	25 municipalities	**25 river basins**	**11,631**	**13,927**	**148,754.13**	**41,323.98**	**20,294.30**

The direct influence area in the 25 river basins where the activities were developed was 148,754 hectares. Populations in regions adjacent to the river basins were benefited by the project activities with better water quality.

All coffee producers with an influence on the river basins had the opportunity to participate in the Project activities, regardless of their size and capacity, according to selection criteria defined objectively.



Manos al Agua-IWM Project structure

The Project integrated key variables that influenced protection and conservation of water resources in the coffee-producing areas to contribute to sustainable rural development.

Four basic components and a management component (Project management, Good governance, Monitoring and evaluation, Risk management, Social responsibility, and Gender) supported the implementation process in the different regions involved in this great initiative (Figure 4).

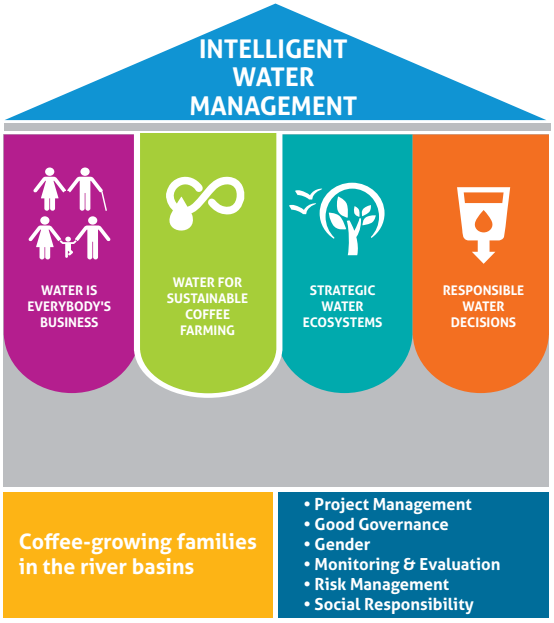


Figure 4. Manos al Agua-IWM components.

Water is Everybody's Business. Articulation of different stakeholders to build dialogue, participation, communication and cooperation spaces at local, national and international levels, in order to generate "Water Governance" mechanisms and strengthen community participation with a territory and landscape management approach.

Water for Sustainable Coffee Farming. Development of systems for sustainable coffee production at farm level through training and technology transfer, with water solutions and good practices; adoption of continuous improvement plans that responded to coffee growers' needs and their production potential.

Strategic Water Ecosystems. Ecosystems where coffee farming takes place protect the production environment and are vulnerable to impacts of bad practices of producers and communities. It was essential to address the environment to protect water resources and promote tools that encourage their protection.

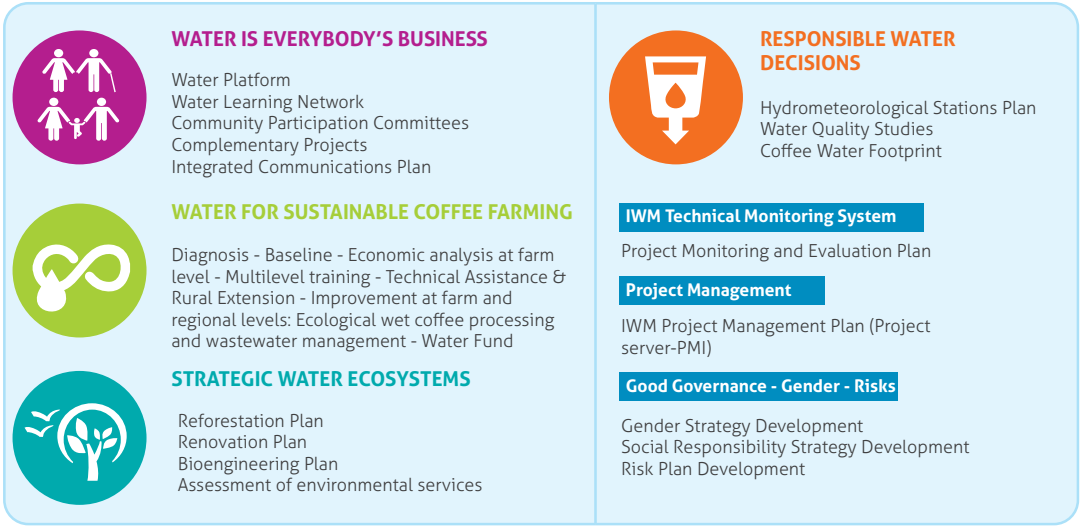
Responsible Water Decisions. Guidance on making of decisions related to climate impact on coffee farming and reasonable use of natural resources to mitigate impacts caused by coffee production.

Project Management, Good Governance, Risk Management, Gender and Social Responsibility. With an approach of best practices of Project management and implementation, risk monitoring, and monitoring and evaluation, the activities were addressed in an integrated way at farm and regional levels. Good Governance and Social Responsibility guided IWM key elements to be appropriated by all stakeholders to achieve the expected results and benefits in a sustainable, ethical and responsible way.

For the IWM strategy in the five implementation years, 24 work plans were defined: 19 work plans in the four main components and five work plans in the component of Project management, Good Governance and Social Responsibility.

The Project was structured in this way to promote knowledge for managing the territory (the river basin), seeking to generate actions at farm and regional levels towards integrated water resources management, considering different interventions based on social, cultural, economic, political and environmental reality of the territory.

The aim of Manos al Agua-IWM is to be a replicable model for coffee river basin management, in order to achieve joint and committed actions by families and communities that inhabit them.



"The traditional fragmented approach is no longer viable and a more holistic approach to water management is essential."

United Nations, Department of Economic and Social Affairs

Summary

This chapter described all the conceptual aspects and guidelines that supported the Manos al Agua-IWM Project proposal, the problems faced, the pubic-private partnership as articulation mechanism, the IWM alignment with sustainability and water strategies in different spheres, the geographical implementation context, and the Project structure that operated during the five years.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

INTEGRATED MANAGEMENT OF COFFEE RIVER BASINS

4

"Water for everybody, but not for everything ... To optimize this natural resource and avoid waste will be the only solution to meet needs in 2030."

José Luis Gallego, environmental communication expert

This chapter presents the coffee river basin as a system, the criteria for selection and delimitation of river basins defined in Manos al Agua-IWM, and the region management strategy with an integrated management approach used in the intervention model during the five years of the Project.

Coffee river basins

River basins have similar geographical, physical and biological features that make them work as ecosystems; therefore, they must be considered as basic units for planning and implementation of practices of conservation, management, use and promotion of renewable natural resources, considering the ecosystem balance (Inderena, 1995); this makes it necessary to do diagnosis and design restoration plans to keep them within stable conditions.

Colombia's coffee region comprises a system of mountains and landscapes with very diverse vegetation, where hundreds of rivers are born, move and connect, which are favorable to coffee production and relations of all factors, generating social stability and economic development.

The river basin as territorial space is defined as a water system delimited by the dividing line of waters that flow to a main river and continue their course to a larger water body, forming the water system of a large basin. The river basin space enables interaction between topography and what exists on the ground, deep soil layers and the environment of the dividing line of waters.

Work in coffee river basins must integrate knowledge, understanding of territory and its environmental conformation with social aspects to generate a culture around the region and its constitutive elements, with an equitable and solidary management, collective awareness and respect for differences.

Positive impacts on a coffee river basin must start with work farm by farm, supported by awareness raising, training and multidisciplinary technical continued support to achieve consciousness of the importance of collective work, jointly with the community, for equitable management and distribution of resources based on integrated water resources management.

The coffee-growing families living in a river basin have similar interests, cultural elements and customs. Understanding their territory and generating principles and individual and collective values are fundamental aspects for families and communities in these natural regions to implement actions that become good habits to be passed on to the next generations.

This aspect is very important for coffee river basins and water resources to be considered as connecting elements of environmental, social, economic and good governance work.

Natural resources management in coffee river basins is an essential part of the local development driver and should encourage participation and integration of the community, articulation and relationships of stakeholders, and creation of local mechanisms that revitalize regional activities in social, economic, political, and good governance terms.

The coffee river basin as a system

The river basin itself is a system because of the relations and interrelations of its elements, and because it has water resource inputs and outputs. Social, environmental and technical-economic relations were fundamental to define interventions in the 25 river basin systems (Manuel Mejia Foundation, 2016).

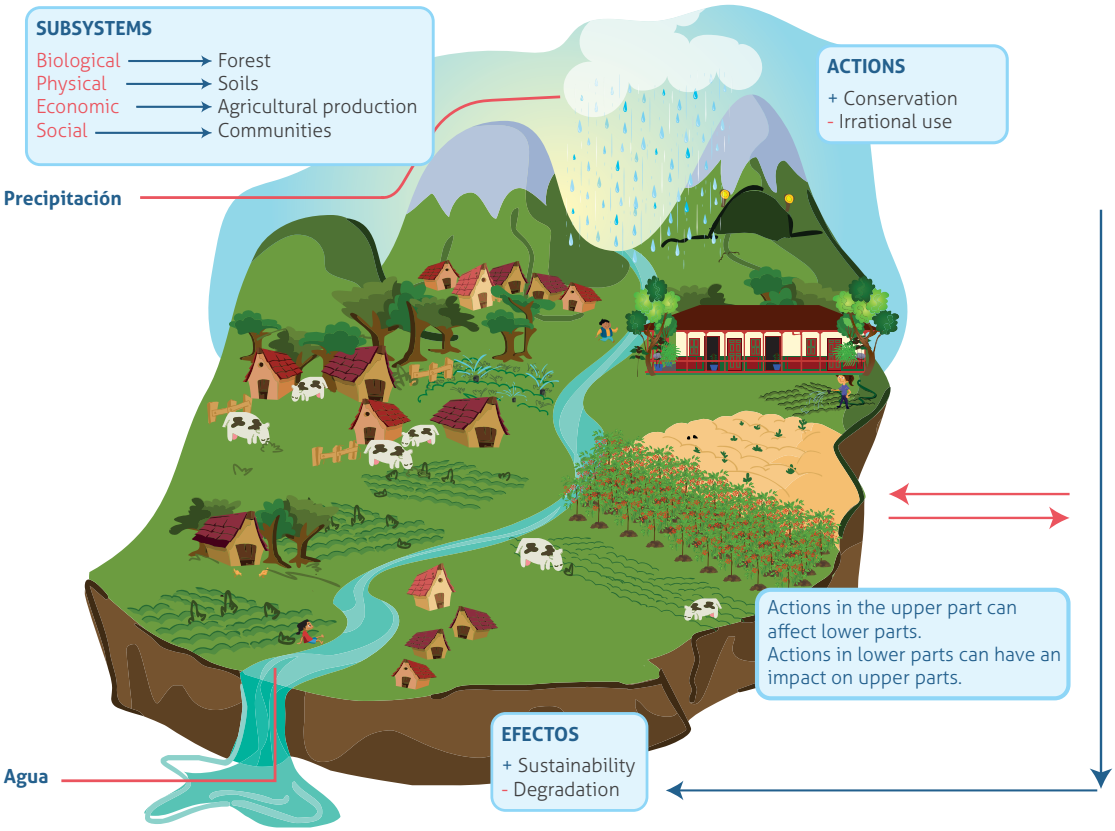


Figure 5. The river basin as a system.

Social element

Set of cultural values, traditions and beliefs of the populations settled were essential as a mechanism to involve communities living in the intervention area and define how human activities impact the environment.

Biophysical component

Environmental supply in the intervention area of the river basins, with specific characteristics of climate, land use, forests, hydrographic network and geological components, among others; they were key elements to plan work at farm and regional levels.

Technical-economic component

It provides options for exploitation or transformation of resources in the coffee river basins, with the possibility of using these resources to produce goods and services through human and technical activities.

Coffee river basin zones

Zone where most of the water sources are born. Fragile zone for water conservation. Actions such as deforestation affect quantity and quality of water required downstream (middle and lower basin) for natural and human processes, being the middle and lower basins the recipients of products and consequences of upper basin management.

Zone where most of the water sources are born. Fragile zone for water conservation. Actions such as deforestation affect quantity and quality of water required downstream (middle and lower basin) for natural and human processes, being the middle and lower basins the recipients of products and consequences of upper basin management.

It depends on good middle basin management. High stress on the middle basin can significantly affect natural resources and inhabitants of the lower basin. We cannot forget that river basins are interconnected, and practices therein also have consequences downstream, on the receiving or storing water bodies.

Criteria for selection of coffee river basins in Manos al Agua-IWM

The 25 IWM coffee river basins are environmentally relevant for water protection; they were chosen for their location and coffee zone characteristics that allow comparison and validation of models. They are important for stability of supply chains of the PPP partners, which led to increased commercial opportunities for regional coffee.

To ensure validation of the model, integrated management effectiveness and water resources protection, the 25 river basins were chosen based on inclusion and priority criteria. Inclusion criteria were *sine qua non* conditions for participation, and priority criteria were applied to the general group selected (Table 2) to define specific intervention areas and participants of concrete actions.

Table 2. Criteria for selection of river basins.		
Function	**Inclusion**	**Priority**
Criteria	• Areas dedicated to coffee production. • Areas participating in the Nespresso AAA or Nescafé Plan programs. • Existence of marketing opportunities. • Alignment with local environmental plans. • Commitment to participating in Project activities and to complying with code of conduct.	• Socio-economic needs. • Potential impact expanded. • Greater environmental importance. • Synergies with other initiatives. • Potential market access. • High potential for use of resources between public and private partners. • Advanced experience and leadership in river basin planning and management. • Organization in the coffee area.

Criteria for delimitation of coffee river basins in Manos al Agua-IWM

Criteria for delimitation of coffee river basins selected for the Project were defined by the following steps:

1. Selection of main river. The main river in each area selected for the project was identified, along with the hydrographic network (tributaries) making up the river basin to be intervened.

2. Delimitation of areas. The digital elevation models (DEM) of the territory, the main river and the hydrographic network of the IWM areas were used as input information. With the Hydrology tool of ArcGIS 10.2 for Desktop, the edge of the river basin was delineated.

3. Adjustment according to farms selected. The delimited areas were adjusted according to the project beneficiary farms (selected by the Coffee Growers Committees), structuring the final areas.

4. Delimitation by coincidence with departmental or municipal limits of the territory (by political-administrative division).

Region management strategy - Integrated river basin management approach

The IWM Project was designed to impact regions, starting with work on the farms in an integrated way. Landscape and territory management was at the heart of the strategy.

Integrated management of river basins, where water was the integration and management element, enabled the coordination of several sectors and activities in the territories defined for intervention. The Project strengthened resilience and productivity of regions, applying adaptive management, involving stakeholders, and meeting multiple objectives on a landscape scale.

The IWM Project promoted integrated river basin management with direct on-farm actions, seeking to mitigate environmental impacts of agricultural and management processes (which led to proper environmental management), with a strategic role of water resources (quantity and quality), promoting knowledge and biodiversity management, implementation of best agricultural practices, and work with the community to build local capacity (Figure 6).

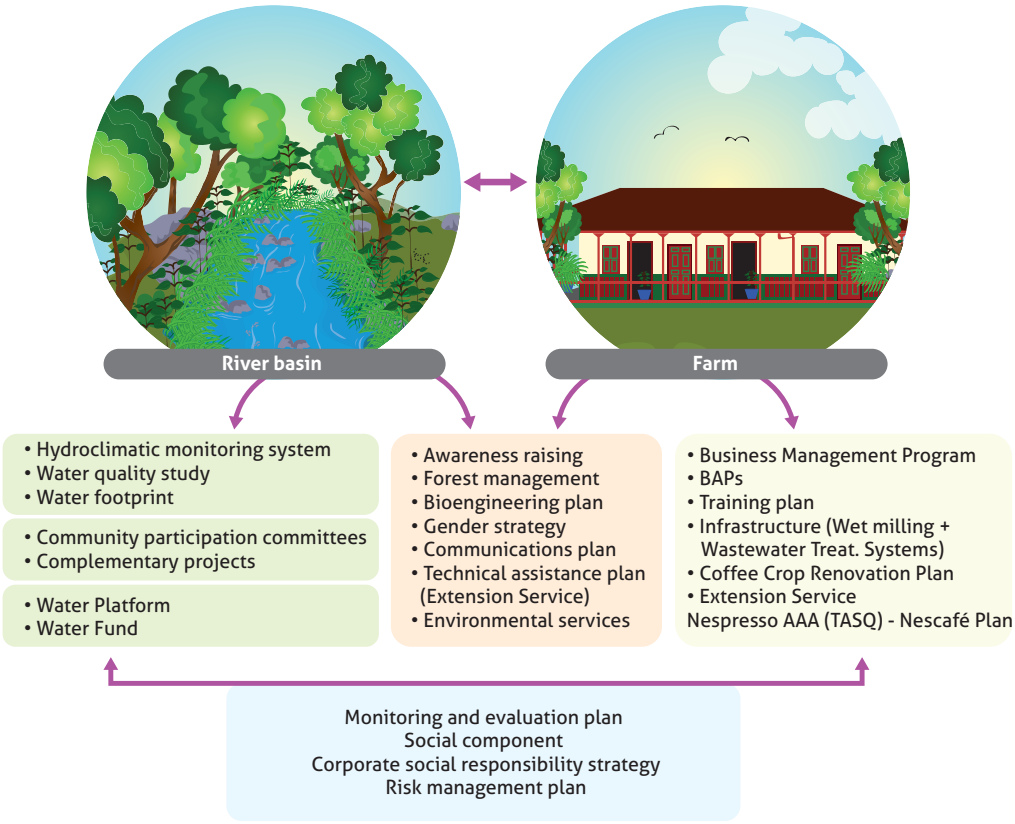


Figure 6. Strategy and elements for integrated river basin management approach.

The Project aimed at improved and efficient water resources management, to ensure not only water quantity but also quality, and generating tools and strategies to foresee risk factors and thus anticipate and mitigate their impact.

Manos al Agua-IWM, a river basin intervention model that supports strengthening of the large Magdalena and Cauca river basins

Summary

This chapter described the concept of coffee river basin as a system, the criteria defined for selection and delimitation of river basins, and the region management strategy with an integrated river basin management approach under the Project.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

MANOS AL AGUA-IWM INTERVENTION MODEL PHASES

5

MANOS AL AGUA-IWM INTERVENTION MODEL PHASES

Integrated river basin management has contributed to sustainable development and enabled better planning, management and organization of elements of the system, the river basin.

This chapter shows the four phases defined and applied in the Manos al Agua-IWM process (with a five-year Project lifecycle): river basin management planning phase, operational capacity building phase, implementation phase, and closing phase (Figure 7).

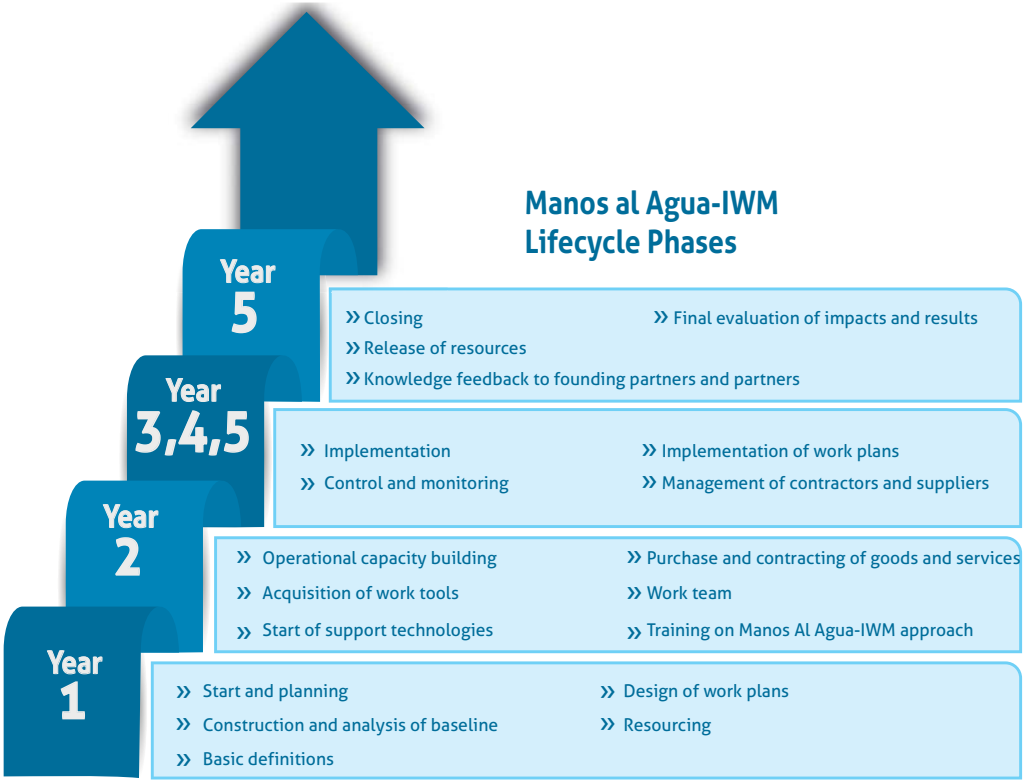


Figure 7. Phases in Manos al Agua-IWM lifecycle.

River basin management planning phase

Planning was essential to success of the Project, dedicating 20% of its total duration to this activity (Year 1). Proper and effective implementation of the IWM Project was based on knowledge, methods and best project management practices recognized worldwide by the Project Management Institute.

Planning was relevant to organize activities in each coffee river basin, seeking a positive impact on the system and its communities with sustainable actions. A clear approach and achievable objectives and goals aimed at solving water-related problems and at economic and social development of the regions.

Different aspects considered in the planning process are described in Figure 8.

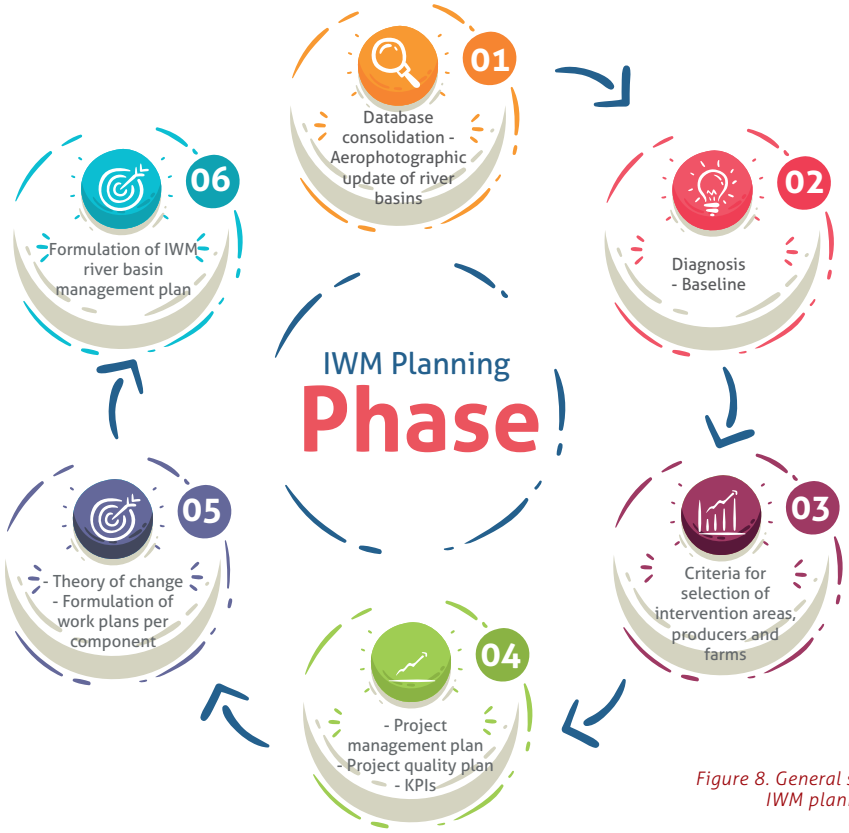


Figure 8. General steps of the IWM planning phase.

Database (information on coffee farms and producers)

The Coffee information System (SIC@) is part of the FNC's data infrastructure and the main strategic information source for design, formulation and monitoring of Colombian coffee farming competitiveness and sustainability policies.

This system is permanently updated by the FNC Extension Service through web technology and is queried online for analysis and decision-making. It is a dynamic and geo-referenced database of national coverage, accessed via the Internet to update, query, analyze, model and view geospatial data of basic information about coffee producers, farms and lots in the country. This institutional tool was the information base for the Manos al Agua-IWM Project, used to structure guidelines to ensure delimitation of river basins and location of farms in relation to water bodies.

Aerophotographic update

A total of 80,296 hectares of river basins were updated to facilitate spatial analysis, locate coffee farms, and delimit the territory and hydrographic network (main river and its tributaries), defining intervention areas that were close to water bodies.

Based on the SIC@ and spatial delimitation of river basins, technical information on the region and the participating farms was consolidated. Systematization of information used methods of geo-referencing and analysis of biophysical and socio-economic data, and complementary databases were organized (Figure 9).

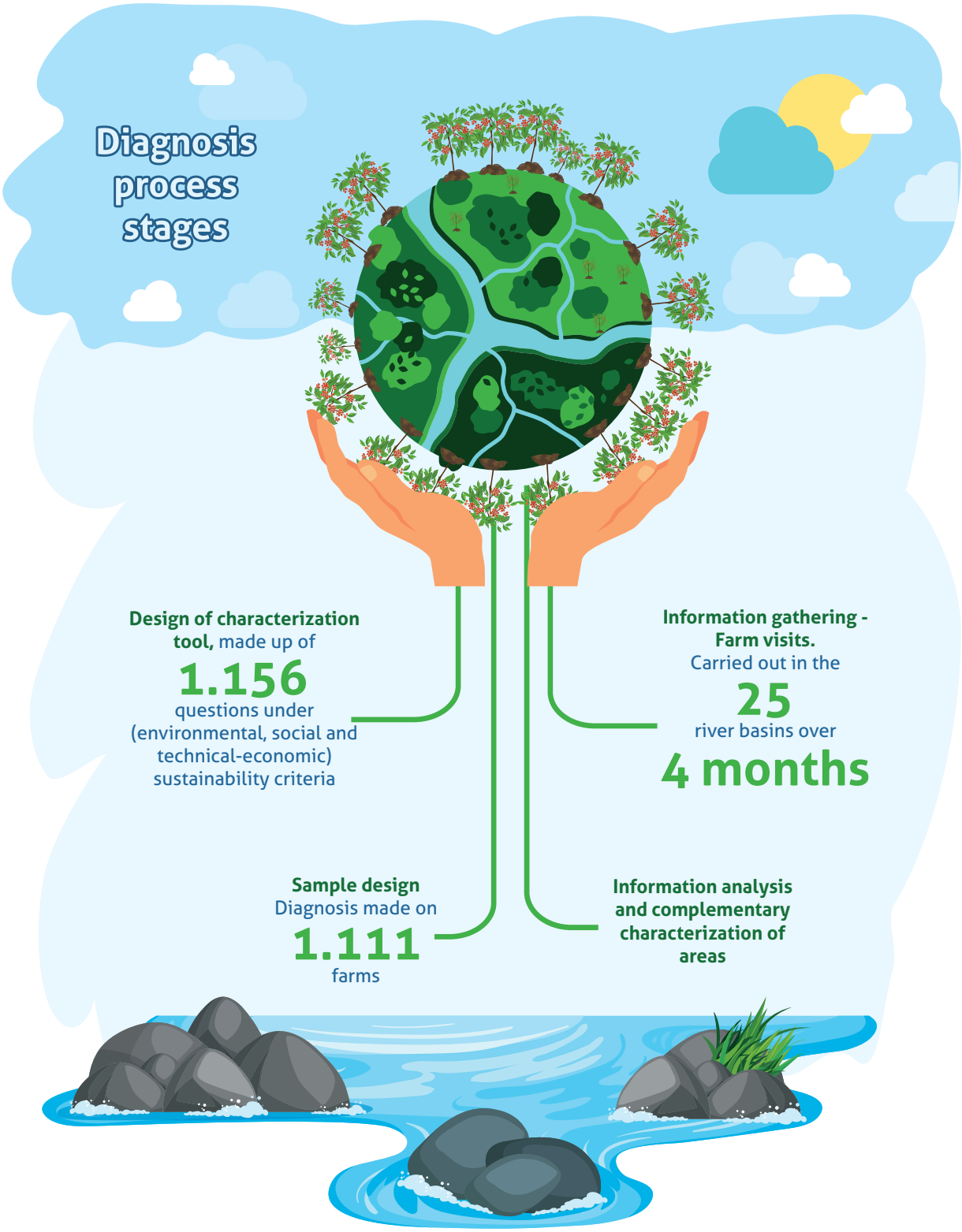
Figure 9. Color orthophotomosaic (pixel size = 0.15 m), in Caicedonia, Valle del Cauca. LiDAR Profile.

Diagnosis process

In the first planning year, the sustainability diagnosis in the river basins was made based on a sample design. This process was carried out under coordination of the Cenicafé Project Management Unit and Soils, Plant Science and Post-harvest Disciplines.

The diagnosis aimed to provide the information required to establish and support planning, structuring of work plans, and follow-up, control and monitoring mechanisms to achieve results during the implementation years. Diagnosis provided the Project with aggregate, timely, and reliable information that enabled efficient management and decision-making processes for structuring the implementation elements.

a. Diagnosis & characterization process stages



b. b. Complementary characterization of areas

This information is specifically related to water quality, soil and forest conditions, and hydroclimatic monitoring needs in the river basins, gathered by a team of research assistants and auxiliaries hired and under the supervision of Cenicafé. It was additional support for the proposed work plans.

The work methodology led to the following information in each of the 25 river basins (Figure 10):

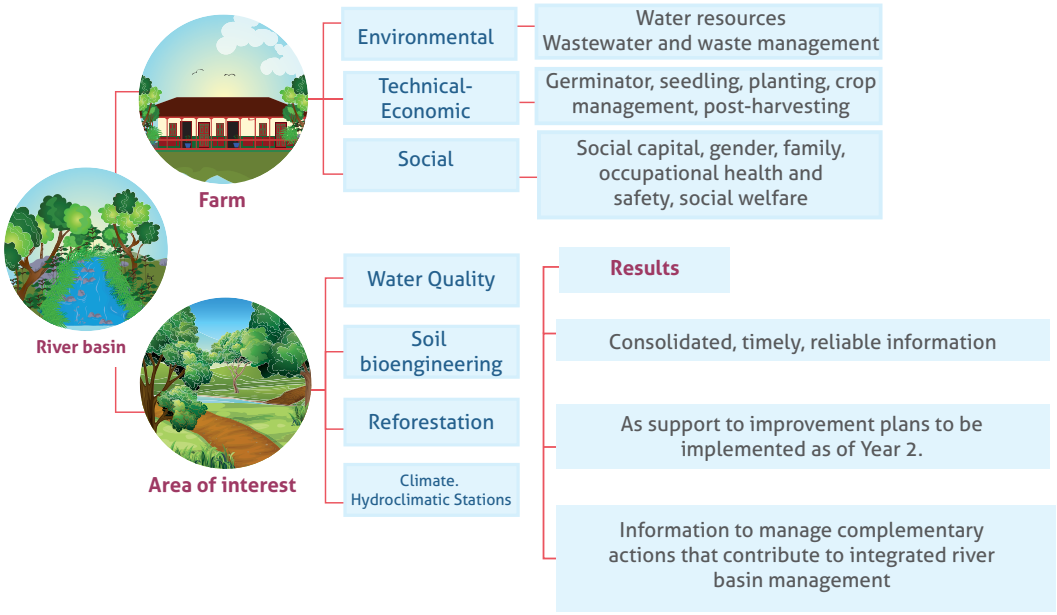
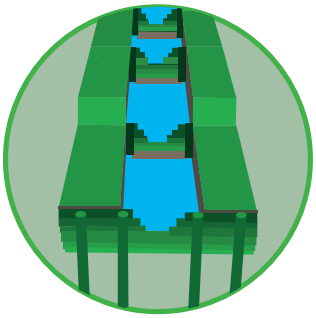
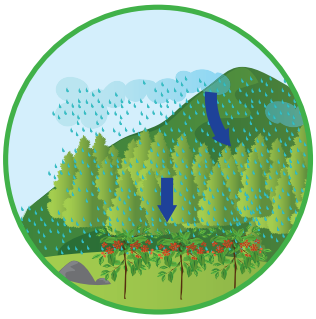


Figure 10. Description of the Manos al Agua-IWM diagnosis.



b.1 Soil conservation for bioengineering works

» Analysis of remote sensors.
» Diagnosis on soil use, management and conservation practices at farm level.
» Inventory of mass movements and erosion processes.
» Characterization of mass movements.

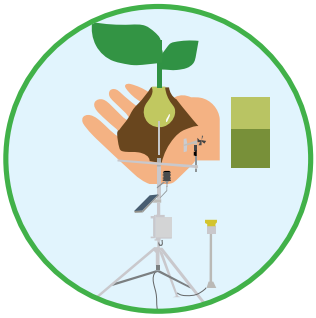


b.2 Water quality

» Identification of water bodies to be evaluated.
» Criteria for selection of water bodies to assess quality before and during the IWM Project implementation.
» Criteria for selection of sampling points.
» Field recognition of sampling points.

b.3 Forest management

» State of vegetation cover in and around the river basins.
» Ecological restoration implementation proposal, tailored to needs and conditions of the area.
» Selection of forest species to be planted (descriptive statistics, and frequency analysis and histograms).



b.4 Hydroclimatic stations plan

» Selection of farms and places for installation of the 25 Automatic Weather Stations (AWS) in the river basins selected (one per each).

The baseline of the most relevant biophysical aspects of the 25 river basins used different secondary information from technical studies and territorial planning tools of public-private entities such as the Agustín Codazzi Geographic Institute (IGAC), Cenicafé, the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM), Autonomous Regional Corporations (environmental authorities), and municipal administrations, among other institutions. From a practical perspective, an overview of conditions of the environment and natural resources in the river basins was obtained based on description of geographic, biotic and abiotic aspects.

c. Products of complementary characterization of areas

- Soil conservation and forest management diagnoses.
- Water quality diagnosis.
- Diagnosis to define places for installation of hydroclimatic stations.
- Target trees.
- Support information for intervention plans.
- Support information for measuring key performance indicators (KPIs).

d. Importance of the diagnosis and characterization process

- It was the planning basis in Year 1 of the IWM Project.
- It provided basic information to measure impacts with the monitoring and evaluation plan.
- The information gathered served to propose complementary projects, for influencing regional policies and for environmental planning at regional level.

Overview of diagnosis results

The diagnosis of farms and complementary zones provided necessary and supporting information on conditions of the river basins for expert teams to structure work plans to be implemented from Year 2 on. For integrated water resources management, problems such as high water consumption on farms for post-harvesting, low water saving and inefficient use, and poor coffee and domestic wastewater management were identified.

The most relevant results of diagnosis of river basins are shown in Figures 11 to 14 and Table 3.

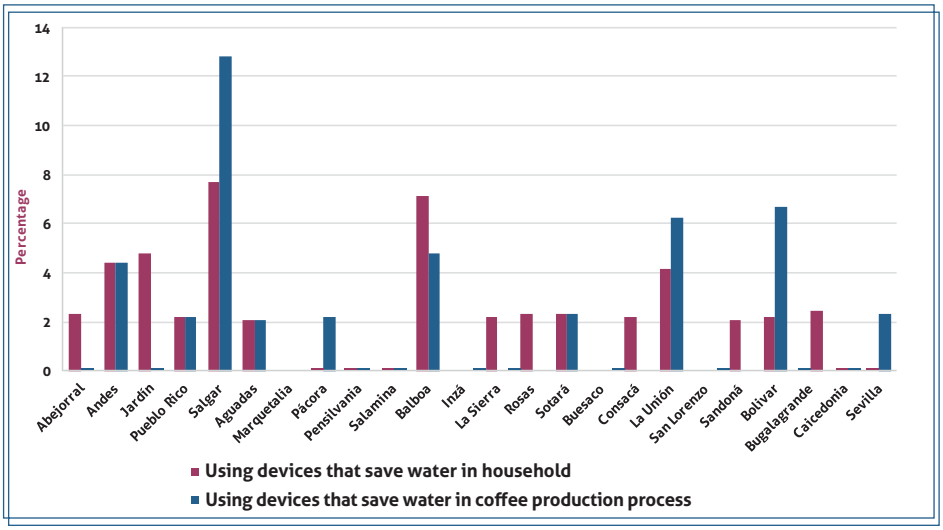


Figure 11. Percentage of farms in river basins that use water-saving devices in both household and coffee production.

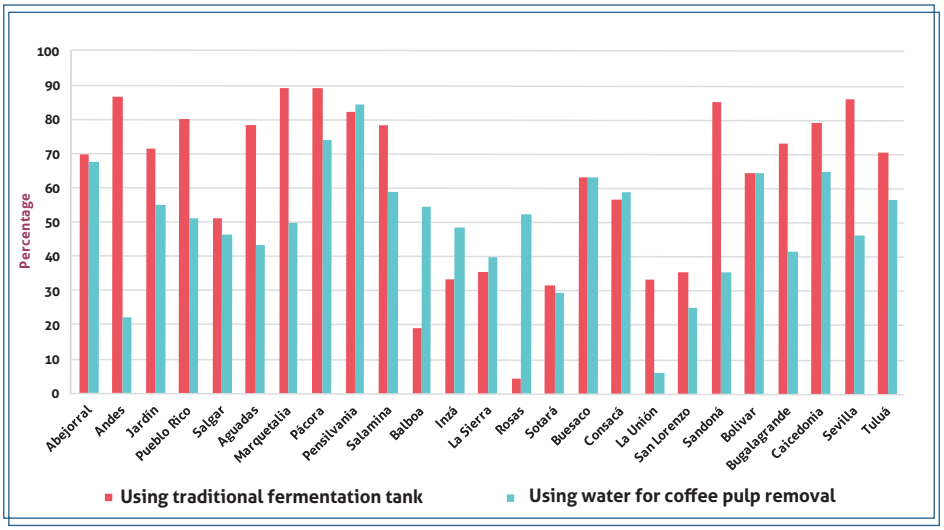


Figure 12. Percentage of farms in river basins that use traditional fermentation tank and water for coffee pulp removal (with high water consumption).

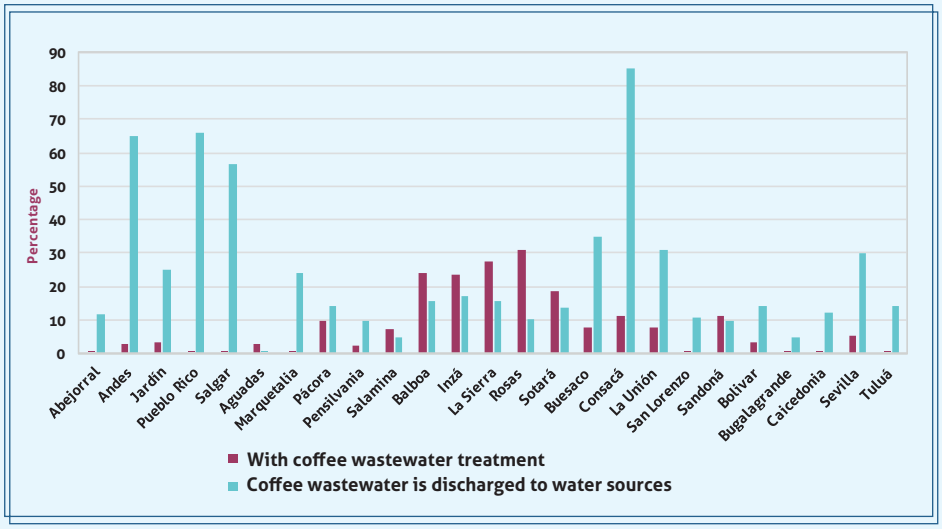


Figure 13. Percentage of farms in river basins with coffee wastewater treatment or discharging it to water sources.

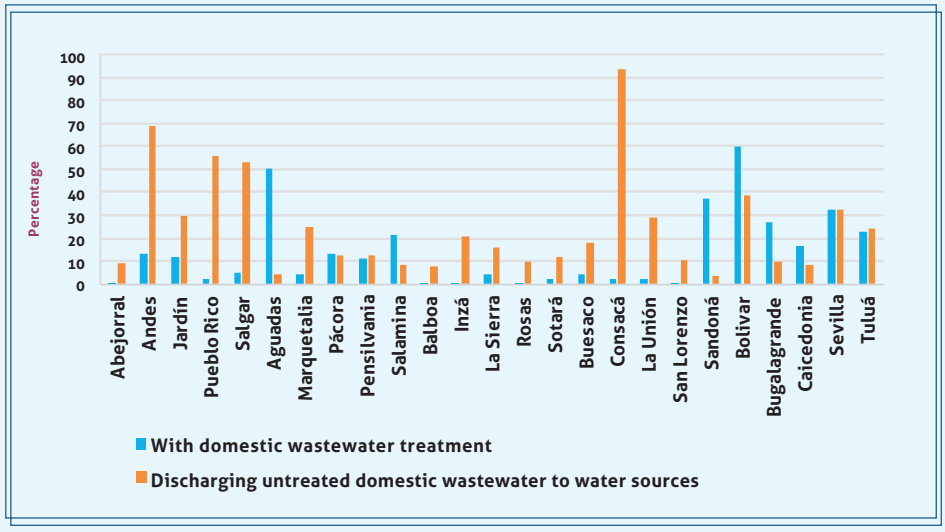


Figure 14. Percentage of farms in the river basins treating domestic wastewater or discharging untreated wastewater to water sources.

Table 3. General situation of farms and river basins identified in diagnosis (list of needs and aspects to be improved).

Categories	Needs	
Record keeping on the farm	- Low level of record keeping on the farm. - Records are not systematically and fully kept. - Cost information is not reliable.	**17%** of respondents keep some type of cost/income records on the farm. Only 9.4% keep full records.
Development of skills - knowledge strengthening - generational change.	Poor participation of young people and lack of knowledge.	**14.4%** of requests for benefits in the community were made by young people. **45%** of children know about wastewater treatment and **46%** understand problems resulting from poor water quality.
	Lack of awareness raising and training of river basin inhabitants in aspects related to their care.	**43.7%** of respondents have participated in water resources management topics.
	Low level of training on empowerment, community participation, peaceful conflict resolution and human rights.	**43.7%** of respondents have participated in social matters.
General environmental aspects	Producers do not use devices that save water at home and in the production process.	Only **2%** of producers use devices to save water both at home and in the production process.
	- Low rates of discharge permits. - Low rates of water concessions. - Lack of knowledge of environmental regulations.	**1.2%** of respondents said they have discharge permits. **5.9%** of respondents said they have a water concession.
	Preparation and decision-making faced with weather events. Water-related conflicts in the regions.	**27.5%** of respondents said they have had water-related conflicts.
Post-harvesting	It is evident that coffee pulp is removed with water.	**49.3%** of respondents said they use water for pulp removal.
	High rates of use of traditional fermentation tanks (high water consumption).	**62%** of farmers use traditional fermentation tanks. Only 16.8% have tub-tanks on the farm.
	Lack of knowledge of amount of water used in wet coffee milling.	**0.8%** of farmers said they know the amount of water used in coffee pulp removal.
	No proper pulp management. Conditions of pits have to be improved.	**39.8%** of respondents reported having a pit for coffee pulp treatment.
	High percentage of farms without power supply.	**35%** of farms without power supply.
Wastewater management on the farm	Low rate of coffee and domestic wastewater treatment.	**6.9%** of population surveyed have coffee wastewater treatments. **31%** have septic pits and 21.5% have grease traps on their farms.
	Water bodies used as dumps. Untreated coffee and domestic wastewaters are discharged to water sources and to land.	**21.6%** of respondents discharge untreated domestic wastewater to water sources, and 61.8% discharge them to land. **22.2%** discharge coffee wastewater to water sources and 71.8% to land.

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-> Continuation

Table 3. General situation of farms and river basins identified in diagnosis (list of needs and aspects to be improved).

Categories	Needs	
Soil management and conservation - bioengineering	Poor land use planning.	Evidence of erosion on **32%** of farms. **44.9%** of farms with proper water carrying. **14%** of respondents reported landslides in the river basins. **36%** of farms with integrated weed management through noble vegetation. **53%** of coffee plantations in full sun exposure.
	Little or no work for control of landslides at farm level.	
	Low rate of integrated weed management.	
	Coffee plantations in full sun exposure.	
Forest management	Threatened or endangered species.	River basins reported on average 8.8% of forest species threatened or endangered.
	Need for conservation trees and agroforestry systems.	**40%** of IWM river basins and **36%** of priority intervention areas with sites susceptible to be improved. 64.1% of respondents said they have banks of water sources protected.
	Scarce technical assistance specialized in forest management.	
Renovation of coffee crops	Crops planted with susceptible varieties. Aged coffee plantations. Coffee crop fertilization and productivity levels.	**38.3%** of coffee area with varieties susceptible to rust and older than 9 years. **15%** of producers fertilize based on soil analysis.
Water quality	Lack of knowledge about water quality aspects.	No water quality monitoring.
	Evidence is reflected in water appearance, stability of banks, hydrological alteration, and habitat for different aquatic species.	Low habitat health level.
Social:	Poor participation of surveyed population in different local base groups (producer organizations).	**85.5%** of surveyed population do not participate in local organizations.
	Poor participation of women and men in human rights and gender training.	**20%** of women and **55%** of men participate.
	Unequal distribution of roles between men and women on the farm.	Person in charge of: Cooking for workers = **58%** women and **4%** men. Buying food = **26%** women and **61%** men.
	Decision-making on production process on coffee farms is unequal between men and women.	Decision-making: On renovation process = **4%** women and **49%** men. On harvesting = **7%** women and **75%** men.
	Poor female participation versus men's in community groups or committees.	Of participants: **25%** are women and **75%** are men.
	Poor access of women to mass media.	Radio (daily) = **20%** women and **56%** men. Phone (daily) = **18%** women and **54%** men.
	High responsibility of women in management of water for consumption and farm activities.	**70%** of women and **16%** of men are responsible for water management on farms.

As to water-related conflicts in the regions, diagnosis found that in **96%** of the river basins, water conflicts were evident and very frequent (Figure 15), caused mainly by issues of pollution, easement, water supply, and need for supply in shortage times, among others. The level of water-related conflicts in some regions was above **70%**.

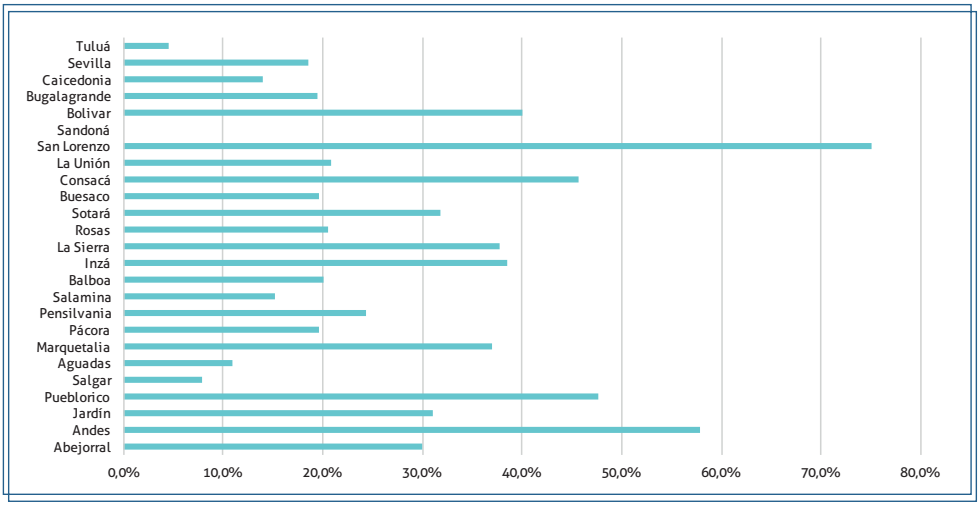

Figure 15. Percentage of rural district ("vereda") inhabitants who have had water-related conflicts.

Other social, economic, environmental and good governance needs identified were recorded and managed with new resources achieved through the strategy of the Complementary Projects Plan and the Water Fund.

Reflections and lessons learned in diagnosis

- Skills of participants, researchers, technicians and team members contributed significantly to meeting the characterization objectives.
- Continued support, monitoring and assistance to pollsters and data entry clerks to correct problems and verify data was instrumental in the process.
- It is important to establish security and trust protocols between the community and technicians responsible for diagnosis (official presentation in the area, use of distinctive shirt, and continued support by the Extension Service, among others).
- To identify opportunities for improvement of characterization methodology.
- Data entry as quality control mechanism generated reliable information and enabled relational data analysis.

The baseline

This was the reference point for quantitative and qualitative assessment of results, achieved impacts and changes at technical and socio-economic levels related to the IWM implementation. Farms participating in the Project were characterized once field activities started taking into account selection of farms in prioritized areas. It was fundamental to monitor actions defined in the different work plans, make necessary adjustments, and redirect or increase actions, seeking to ensure expected results.

Progress of actions was monitored through a series of indicators set out in the IWM Monitoring and Evaluation Plan; some examples of indicators are the following:

Result indicators	Process indicators
• Forest area with native species planted on farms per river basin. • Coffee or shade-grown coffee area. • Area of coffee crops renovated with rust-resistant varieties. • Implementation of coffee production system and environmental BAPs. • Ecological wet milling systems installed on farms. • Wastewater treatment systems installed per farm in river basins. • Soil physicochemical analyses.	• Coverage of farm visits. • Coverage of office visits. • Coverage of educational events (extension activities). • Awareness-raised and trained coffee farmers.

IWM Project performance indicators

A total of **29 key performance indicators** (KPIs, Table 4) were defined and structured with over **100 result and process indicators**, which enabled monitoring of the Project progress and performance measurement in the 24 work plans.

Table 4. Key performance indicators (KPIs) defined in Manos al Agua-IWM.

KPIs	No.
Total area (hectares, ha) dedicated to improving management	1
Area of coffee plantations (ha) under improved practices	2
Area (ha) prepared and resistant to water shortage/excess due to extreme events	3
Number of interventions to improve water management	4
Number of people trained	5
Number of people reached by relevant communication activities	6
Number of participating households that use water more efficiently	7
Attitude of participating farmers to introduced practices and technologies	8
Knowledge of participating farmers about introduced technologies and practices	9
Actual use by participating farmers of introduced technologies and practices	10
Percentage of agricultural businesses that reach break-even point or can be held by the country's finances	11
Cost-benefit analysis of farms based on real data	12
Cost-benefit analysis of participating companies (Nestlé - Nespresso)	13
Farm cash flow analysis	14
Trends in crop and farm yields based on real data	15
Coffee production levels in relation to water shortage/excess (indicator of resistance to drought and floods)	16
Occurrence of landslides in relation to water excess (indicator of impact of extreme events)	17
Infrastructure is still functional at the end of the project	18
Amount of money spent on operation and maintenance of installed equipment	19
Surface water quality according to specific context regulations. Above all organic pollutants and eventually pathogens, heavy metals, sediment loads and pH (indicator of improvement and achievement of water quality objectives)	20
COD grams per kg of coffee - Lower discharge of pollution to groundwater	21
Fines for pollution in the Project communities (local indicator of compliance with environmental legislation)	22
Number of regions with river basins in the Management Plans (POMCAs)	23
Development and ratification of national or corporate sustainable water policies	24
Participation of both genders in decision-making processes at all levels	25
Project stakeholders participate in the Water Platform for dialogue and collaboration	26
Development of a Social Responsibility policy	27
Percentage of vulnerable population in total beneficiary population	28
Prevalence of waterborne and sanitation-related diseases	29

The 29 KPIs were structured based on result indicators. For this purpose, different universal tables were developed to use a performance index rated between 0 and 1, with the following categories (Table 5).

Table 5. Performance categories for KPIs of the Manos al Agua Project

KPI performance categories	Index range
Excellent	0.90 - 1.0
Good	0.70 - 0.80
Regular	0.50 - 0.60
Bad	0.30 - 0.40
Very bad	0.00 - 0.20

Each KPI was rated this way to generate an **Overall Performance Index** that directly supported analysis of the 29 KPIs. The KPIs were integrated through a **radar chart** (Kiviat diagram) to establish a performance level for the river basins and the entire Project.

Chart of Project KPIs

Information on performance of the 29 Project KPIs used a radar chart tool called RedGIA. This graphic enabled analysis of the evolution and achievements in each region, in regions compared, and in all of them throughout the Project (Figure 16).

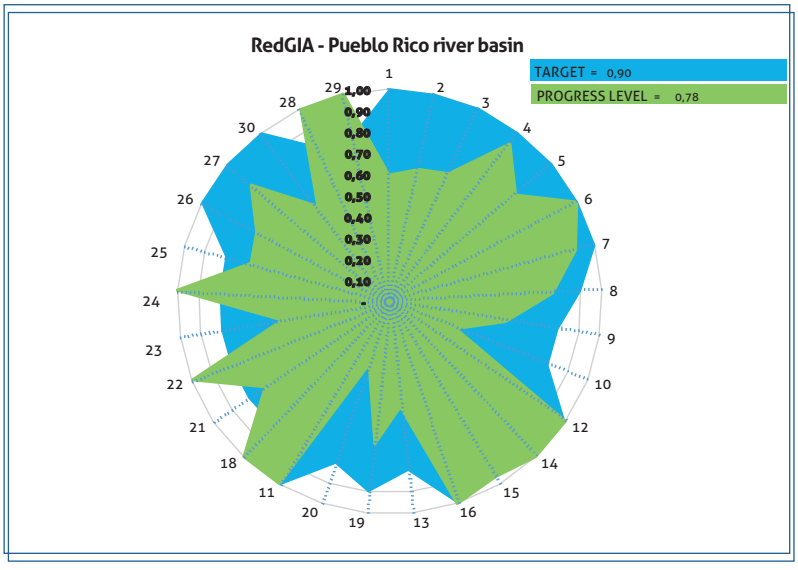

Figure 16. Example of RedGIA of an IWM river basin as of Year 4 of the Project in Pueblorrico, Antioquia.

Criteria for selection of producers and farms

Appropriate selection of coffee farmers and farms to be involved in the improvement plans and implementation actions was fundamental to ensure achievement of results and meeting the set goals.

Definition of criteria for selection of coffee farmers and farms was crucial in regards to the following aspects (Table 6):

- It enabled focusing interventions and prioritizing use of resources based on achievement of objectives.
- It enabled the organization of implementation activities.
- It shielded the strategy from particular interests and factors that could generate distortion.

Table 6. Criteria for selection of producers and farms to take part in the IWM Project.

First level (at general level, for selection of the 11,600 coffee growers to participate in IWM)	Second level (for pre-selection of coffee growers to participate in the different IWM implementation plans)
1. Coffee producers. Without restriction as to farm size or coffee area.	1. IWM producers with farms located within 100 and 200 m from water bodies.
2. In the intervention area, to concentrate the largest number of coffee farmers and the largest number of water bodies.	2. Producers causing direct pollution impact on water sources.
3. Priority to farms close to natural bodies of water or whose location and activities affect or converge into water sources.	3. Coffee growers willing to participate in implementation plans and follow recommendations for successful intervention.
4. Nespresso and Nescafé Plan municipalities; producers selected could take part in these programs.	4. Commitment to proper use and maintenance of actions performed.
5. Farms of IWM coffee farmers (or their partner) with updated information on the SIC@.	5. Commitment to contributing labor or materials in the region if necessary.

Third-level selection criteria (for final selection of farms) according to particularities of each work plan, farm conditions and intervention needs.	
General (determining for all work plans).	1. Selection of farms in the prioritized impact area.
	2. IWM producers with farms bordering the water bodies selected, with direct pollution impact on water sources (farms within 100 - 200 m from body of water). Once farms in the priority area are covered by components such as ecological wet milling or wastewater treatment, new farms beyond 200 m from body of water will be included.
	3. It is not necessary for an IWM coffee grower to participate in more than one plan or in all of the implementation plans. This aspect is defined by real need to prevent the greatest direct impact on bodies of water.
	4. Selection of farms according to distribution by type of producer (smallholder, medium-sized and large) close to the water source defined.
	5. Priority to AAA Program and Nescafé Plan farms with good technical and commercial performance.

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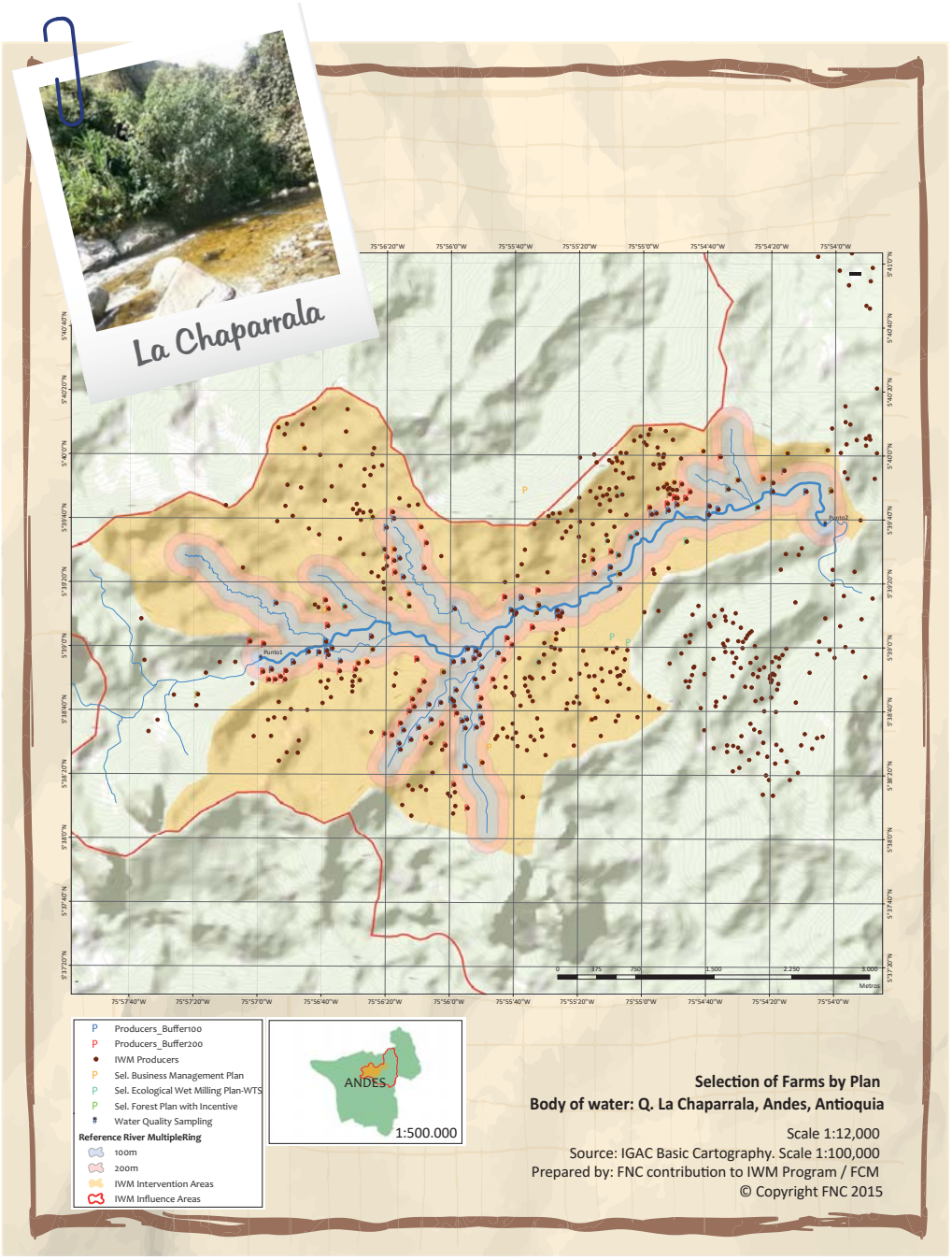
-> Continuation

Economic analysis	1. IWM producers willing to participate; farms that are part of the Business Management Program; and farms receiving support with IWM resources.
Ecological wet milling	1. Farms of smallholder producers, preferably those of highest production.
	2. Largest farms, with power supply (for implementation of larger equipment).
	3. Space available on the farm.
	4. Wet milling equipment to be installed on the farm had to follow design by the Project technical team, according to farm production capacity.
Coffee wastewater treatment	1. Farms with good coffee pulp management, with devices suitable for this purpose.
	2. Farms with rational water consumption for coffee washing. The farms to be selected must have wet milling water-saving equipment (tub tanks, Becolsub or Ecomill®).
Wetlands	1. Farms with coffee or domestic wastewater treatment systems implemented.
Renovation of coffee plantations	1. Farms with coffee lots planted with varieties susceptible to rust.
	2. Farms with aged, technically modern coffee plantations.
Climate monitoring stations	1. Coffee farmers willing to have an automatic weather station on their farm without remuneration. Having a space of 5 x 5 m for installation, preferably on even zone or of low slope.
	2. Producers had to live on the farms, with commitment to and responsibility for the station installed.
	3. Coffee growers had to be the owners and provide the property registration number.
	4. Signing of contract by the producer specifying lending of land to install the station. Stations insured against all risks in case of loss of equipment or damages.
	5. Cell phone signal on the site, fit for data transmission.

Delimitation of prioritized intervention areas

Based on proximity of farms to bodies of water as a determining success factor, the organized work of implementation on the farms implied prioritization of sites to be intervened with a logical criterion and a clear objective. In order to achieve an impact on the territory and maximize available resources, criteria for selection of farms were based on their location in the river basin. Under the assumption that the shorter the distance from the body of water, the greater the impact of the farm polluting load, two intervention areas were defined: within 100 and 200 m from the main water body and its tributaries, respectively.

The farms located within these delimited areas were selected to be directly intervened with infrastructure that would solve water-related problems and conflicts. This prioritization criterion made it possible to shield the strategy from some pressures in the region, which wanted support to target all types of needs and producers regardless of their location in the territory.



Map of La Chaparrala river basin, in Antioquia, with delimitation of intervention area at 100 and 200m from bodies of water.

The IWM Project, thanks to this strategy, managed to focus use of resources more efficiently, targeting only 25% of farms, those truly strategic for their degree of direct impact on bodies of water in the prioritized intervention zones and not 100% of farms in the region. Also, seeking to complement actions in the territory, a relevant number of farms were involved in forest management, bioengineering, renovation of coffee plantations with resistant varieties, and agroforestry management to strengthen natural capital and landscape of regions.

Strategy 25-100

25% of farms (those located within 100 and 200 m from water bodies) for an impact on 100% of the region

Work plans established

For implementation, **24 work plans** were established: 19 work plans in the four main components and five work plans in the component of Project management, support and monitoring. As major deliverables in Year 1, the Gender, Social Responsibility, Risk, and monitoring & evaluation strategies were defined.

To meet the Project objectives, an **integrated strategy** was structured to facilitate, through each work plan, implementation of actions for integrated water resources management, in terms of rational use, preservation and quality improvement.

Participatory planning

Participation of different local, regional and national actors aligned with the Project objectives was promoted. To achieve this participation, it was important to present a clear and sound strategy and motivate them about the benefits and advantages that could be achieved. The role of professionals, technicians and research staff in the areas was instrumental in the planning stage for their knowledge of the territory and of economic, social and environmental conditions.

The actors involved in participatory planning were:

- Team of professionals of the FNC at central level.
- Team of Cenicafé researchers.
- Staff of Coffee Growers Committees of Antioquia, Caldas, Cauca, Nariño and Valle del Cauca.
- Manuel Mejía Foundation (FMM).
- Producers and community leaders in the coffee regions.

River basin management priorities

These were defined based on the following considerations:

- Needs according to problems identified and diagnosis of the region.
- To generate positive impacts on coffee regions and farms, with an integrated water resources management approach.
- Intervention areas based on proximity to bodies of water.
- Clarity of objectives.
- Activities defined in an integrated way to develop the strategy (environmental, social, technical-economic, and good Governance components).
- Involvement of family owners of farms and communities.
- To encourage stakeholder articulation.
- Participation of a professional (interdisciplinary) team.
- Legal or regulatory requirements in the territory and by environmental authority.
- Requirements of strategic plan of the FNC as project implementer.

Decision-making for river basin management considered different needs and interests of producers and their families, communities and institutions. The Project sought common elements to work on to contribute to goals and objectives of the different stakeholders, such as water resources, the environment and coffee production.

Work plans for river basin management

Based on clear objectives and taking into account the implementation implications, a balance between the different actions proposed in the 24 work plans was promoted, looking for them to be productive and with low impact on or damage to the environment (Table 7). To implement coffee river basin management actions, the IWM strategy considered factors such as **participation of communities, articulation of stakeholders, socio-economic level, land holding, location of farms in the region, and environmental conditions of farms,** among many others.

Technical, environmental and social formulation of all actions proposed in an integrated way aimed at positive environmental impacts, with an emphasis on improving water quantity and quality in the river basins, aiming to ensure that cost of actions would not exceed results or benefits of their implementation.

Table 7. Work plans of the Manos al Agua-IWM Project

Objective	Expected result	Expected result
WP 1.1 Water Platform	To promote dialogue and coordinated, multi-stakeholder action around Integrated Water Resources Management (IWRM) at local, regional, national and international levels.	- Platform operating. 50 new partners.
WP 1.2 Water Learning Network	To promote exchange of experiences and knowledge, and creation of intersectoral dialogue spaces to have the necessary information and knowledge to make timely decisions on IWRM.	- Learning network operating. - At least 50 members participating (technicians and professionals).
WP 1.3 Community Participation	To promote and strengthen social organization of the community through groups of producers in the river basins, in order to improve participation and supervision mechanisms to ensure good local governance around water problems, with a focus on gender equity and family participation in the activities.	- Manos al Agua Groups at local level: 25 - Manos al Agua Groups at regional level: 5 - Evaluation of factors of success for work and strengthening of community organizations.
WP 1.4 External communications plan	To incorporate stakeholders and present objectives, principles and results of the Project in a clear and effective way, through an integrated communication strategy that enables dialogue and exchange among stakeholders to align and connect the different IWM components.	- Communication and visibility mechanisms: logo, website, social media. - At least 8,000 people served through different communication mechanisms.
WP 1.5 Complementary projects plan	To identify intervention opportunities to leverage resources from strategic partners that lead to protection and restoration of water sources, in order to improve quality of life of IWM river basin inhabitants.	- At least one complementary project per region (five regions) to extend impact of the Project.
WP 2.1 Diagnosis and baseline	To know the status of farms and river basins at social, technical-economic and environmental levels to structure the intervention strategy (work plans).	- Planning process. - Baseline generated to measure progress of implementation.
WP 2.2 Economic analysis at farm level	To generate baseline.	- Farms involved in economic analysis: 1,160 - SROI impact assessment.
WP 2.3 Transfer and	To generate a model to measure economic impact on smallholder, medium-sized and large coffee producers and of the entire IWM Project.	- Transfer & Sustainability study document.

Continuation ->

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Table 7. Work plans of the Manos al Agua-IWM Project

Work plans	Objective	Expected result
WP 2.4 Detailed multilevel training program	To promote improvement of knowledge and commitment of producers and their families involved in the IWM Project through design of the strategy for awareness raising and training on water issues, efficient use and conservation, in order to improve adoption levels and strengthen sustainability and integrated river basin management.	- In-person training modules for producers, families, and communities: 8 - Virtual training modules for technicians and professionals: 4 - Families trained: 8,000 - Training participants certified: 8,000
WP 2.5 Detailed program of technical assistance and rural extension	To provide technical continued support so that families participating in the IWM Project adopt Best Agricultural and Production Practices on their farms and implement strategies for proper management of natural resources, especially water.	- Multidisciplinary Extension Team: 45 professionals. - Team of research assistants at Cenicafé to ensure transfer and adoption: 15 professionals. - ICT tools in the field.
WP 2.6 On-farm improvement plans - Ecological wet milling and water saving	To design and implement an action plan for efficient use of water resources and reduction of pollution.	- Farms with improvement in ecological wet milling: 1,000 - Farms with improvement in coffee pulp processors: 500 - Sanitary water savers installed on farms: 500 - Community wet mills: 3
WP 2.7 On-farm improvement plans - Wastewater treatments	To reduce water pollution and consumption by implementing domestic and coffee wastewater treatment systems on coffee farms of the 25 IWM river basins.	Farms with coffee and domestic wastewater treatment systems: 1,000
WP 2.8 Water Fund design	To design and structure operation of a fund as financial instrument that helps strengthen production sustainability within the framework of environmental protection in the hydrographic zone of the 25 river basins.	Fund structured: 1
WP 3.1 Plan of reforestation	To recover, protect and care for coffee water ecosystems, in order to help users in 25 coffee river basins have a greater quantity and better physicochemical, microbiological quality of water.	- Forest nurseries. - Farms with forest investment (incentive and promotion): 1,100 - Hectares of forest management with planting of native species (incentive and promotion): 90
with native species	To encourage renovation of aged, susceptible-to-rust coffee plantations with resistant varieties, applying techniques that lead to better productivity and environmental management as strategy for better use of resources, stabilization of production and better income on coffee farms.	- Hectares renewed by planting resistant varieties: 800 - Soil analyses: 1,050

Continuation ->

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WP 3.3 Bioengineering plan - Ecological restoration and conservation plots	To contribute to conservation of water ecosystems that are strategic for coffee production through bioengineering works, stabilizing sites affected by mass movements and implementing conservation practices to improve soil resilience to rain excess and reduce concentration of sediments in water sources.	- Restoration areas (management of mass movements): 25 - Plots with soil management and conservation: 25
WP 3.4 Assessment of environmental services	To contribute to sustainable use of natural resources and to generation of alternative income for producers, their families and coffee communities through design of a scheme of Payment for Environmental Services (PES) in some of the 25 IWM river basins.	- PES operating: 1
WP 4.1 Hydrometeorological stations plan	To guide the making of decisions related to climate incidence on coffee farming and reasonable use of natural resources, providing information on the state of weather variables through installation and operation of 25 automatic weather stations (AWS) in the IWM river basins.	- AWS installed and operating as part of the Agroclimatic Coffee Platform: 25 - Scheme of early warnings structured and IWM promoters advising producers.
WP 4.2 Water quality studies	To determine quality of water in the 25 river basins of the IWM Project, before, during and at the end of the implementation process.	- Monitoring per river basin/ year: 2 - Water quality report/analysis per year - Water quality study for the IWM river basins.
WP 4.3 Coffee Water Footprint	To quantify water footprint of dry parchment coffee production and determine its impacts on water resources in the Project area.	- Colombian coffee water footprint study and technical guide.
WP 5.1 Monitoring and evaluation plan	To measure progress and take preventive or corrective actions that contribute to achievement of results and goals through monitoring of Key Performance Indicators (KPIs) of the Project.	- Support for development and delivery of results - KPIs (e.g.: water consumption, treated water, etc.).
WP 6.1 Development of gender strategy	To promote empowerment of women in the family and community contexts for implementing water management systems in coffee farming at local level. To develop and implement the gender strategy.	- Awareness raising, promotion and training activities: 840 - Participants: 21,000 - Gender indicator: 37% of female participants.
WP 6.3 Development of risk plan	To promote adequate risk management in the Project lifecycle, with identification, determination of intensity and potential impact, and definition of management plan to facilitate decision-making towards achievement of expected objectives.	Risk management system: 1
WP 7.1 IWM Project management plan	To promote adequate and effective implementation of the Project through application of knowledge, standards, methods, processes and best management practices.	- Resources management and budget realization.

Expected impact

The IWM Project was planned to generate changes in at least **20%** of the coffee population located in the 25 river basins, that is, around **2,300** direct participating producers. The work plans were designed to change behavior and attitudes of the beneficiary population to **water resource management**. As a result of the planned actions, it was expected to **improve water quality, save water consumed, promote water-friendly agricultural production practices and good soil management practices that have effects on water available on the farms.**

The Project also worked for producers and their families to **understand their living space**, the river basin, the importance of their contribution to its preservation and the benefits of their environment, aiming at better human activity with sustainable vision, although impact was focused on water resources.

Other variables considered in formulation of the Project, such as changes in income or health conditions, had to be considered as indirect effects, because the chain of intervention actions had no explicit strategies or specific resources to increase beneficiaries' income or improve health conditions of producers and their families. In other words, changes in such variables over time couldn't be directly attributed to participation in the Project.

In summary, expected impact of the IWM Project was stated as follows: **"The IWM Project expects to reduce water consumption, increase water saving and improve water quality in at least 20% of coffee farms. Indirectly, it expects to generate conditions for greater resilience to climate variability and water imbalance, improve quality of lives and health conditions of coffee-growing families in the river basins and influence development of national, local and business water policies."**

One of the aspects to be highlighted in the value chain is that, at institutional level, the IWM intervention was able to generate the knowledge necessary for operation and possible replicability of the Project.

Actions to support impact

Theory of change represents the sequence of events or set of assumptions and actions that are projected and related to achieve the Project's expected impact. A theory of change design for the IWM Project was proposed, incorporating the characteristic elements that are summarized in the following graphic (Figure 17):

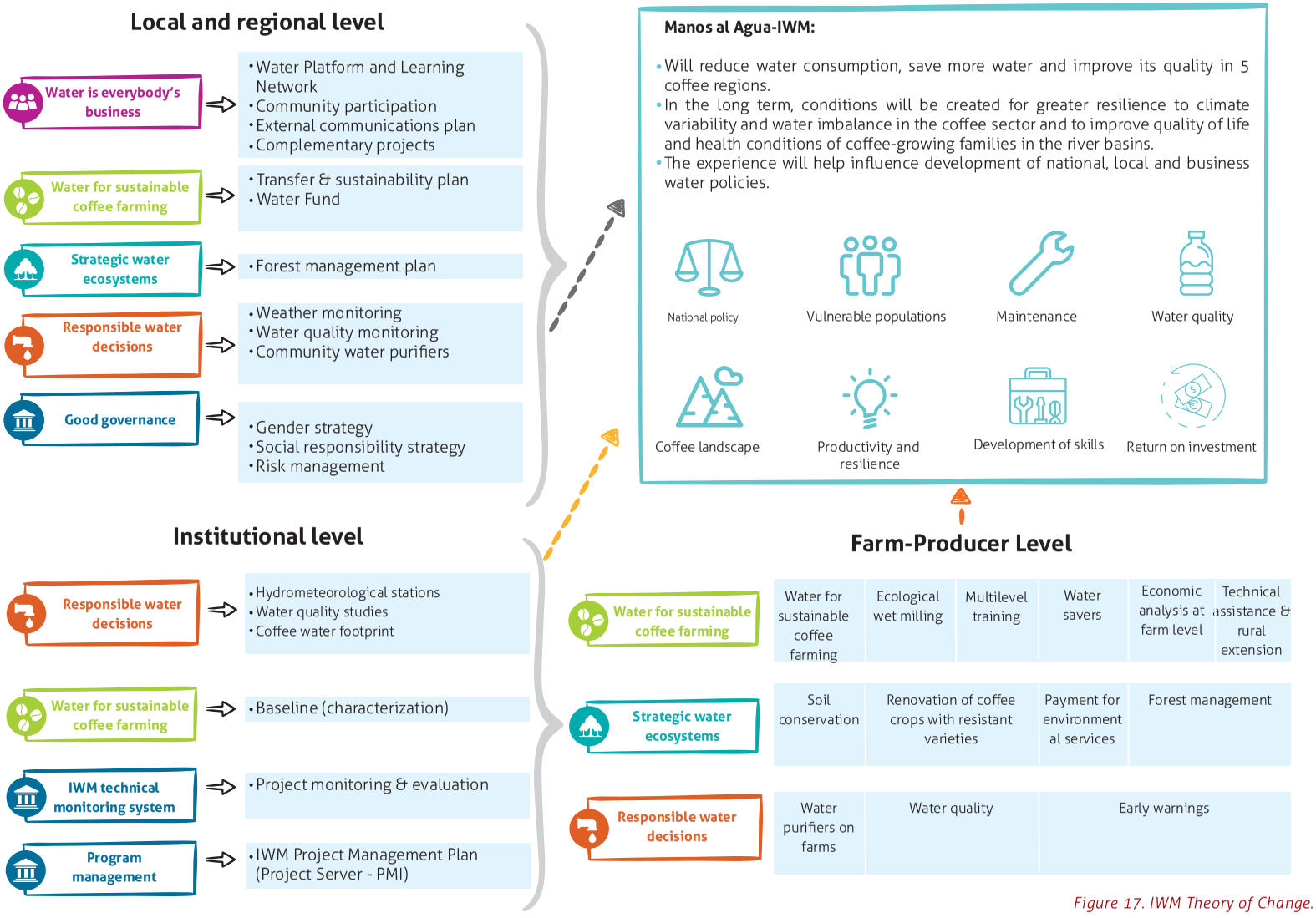


Figure 17. IWM Theory of Change.

The three intervention levels are represented as three sub-theories of change that aim at a common impact. Three sub-theories of change related to the intervention (implementation) levels were defined:

- First level, **farm-producer,** where most of actions were concentrated.
- Second level, **local-regional,** with actions targeting river basin communities; at this level, actions led to concrete results and indirect impacts.
- Third level is **institutional**, seeking to create a conceptual and understanding framework for the IWM Project as intervention model.

Of the proposed theory of change, the sub-theory of change at farm-producer level (detailed in Figure 18) is highlighted, as it led to obtaining direct impacts on the variables of interest of the Project, which were water quantity and quality.

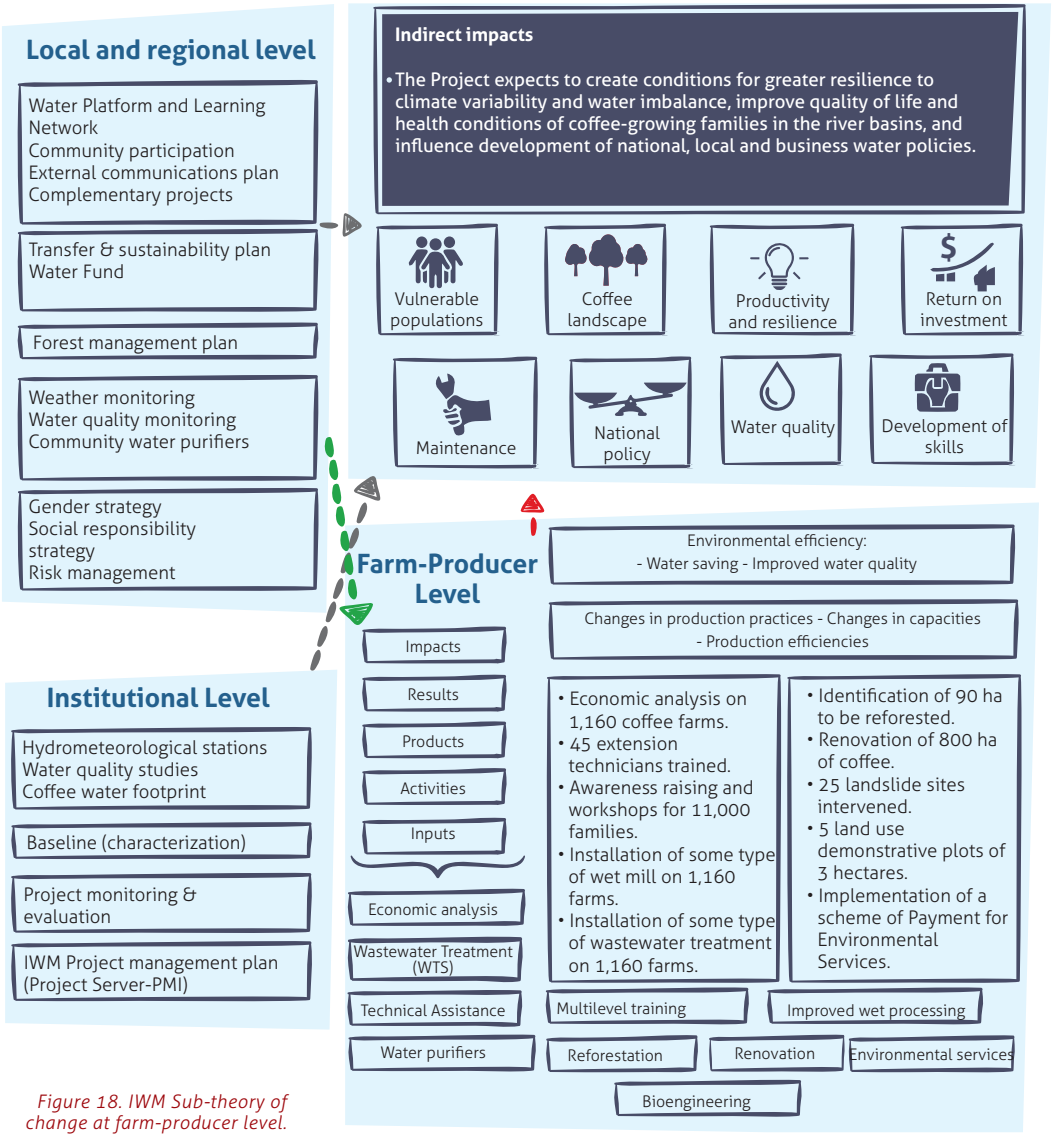


Figure 18. IWM Sub-theory of change at farm-producer level.

Value chain

Once the roadmap or path to changes expected by IWM was identified, the relations between activities and products, and the subsequent results and impacts, were represented through the value chain (Figures 19 to 21), detailing the inputs, activities, products, results and impacts in a logical and causal sequence.

Figure 19. Representation of the IWM value chain for the coffee river basins / Inputs - Activities - Products.

Results (Based on the IWM KPIs)	
1. Intersectoral partnerships for intelligent water management. 2. Community participation mechanisms strengthened. 3. Spaces for dissemination of the Intelligent Water Management model.	**At least 70%** of activities performed within the framework of the Water Platform and Learning Network in the 4 years of implementation. **At least 70%** of Manos al Agua groups perform water management activities in the 4 years of implementation.
1. Coffee growers sign commitment form and improvement plans. 2. Balance of practices adopted on coffee farms is positive. 3. Control of water consumption on farms. 4. Reduction of organic water pollution of farms. 5. Reduction of coffee wet processing wastewater. 6. Reduction of landslide risks. 7. More and better soil conservation practices.	**10%** of farms with management information and economic management at the end of the project. **20%** of farms with **assistance and better** practices and technological solutions for intelligent water management at the end of the project. **20%** (at least 5 liters of) water saved per kilogram of dry parchment coffee (dpc) on **20%** of farms of producers with **assistance and better practices** and technological solutions for intelligent water management in the intervention area at the end of the project. At least **20%** of farms have increased their sustainability standards from initial state (initial score: Bad = 0.3 to 0.4) at the end of the project. **20%** of farms have reduced potential pollution at the end of the project. An average **20%** decrease of COD concentrations in wastewater discharged by each producer participating in improved wet milling and wastewater treatment (WTS) plans in the intervention area at the end of the project. At least **10%** of farms with forest and soil management plans. The farms apply better soil conservation practices at the end of the project.
1. Strengthening of the Coffee Agroclimatic Platform's monitoring network in the river basins (early warning mechanism is operating). 2. Water quality assessment in the 25 IWM river basins before, during and at the end of the project. 3. Quantification of water footprint of the coffee production cycle until obtaining dry parchment coffee and determination of its impact on water resources in the project area. 4. Empowered women (family and community contexts) to establish water management systems in coffee farming at local level.	**10%** of farms complying with water provisions and regulations - Permit for discharges and/or water concession at the end of the project. **20%** of farms with cleaner conditions and better organization at the end of the project. **100%** of stations operating and at least 20% of farms with early warnings and recommendations at the end of the project. 2 annual publications and a final report on water quality in 25 river basins to evaluate system effectiveness. **At least 37%** of women participating in technical, community and training activities at the end of the project.

Figure 20. Representation of the IWM value chain for coffee river basins / Results.

Impacts (Based on the IWM KPIs)		
Direct impacts on river basins	- Influence on development and formulation of local and business water policies	- At least **10%** of IWM farms show direct improved environmental impacts at the end of the project. - At least **10%** of the intervention area (area of coffee farms divided by total area of river basins) integrated into a plan for mitigation and adaptation to climate change effects at the end of the project. - **20%** of farms with less water consumption at the end of the project. - **20%** of farms have reduced potential pollution at the end of the project. - On **20%** of farms, coffee production is stable or has increased at least **5%** compared to previous production year.
	- Improvement in 25 coffee river basins	
	- Less water consumed - Improved available water quality	
Indirect impacts (depending on other context factors)	- Better health conditions for IWM families. - Reduction of production costs because of less water consumption and use of efficient technologies. - Savings because of non-payment of fines for polluting discharges. - Producers with knowledge to identify and address risks of landslides and floods.	
Long-term impacts	- Increased productivity resulting from coffee crop renovation. - Production of higher-quality coffee thanks to use of clean and efficient wet milling technologies. - Reduction of risks of diseases caused by pollution and unsafe water consumption. - Greater resilience to climate variability and water unbalance. - Better conditions for better quality of life.	

Figure 21. Representation of the IWM value chain for the coffee river basins / Impacts.

Four types of impacts were defined:

1. **Direct impact at local-river basin level,** with changes achieved by formulation and design of policies.
2. **Direct impact at farm-producer level** on water quantity and quality.
3. **Indirect impact at farm-producer level,** associated with quality of life, health, and productivity.
4. **Indirect impacts,** depending on factors that are external to the Project.

Manos al Agua-IWM Project Management Plan

Structured to establish how the Project would be implemented, monitored and controlled to ensure good planning, implementation and follow-up, based on management processes tailored to needs. The Project Management Plan for the 5 years of implementation was supported on the following processes:

IWM Project Management Plans	- Scope management - Requirements management - Schedule management - Cost management - Quality management	- Human resource management - Communications management - Risk management - Procurement management - Stakeholder management

a. Budget definition according to needs

The management team and leaders of each work plan defined costs of activities and deliverables to establish the budget baseline for the 5 years. The budget was reviewed in each realization year to validate prices, units and other adjustments according to needs by IWM Change Control Management. Budget took into account all needs to carry out activities regarding technical staff, purchase of hardware, management, monitoring and evaluation, among others.

b. Financial sustainability in Manos al Agua-IWM

Financial sustainability was achieved by securing income of contribution resources to cover costs of all the Project actions and operations, including the investments necessary at both farm and regional levels (river basins).

The IWM PPP made contributions according to planning; additionally, a complementary financial mechanism was achieved with participation of new partners (from public and private regional, national and international sectors), who made contributions to the Project, duly certified, for over COP 4,500,000,000 achieved through activities of the IWM Project components and seeking to increase impacts on the regions. A scheme of Payment by Environmental Conservation Services in one of the river basins was also achieved, the result of interaction with new local and regional partners, which served as a model for other regions of the Project.

> Participation of public and private partners showed that a grant can become seed capital and that, with the experience of private partners, greater participation and additional investment can be achieved to strengthen the Project actions. The founding partners' contributions, additional resources and new partners' contributions maintained operation and gave financial stability to the Project.

Manos al Agua-IWM Project quality plan

Structured with procedures, roles, responsibilities, expected results and records applicable to Rural Development Promoters' work, the Project quality plan was aligned with the FNC Integrated Quality Management System.

Order, control, guidelines management, continued support and communication during the technical and educational work process were achieved thanks to articulation of the Project technical professional team with the FNC organizational structure, duly aligned with the Integrated Quality Management System, defined in the Manos al Agua-IWM Project Quality Plan.

Formulation of River basin management Plan

River basin management implied development of different technical and environmental processes that Rural Development Promoters, Extensionists, specialized technicians and professionals had to perform. Additionally, and as a complement, ongoing **social support** was provided as fundamental to promote technical aspects, generate commitment and appropriation by key actors, producers and their families, and consolidate sustainability. Economic management at farm level was also proposed, all of this with an integrated and interdisciplinary approach.

The IWM river basin management plan document was developed during the **Planning Phase**, supported on diagnosis, SWOT analysis, value chain, selection criteria, and definition of work plans and activities to achieve results and targets, from an initial state where the aspects to be improved in the different river basins were considered until a state where solutions were raised. The way to operate the IWM Project was established on the guide-document for each region, with concrete guidelines that indicated how to perform work plan actions, explaining the different steps and procedures.

A river basin management plan should include at least the following:

- To establish clearly and accurately what is going to be performed, taking into account reality, supported on diagnosis.
- The steps to be followed, methodology, staff responsible and resources required.
- An integrated approach, defining what has to be done on the farm, in the region and at institutional level.
- To be results-oriented, with defined goals.
- Selection criteria for intervention, unifying actions and treatments.
- To be understandable and of easy implementation.
- Document structured to be delivered to the implementation team.
- Region maps with delimitation of river basins, location of farms and a list of producers involved in the process.

Operational capacity building phase

At the beginning of Year 2, Manos al Agua-IWM built the **operational capacity** to support implementation in the areas selected to promote integrated water resources management in the territory in terms of rational use, conservation and quality improvement, with a strong work component of social transformation and articulation of stakeholders. Figure 22 shows the general steps followed in the IWM operational capacity building phase.

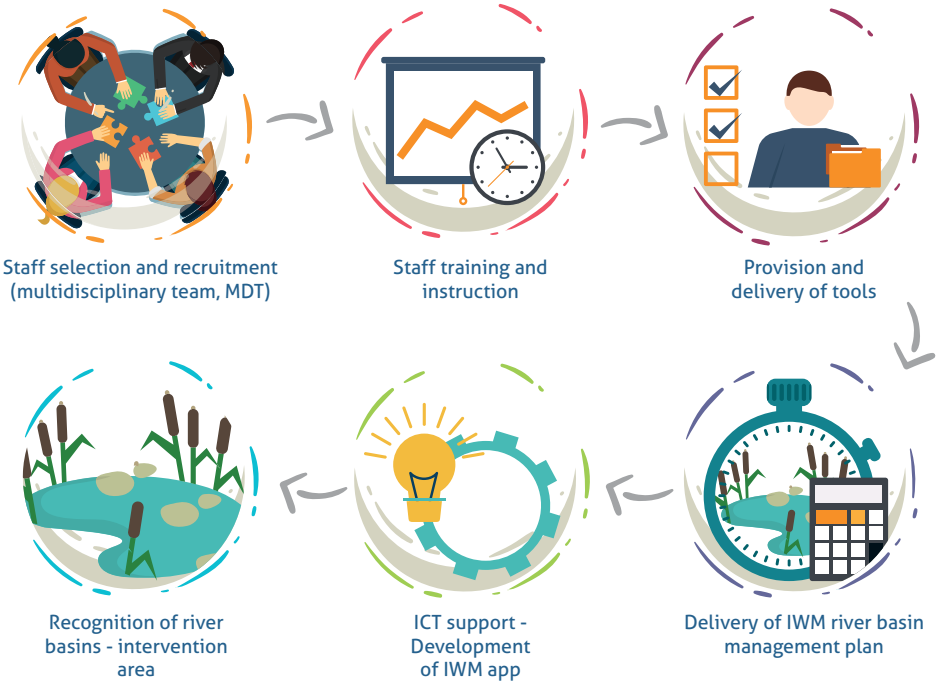


Figure 22. General steps of the IWM operational capacity building phase.

Support to operational capacity during implementation

For field work in the coffee river basins with producers, families and communities, the Project was supported by the FNC extension and implementation experience.

The FNC Extension Service was created in 1959, providing uninterrupted technical assistance since 1960. Colombian coffee growers have permanently been assisted by over 1,200 extensionists that are present in 20 departments and 590 municipalities of the country. The Extension Service technicians are educated first in the country's universities, where they get their professional degrees in agricultural careers, and then within the FNC, through in-person or virtual courses on institutional, technical, economic, environmental and commercial subjects.

The FNC is authorized by the Ministry of Agriculture and Rural Development (MADR, the acronym in Spanish) to provide the service of direct technical assistance to coffee growers in the country as an EPSAGRO (entity providing the service of direct rural technical assistance with an agribusiness approach, Resolution 189 of 2005, MADR).

Since coffee is a mountain crop, on a landscape characterized by steep, long erodible slopes, it has been a challenge, from the technical point of view, to extensionists, who must use all educational resources for coffee farmers to adopt best agricultural practices. Water management in coffee farming and post-harvesting is fundamental to ensure coffee quality. Cenicafé has developed adequate technologies to minimize the amount of water used in wet milling and preserve its quality, a second challenge to extensionists that requires efforts to raise coffee farmers' awareness of their responsibility for water resources.

The IWM Project received technical and rural extension support in the implementation phase, a necessary ongoing support that enabled participating coffee farmers and their families to improve their knowledge, production capacity, farm management, and adoption of different practices promoted in each component and intervention strategy.

Operational capacity, convening power and implementation experience in the rural sector were the support that the FNC, as the IWM Project manager and implementer, provided to the team of Rural Development Promoters (technicians and professionals) of the Project.

Manos al Agua-IWM technical, professional and scientific staff

Made up of a multidisciplinary professional, technical and scientific team in charge of developing the activities defined in the different work plans.

a. Staff selection and recruitment

This task was based on the need of having appropriate staff, exclusively dedicated to the Project, to address technical, production, economic, environmental, social and good governance actions. The process took into account staff selection criteria established for each **Position Profile**, based on specific activities to be performed for the Project. The Manos al Agua-IWM positions were: **Project departmental coordinators, rural development promoters, specialized technical staff, and research assistants.**

As FNC's support to IWM, a human team in each Departmental Coffee Growers Committee directly or indirectly supported the proposed actions (Executive Director, Rural Extension Departmental Leader, Program Coordinators, Sectional Coordinators, and Extensionists), who were joined by the Cenicafé team and the FNC Technical Division support staff.

b. Field implementation staff

The backbone of the implementation process was the team of Rural Development Promoters, distributed by department as shown in Table 8.

Table 8. Distribution and coverage of Manos al Agua-IWM implementation staff					
Department	Departmental coordinators	Rural Development Promoters			
		River basin promoter	Ecological wet milling and water treatment promoters	Forest mgmt., bioengineering & water quality promoters	Ongoing social support promoters
Antioquia	1	5	1	1	1
Caldas	1	5	1	1	1
Cauca	1	5	1	1	1
Nariño	1	5	1	1	1
Valle del Cauca	1	5	1	1	1
Total	5	25	5	5	5

Advantages

- A multidisciplinary team of technicians and professionals.
- Rural development promoters with specific tasks.
- An expert in each matter with the time available, knowledge, and competence to strengthen continued support to coffee farmers.
- Exclusive dedication to the Project.

c. Project scientific staff

The implementation staff received continued support from a team of 15 research assistants from Cenicafé (Table 9), which provided permanent advice and training to the field staff to ensure technical strengthening and knowledge for transfer of the technologies and practices introduced.

Table 9. IWM Project staff at Cenicafé.	
Research assistants	Total
Economic analysis at farm level and environmental services	1
Ecological wet milling and wastewater treatment	3
Bioengineering and soil management - Forest management	3
Physicochemical and biological water quality - laboratory	3
Climate monitoring stations	2
Monitoring and evaluation plan - Transfer & sustainability plan	2
Management and control	1
Total	15

Advantages

- A team providing continued support to extensionists to strengthen transfer.
- Closing of gap between technology generation and transfer to ensure adoption.

d. Coverage

Coverage was determined by the number of producers and family members to be served in the selected river basins. Each Rural Development Promoter provided continued support to a defined population, based on prioritization and plans established according to diagnosis and key intervention results.

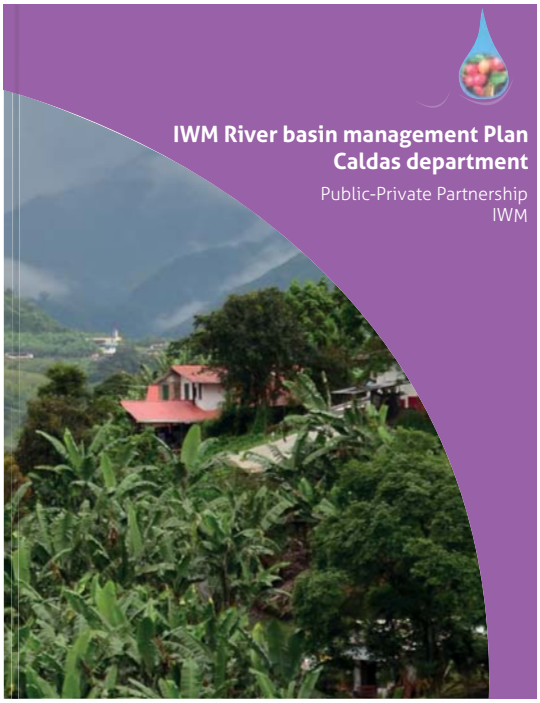
The **IWM Development Rural Promoters** were assigned a specific geographical area by delimitation of the selected river basins. Thus, coverage in terms of number of served coffee farmers was variable depending on the region, but guaranteeing coverage, which reached a service rate of **480 producers per promoter**.

e. Staff training with Manos al Agua-IWM approach

In-person and virtual training on different topics, in order to strengthen their knowledge for better performance in activities of service to producers in the different regions, included **two Rural Extension and Coffee Technology courses** for all the Project staff, lasting one month each. Also, **16 training and updating activities** were developed for the different professionals on topics inherent to field tasks and activities. **Over 128 training days** targeted all the Manos al Agua-IWM staff in the 5 years of the Project.

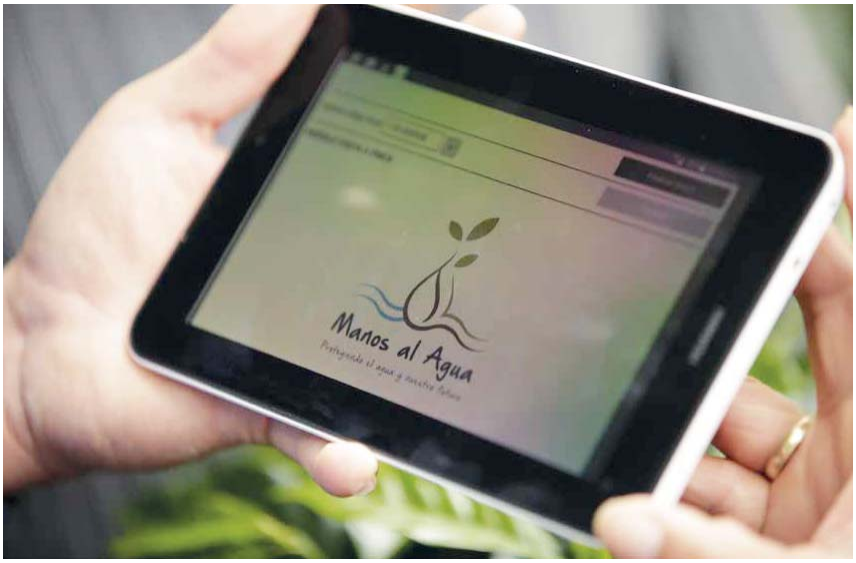
Delivery of guidelines - IWM River basin management Plan

Each Project team member was provided with the document **IWM River basin management Plan**, along with the list of participating farms and river basin maps with their location, as support tool from the start of implementation actions in the river basins. Over 75 copies of the IWM River basin management Plan were distributed in the departments of Antioquia, Caldas, Cauca, Nariño and Valle del Cauca.



ICT support

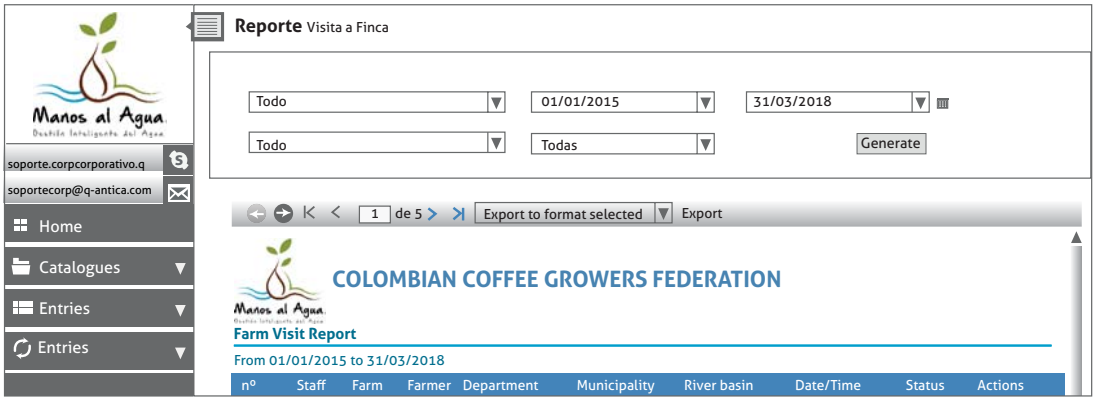
The technical, professional team was equipped with **tablets and an application system** to support information gathering and transmission in the field.



Advantages

- Portable device for farm visits and real-time information.
- Report on training and implementation activities on the farms.
- Information systematization and quality.
- Strengthening of capacity of the Coffee Information System (SIC@).
- Competitive referencing.
- More active extension network.
- Access to information (to know where we were).
- Capacity to improve coverage levels.
- Support to define implementation strategies in the regions.
- Analysis in implementation regions through development of river basin maps.
- Support for impact assessment.

A web application module captured information on implementation, training and service to IWM Project participants. Through this platform, information on field activities, as control and monitoring mechanism, was reported, enabling also an analysis of coverage and impact achieved.



Rural Extension Activities

The implementation basis was the FNC rural extension methodology, which includes individual, group and massive methods with participation of producers and their families.

a. Individual methods

Visits received at the office and visits to farms and households were crucial to achieve the results proposed. The plan projected the monthly number of coffee growers provided with these services.

b. Group methods

Meetings, humanized method demonstrations, tours, field days and short courses are the most important. The number of events held and number of participating producers were also projected on a monthly basis.

"Individual and group methods had written records signed by the participating producers; they are part of the Integrated Management System that certifies service delivery under the NTC-ISO 9001:2008 standard by ICONTEC."

c. Massive methods

Participation of Rural Development Promoters in local radio programs, TV programs and coffee newspapers was very important.

Integrated assistance plan (Technical Assistance - Extension)

Technical assistance and rural extension by Manos al Agua-IWM was at the heart of the implementation phase started in Year 2. The necessary continued support was provided for the Project coffee growers and their families to improve their knowledge, production capacity, farm management and adoption of different practices defined in each of components and intervention strategies.

The integrated assistance plan implemented by the Rural Development Promoters was designed according to the above-mentioned general guidelines, following the instructions defined for each intervention plan established in the planning phase, in order to be applied in production systems of coffee growers. It is noteworthy that, as part of technical and professional continued support, they agreed with each farmer and their family on the actions to be developed on the farms, taking into account their life expectations and projects in the short, medium and long term.

a. Team of field promoters and their work plans

Rural Development Promoters and IWM Coordinators directly developed the activities of each work plan. Table 10 shows work distribution in the river basins.

Table 10. Team of Promoters of the IWM Project and their work plans.

Professional	IWM work plans
River Basin Rural Development Promoter	WP 2.5 Detailed program of technical assistance and rural extension
	WP 2.4 Detailed multilevel training program
	WP 2.2 Economic analysis at farm level
	WP 3.2 Plan for renovation of coffee plantations with resistant varieties
Ecological wet milling and water treatment promoter	WP 2.4 Detailed multilevel training program
	WP 2.5 Detailed program of technical assistance and rural extension
	WP 2.6 On-farm improvement plans -Ecological wet milling and water saving
	WP 2.7 On-farm improvement plans - Wastewater treatment
Forest management, bioengineering & water quality promoter	WP 2.5 Detailed program of technical assistance and rural extension
	WP 2.4 Detailed multilevel training program
	WP 3.1 Plan of reforestation with native species
	WP 3.3 Bioengineering plan - Ecological restoration and conservation plots
Ongoing social support promoter	WP 2.5 Detailed program of technical assistance and rural extension
	WP 2.4 Detailed multilevel training program
	WP 1.3 Community participation
	WP 1.5 Complementary projects strategy formulation
	WP 6.1 Gender strategy development
	WP 6.2 Social responsibility strategy development

This team was led by each IWM Project Coordinator, whose main function was to ensure development of activities defined on the work plans at farm and regional levels (Table 11) through coordinated work with all members of local teams.

Table 11. IWM Project Coordinator and their management plans.

Professional	IWM work plans
IWM Project Coordinator	**WP 1.1 Water Platform design**
	WP 2.5 Detailed program of technical assistance and rural extension
	WP 2.4 Detailed multilevel training program
	WP 5.1 Monitoring and evaluation plan
	WP 6.3 Development of risk plan
	WP 7.1 IWM Project Management Plan (Project server-PMI)

The topics of the multilevel training modules for producers, families and the community were addressed according to the following distribution per Rural Development Promoters (Table 12).

Table 12. Distribution of IWM training modules per Rural Development Promoter.

Training Modules	Target population	IWM Professional/ responsible
Awareness raising + Project presentation	Producers and their families, community in general	All Rural Development Promoters
Business management	Producers and their families	IWM River Basin Rural Development Promoter
Best agricultural practices	Producers and their families	
Integrated water resources management around coffee	Producers and their families	
Associativity: Let's do things together	Producers and leaders	IWM ongoing social support promoter
Generational change, gender and rights	Women, youth and children	
Ecological wet milling and farm wastewater treatment	Producers and their families	IWM ecological wet milling and water treatment promoter
Forest management - Soil management and conservation	Producers and their families	IWM forest management, bioengineering & water quality promoter
Complementary training	Youth and producers	SENA instructors

b. Specialist central-level and Cenicafé research work teams

At central level of the IWM Project, a professional team supported development of strategic work plans including farm and region activities (Table 13). Their role also

focused on ensuring communication channels and coordinated work between the Cenicafé research and Project Coordinator teams and field promoters.

Table 13. IWM Project specialist team and their work plans.

Professional	IWM work plans
Team of central-level specialists	**WP 1.1 Water Platform design**
	WP 1.2 Water learning networks
	WP 1.4 External communications plan
	WP 2.1 Diagnosis and baseline
	WP 2.8 Water Fund design
	WP 3.4 Assessment of environmental services
	WP 5.1 Monitoring and evaluation plan
	WP 6.3 Development of risk plan
	WP 7.1 IWM Project Management Plan (Project server-PMI)

At Cenicafé, the IWM Project created a team responsible for leading several regional work plans (Table 14), with an emphasis on monitoring and evaluation, and for supporting the field team on assistance, technology management, tools, specialized training and transfer to contribute to greater levels of continued support by Rural Development Promoters and to strengthen levels of adoption and appropriation of the technologies and practices introduced.

Table 14. IWM Project team of research assistants.

Professional	IWM work plans
Cenicafé researchers - research assistants	**WP 2.3 Transfer and sustainability plan**
	WP 2.6 On-farm improvement plans - Ecological wet milling and water saving
	WP 2.7 On-farm improvement plans - Wastewater treatment
	WP 3.1 Plan of reforestation with native species
	WP 3.3 Bioengineering plan - Ecological restoration and conservation plots
	WP 4.1 Hydrometeorological stations plan
	WP 4.2 Water quality studies
	WP 4.3 Coffee water footprint
	WP 5.1 Monitoring and evaluation plan

To achieve the IWM objectives, the Project team carried out the following activities:

- Presentation of Project and awareness raising.
- Training on topics of their competence defined in the Multilevel Training Plan, using extension tools designed by experts.
- Support each other among members of the multidisciplinary team in training tasks.

- Preparation of on-farm action and improvement plans with the model designed for such purpose.
- Monitoring of on-farm improvement plans defined with producers and their families.
- Advising on farm improvement in specific components, according to the improvement plan at farm and river basin levels (work packages with investment of resources).
- Continued support and collaboration with the other IWM team members in activities established in the different work plans whose implementation is not the responsibility of the Extension Service.
- Support to verification of realization of infrastructure works on farms and regions.
- Support to the IWM Project impact assessment process.
- Permanent update of information on farms and producers to guarantee compliance.
- Management and operation of matrix of monitoring of work done on the IWM farms.
- Reporting on education and application work.
- Monitoring and evaluation in the regions.
- Community participation and social and stakeholder management activities.

All the Project's multidisciplinary technical and professional team members were constantly trained to enable them, along with their experience, to promote their activities (Figure 23). Rural Development Promoters' actions were strengthened to improve continued support to producers and their families for a higher level of adoption and sustainability of actions.

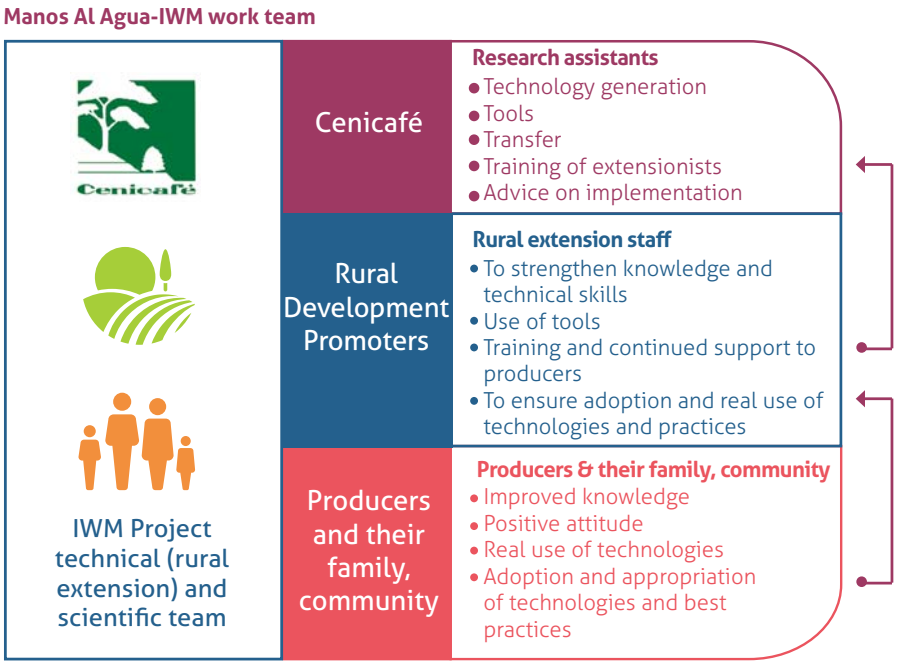


Figure 23. Knowledge circuit in the IWM implementation process.

Phase of implementation in the river basins

From the start of the implementation phase, it was essential to present the Manos al Agua-IWM Project to communities, local organizations, institutions and other key entities in the intervention areas and make them aware to generate commitment and participation for achieving objectives of the integrated river basin management plan. Different stakeholders were incorporated and integrated in a representative way, with gender equity and equal rights and responsibilities, in search of achieving the agreement required to meet demands and expectations in the river basins.

Figure 24 shows the general steps followed in the IWM implementation phase.

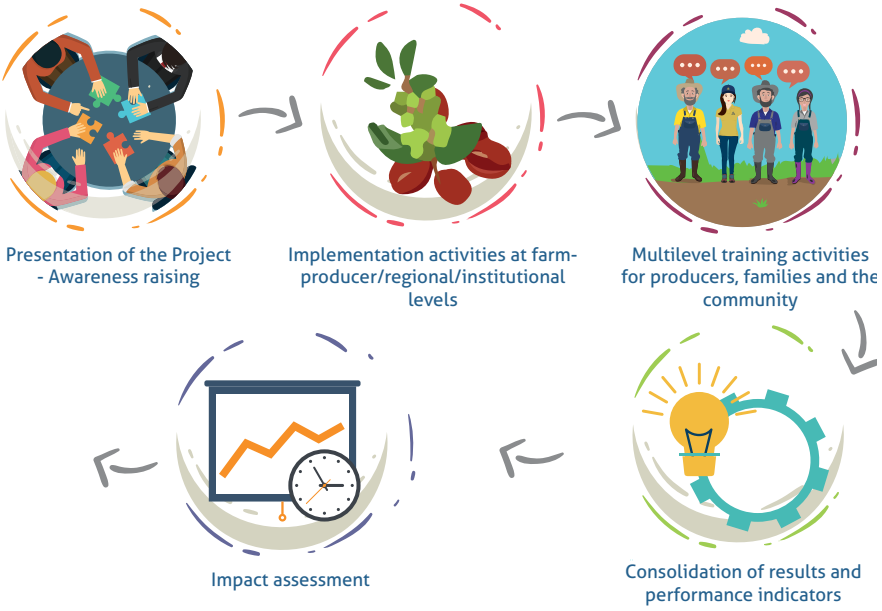


Figure 24. General steps of the IWM Implementation phase.

The implementation phase was supported on three fundamental aspects to strengthen activities on farms and regions and potentiate work with the community as cohesive elements:

The territory concept, the river basin as a system.

Water as a vital and fundamental element for life, production, integration, decision-making and management of the territory.

Identity with the process, Manos al Agua brand that motivates actions.

IWM Project presentation - Awareness raising

At the beginning of the process, Manos al Agua applied an awareness-raising methodology (using didactic materials) to motivate coffee growers, their families and the community to participate in self-knowledge and group knowledge spaces as an opportunity for change and improvement of their lives, becoming aware of the importance of their territory, the river basin, and the meaning of water, understanding the impact of its inadequate management.

The **awareness-raising** activities emphasized the degree of vulnerability to which producers, their families and communities are exposed, to thus improve their resilience, awareness and valuation of their environment and recognition of their river basin. A space was also created to promote formation of **Manos al Agua** groups to perform joint actions for water conservation as a great outcome, the result of a targeted awareness-raising process.

Importance of multidisciplinary teams

With an integrated approach, Manos al Agua-IWM proposed a work team with the capacities and attitudes necessary to address integrated management of the territories, the river basins, with implementation actions at regional and farm levels, providing continued support to producers and their families to improve their knowledge and strengthen adoption and appropriation of technologies and best agricultural practices.

The profile of the Project team members was as Rural Development Promoters (Figure 25), specialists in ecological wet milling, wastewater treatment, forest management, soil management, agronomic management and social work with communities, backed by a Cenicafé expert team that provided continued support to the technical team of promoters to strengthen transfer of knowledge, technologies and practices for a greater level of adoption and appropriation.

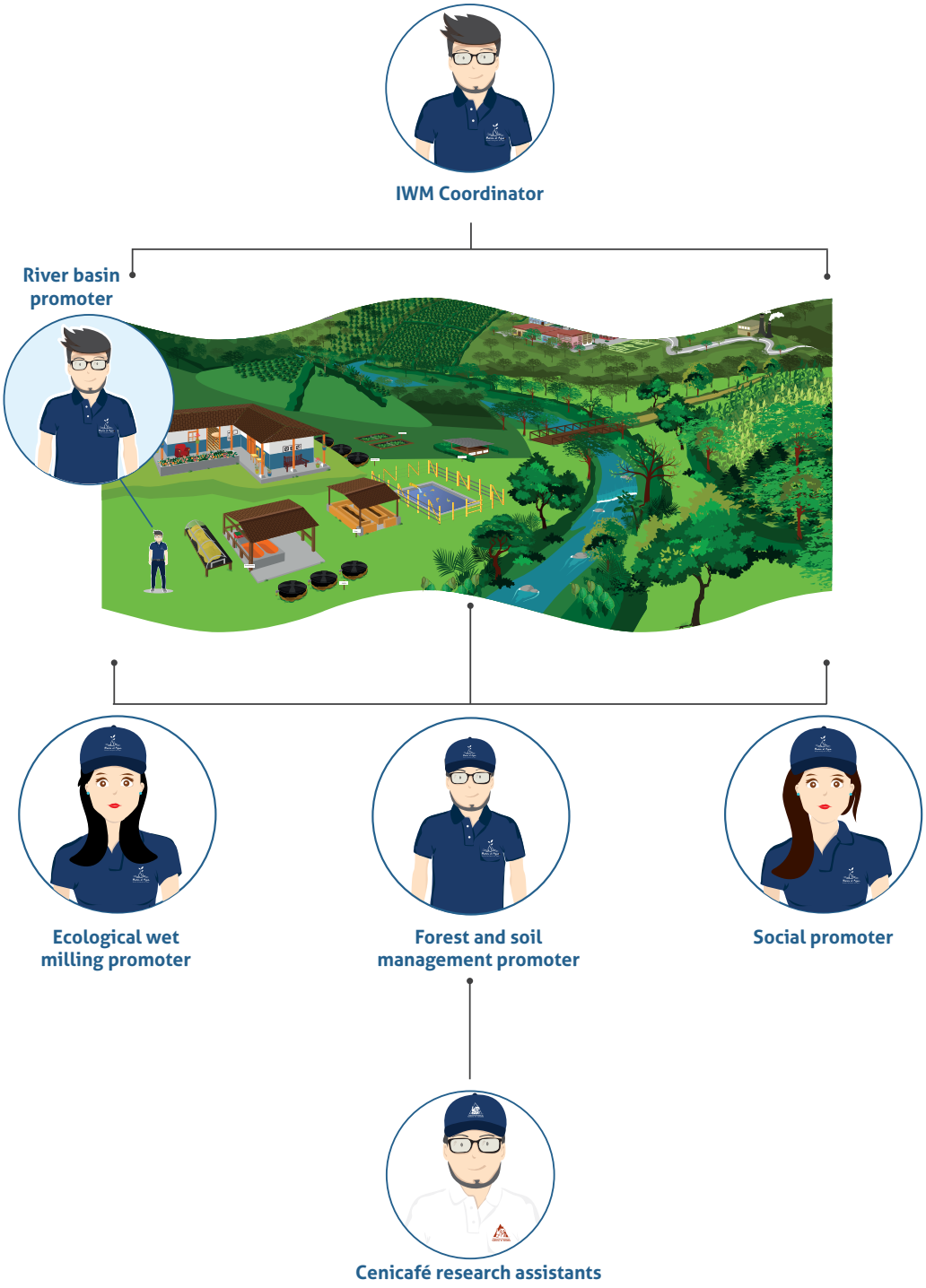


Figure 25. Diagram of interaction of IWM Project team of promoters in the river basins - Multidisciplinary teams.

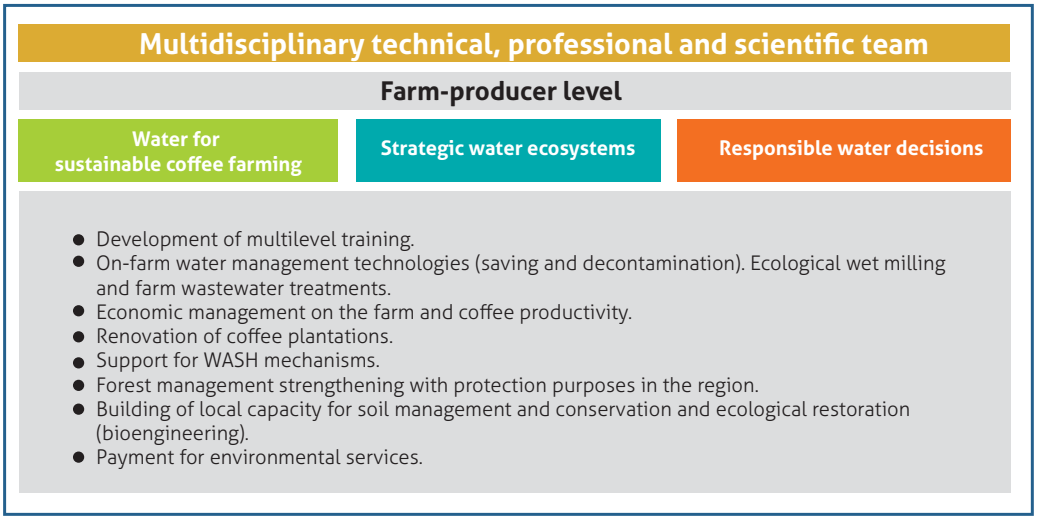
Implementation process

The implementation phase aimed to achieve higher levels of adoption and behavior changes through an integrated strategy that included awareness raising, training, technical and professional continued support by multidisciplinary teams, community empowerment, relationships between stakeholders, and sectoral and inter-institutional articulation, together with introduction of clean technologies. The model proposed by the Manos al Agua-IWM Project helped strengthen adoption and appropriation levels.

Supported by Theory of Change, actions were implemented at farm-producer, regional and institutional levels. Once the operational capacity was built, the next step in the implementation phase was the Project presentation and awareness-raising process.

The most relevant implementation phase aspects are mentioned below.

Implementation at farm-producer level



a. Development of multilevel training

With the challenge of strengthening the understanding of their territory, the river basin, and ensuring adoption of best water management practices on coffee farms, as well as community relationships, associativity, social responsibility and gender equity, it was essential to have a robust, rich training plan, but also pleasant, of easy understanding, and useful for participants.

The IWM training plan generated a model supported by the Manuel Mejía Foundation that built on the experience of different projects to strengthen pedagogical skills of Rural Development Promoters and Extensionists as instructors and facilitators. These improved skills helped them achieve a change of attitude and improve transfer of knowledge

and real use of introduced technologies and practices by producers and their families, looking at the present and at the future to propose doing things in an innovative way.

Manos al Agua-IWM training targeted producers, families, children, youth, women, communities, institutional staff, technicians and professionals.

b. On-farm water management technologies

The field implementation teams reached a degree of maturity with greater ability to manage technologies developed by Cenicafé to address situations on the farms, achieving a more integrated continued support to coffee growers and their families.

Water saving improvement or implementation on farms

Evolution of water consumption in ecological wet coffee processing has been fundamental, achieved through years of innovative work by Cenicafé. Table 15 summarizes wet coffee processing methods (from traditional to ecological).

Table 15. Wet coffee processing methods on the farm (from traditional to ecological).

Method	Description	Type of coffee grower	Water consumption (L/ kg of dpc)
Traditional wet milling	High water consumption in pulp removal, transport, and coffee washing. Cement tanks, without rounded corners, use of washing and classifying ("correteo") canal, among other features.	All	40
Ecological wet milling with tub-tank	Dry pulp removal, coffee transport without water. Tub-tank (plastic or stainless steel) with rounded corners for rational washing with water. Good wet milling practices.	Smallholder	5
Becolsub	Low water consumption in the process. Dry pulp removal. Mechanical mucilage removal.	Medium-sized	1
Ecomill®	Byproduct management. A clean technology using on average 0.5 L of water to process 1 kg of dry parchment coffee (dpc).	Large	0.5

This component employed the following options:

Full ecological wet milling module: With tub-tank for smallholder producers, and Ecomill® or Becolsub for medium-sized and large farms and community wet mills (producer groups). Producers were supported with a complete ecological wet milling system to efficiently perform the process, with significant water saving.

Complementary actions in ecological wet milling: Some type of device to strengthen or improve existing ecological wet processing, either tub-tank, dry hopper, pulping machine or general infrastructure (only one or a combination of some of these elements).

In this case, producers were supported to complete ecological wet processing and ensure high water saving efficiency.

Sanitary water saver: Mechanism to avoid water waste and rationalize discharges at sanitary level, saving up to 50% of water.

On-farm wastewater treatment improvement or implementation

For improving or implementing wastewater treatment on the farm, three types of integrated solutions were employed.

Coffee wastewater treatment

Coffee growers were provided with full Modular Anaerobic Treatment Systems (SMTA) or complementary solutions to achieve full functional systems on the farms. In the case of Valle del Cauca, biodigesters were implemented, meeting a double goal: to treat coffee wastewater (alone or mixed with pig-farming wastewater) and to produce biogas (systems endorsed by the Valle del Cauca Regional Autonomous Corporation and Cenicafé).

Domestic wastewater treatment

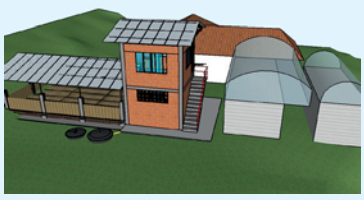
Coffee growers were provided with partial or full septic systems and grease traps.

Wastewater post-treatment (artificial wetlands)

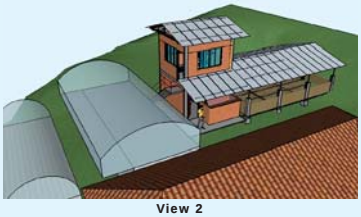
The last phase of the wastewater treatment system seeks to complete the scheme and ensure proper final disposal of farm wastewater; this system of artificial wetlands with aquatic plants receives both coffee and domestic wastewater. Its installation was prioritized on the most critical farms (those with direct polluting impact on water sources).

Community ecological wet mills

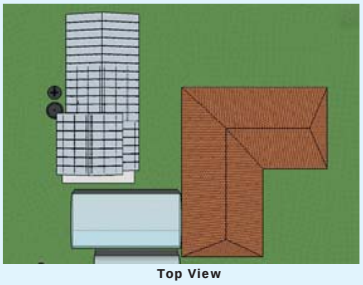
To contribute to improving rural infrastructure, reducing water consumption and ensuring good coffee byproduct management in a centralized way, with positive regional and environmental impacts and by encouraging use of available resources, Community Ecological Wet Mills were developed as an alternative, using the Ecomill® technology developed by Cenicafé to involve a number of coffee farmers, mainly smallholders, with deficiencies in the post-harvest infrastructure on their farm.



View 1

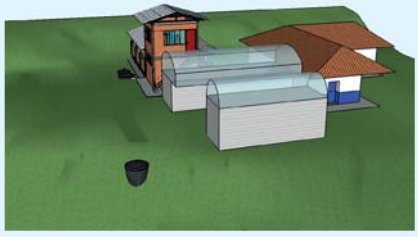


View 2



Top View

Image of El Bosque farm



View 3

Designed: POSCOSECHA			22/06/2016	Project Cafexport FARM EL BOSQUE -SALAMINA WET MILL ECOMILL® 1500	Plan 1/8
Drew: Ing. Carlos Tibaduiza			13/01/2017		
Reviewed: Arq. Cesar A. Ramirez			13/01/2017		
Reviewed: PhD. Carlos E. Oliveros			13/01/2017		
Reviewed: PhD. Juan R. Sanz			13/01/2017	Contains General Location	
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POST-HARVEST

:: Proyecto "PERFORMANCE" :: Federación Nacional de cafeteros de Colombia. Centro Nacional de Investigaciones de Café - Km 4 vía antigua Chinchiná Manizales - 24 Octubre de 2016 ::

c. Farm economic management and coffee productivity

A successful coffee entrepreneur must have clear purposes and make appropriate decisions to manage their business, which requires having available information to make decisions and, in this way, obtain better results at reasonable costs.

The farm economic management plan developed by the Project worked in different key areas at farm level: business production structure, technical-economic indicators of coffee farming (ITECs, the acronym in Spanish), budget, production costs, and monitoring and control of production activities of the coffee business.

Economic management of the coffee business involved a training process that included the following topics (considered in the IWM Multilevel Training plan):

- Diagnosis of the coffee business and implementation of record keeping.
- Management of coffee farming technical-economic indicators.
- Budgeting and production costs.
- Coffee business production alternatives.

In addition, the practice of renovation of coffee plantations was one of the essential activities among crop management factors, which impacted production and profitability. The highest yields per area and environmental stability were obtained in coffee regions where coffee crop renovation with resistant varieties was strengthened, replacing aged coffee plantations and those with rust-susceptible varieties.

The Manos al Agua-IWM Project, in line with the institutional strategy **"More agronomy, more productivity,"** promoted crop renovation (by planting resistant varieties) to achieve young and productive coffee crops; aged coffee plantations cause losses due to lower quality, lower production, and higher production costs, affecting competitiveness and coffee business resource management.

This work plan, in line with the farm economic management plan, managed to:

- Promote production stabilization on coffee farms.
- Provide technical assistance for proper soil management and establish agroforestry coffee systems according to soil conditions of plots and the region's climate.
- Promote rational and timely fertilization based on soil analysis.
- Provide ongoing technical support specialized in this work for application of best agricultural practices (BAPs).

d. Support for WASH mechanisms - Drinking water and sanitation for health of producers in the Project river basins

The Project provided support with different mechanisms to strengthen access to improved water sources for domestic consumption, basic sanitation facilities and activities involving producers, their families and communities to create conditions that enhance quality of life on the participating farms.

The actions developed improved **supply of drinking water (safe water)** for human consumption: better quality of water consumed by farmers, their families, workers and other community members to reduce prevalence of water-borne diseases.

Actions developed
• Supply of drinking water filters to coffee-farming families and community purifiers to rural schools.
• Recovery of effluents in a feasible and safe way. Support in management of springs that supply water for domestic consumption; forest enrichment and restriction of access of animals to springs.
• At basic sanitation level, improved sanitary management and domestic wastewater management and treatment on the farms.
• Improved solid waste management on farms to minimize impacts on the environment and health of families; better understanding of the problem to improve order, sanitation and hygiene at households of coffee-farming families.
• Improved disposal of solid waste on the farms.
• Continued support, awareness raising and training for adoption of good hygiene practices on the farm.

e. Strengthened forest management with protection purposes in the regions

The Project led communities to perceive forest covers positively, not only for their productive use, but also for their function of protecting the ecosystem (water, soil, production systems, fauna, etc.). The IWM Project worked on generating this perception change as to what a forest represents for the community, for real changes in landscape over many generations at the level of producers, their families and communities.

The forest models (landscape management tools) most commonly used in the IWM strategy, taking into account conditions and needs of regions and farms, and willingness and commitment of producers and families, were the following:

- **Enrichment and protection of water sources:** With the purpose of protecting and conserving natural drainage and ensuring availability of water resources.
- **Hedges:** Those in which, instead of wood, bamboo or cement poles, live trees are used.
- **Trees on paths and boundaries:** They delimit farms, enrich lots or paths, and beautify the landscape.
- **Conservation corridors:** Areas that work as forest connections.

These forest models were addressed in the regions through two modalities:

Forest management with incentive

Promover la siembra de especies forestales nativas mediante el pago semestral de un incentivo monetario, para realizar el mantenimiento del modelo forestal establecido.

Forest management by promotion

Planting of native forest species was promoted by involving the community in a voluntary participation process. This component did not require the payment of incentives. Voluntary planting and forest management activities by communities and Manos al Agua groups, through landscape tool models, outnumbered incentive forest management activities and strengthened actions for connectivity and protection of water body channels in their regions, focused on their territory, the river basin.

f. Local capacity building for soil management and conservation and ecological restoration (Bioengineering)

40% of Colombian soils show some degree of erosion. Coffee farms, households, roads and schools are seriously affected by this situation. The IWM Project, through a participatory strategy and joint implementation (with the community) of soil conservation practices and intervention of mass movements (with bioengineering works), provided the territories with a concrete response to this problem.

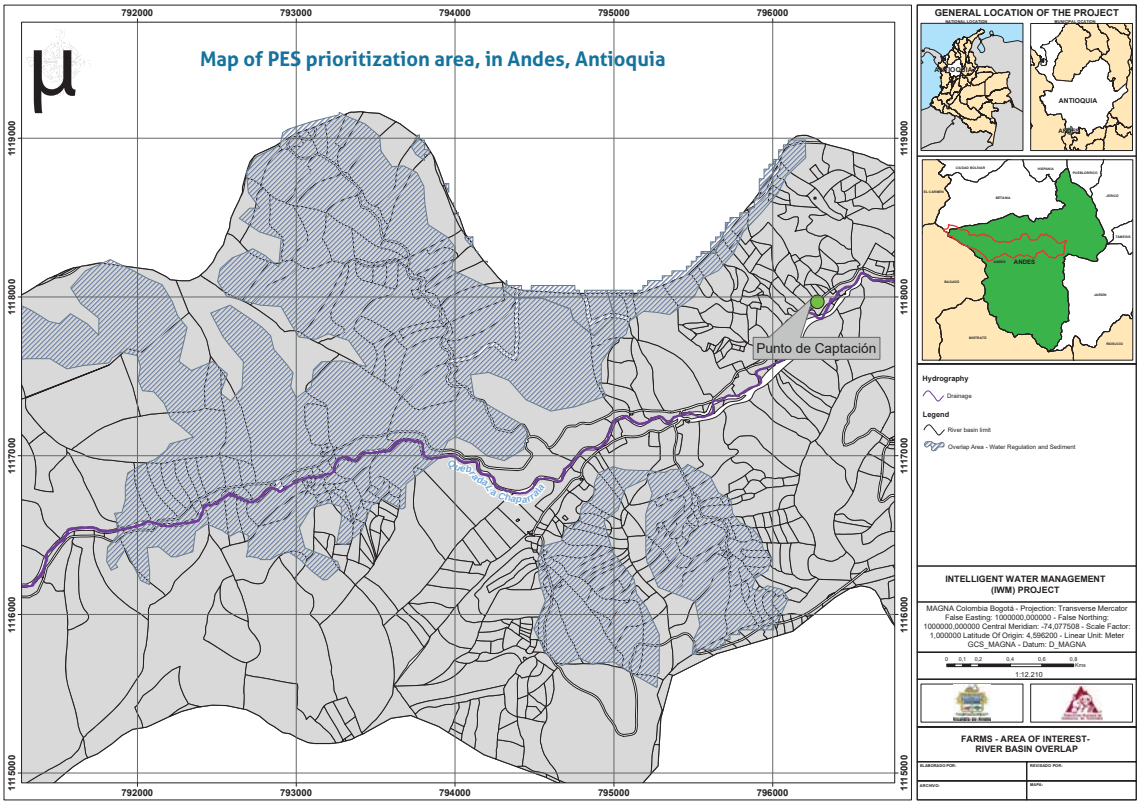
Bioengineering activities for soil management and conservation and ecological restoration built knowledge and local capacity to face this problem in a technical but more determined way.

g. Payment for Environmental Services (PES)

Payment for Environmental Services has emerged as an option to recognize environmental benefits of decisions made on farms and, with these resources, finance solutions to stop degradation of ecosystems and make economic growth, social development and environmental conservation compatible in each region.

In La Chaparrala river basin, in the municipality of Andes (department of Antioquia), in the area of San Perucho-San Peruchito, Morro Seco and El Cardal, the Project worked on development of payment for environmental conservation service.

The area was selected for its importance, as it is the river basin area that holds the most water and where more sediments are produced, a priority area for water supply to the municipal aqueduct and, therefore, a site of the greatest relevance for the PES. In the process of materializing the PES in the municipality of Andes, the Mayor's leadership was outstanding, due to commitment to improving quality of life of the community.



Implementation at Regional Level

Multidisciplinary technical, professional and scientific team

Regional Level

- **Water is everybody's business**
- **Water for sustainable coffee farming**
- **Strategic water ecosystems**
- **Responsible water decisions**
- **Good governance gender - risk**

- Articulation with stakeholders in the regions
- Involvement of communities and work on community strengthening Communications plan
- Key elements for transfer and sustainability of actions
- Strengthening of climate monitoring in the region for early warning service
- Monitoring of water quality in the river basins
- Gender and social responsibility strategies
- Manos al Agua-IWM Project risk monitoring

a. Articulation with stakeholders in the regions

Since landscape configuration is different and there are many land uses and multiple territorial objectives (economic, environmental, social, etc.), the relationship with all stakeholders is necessary. This relationship seeks meeting points, collective needs and synergies that enable coordination between organizations, institutions and communities for work on integrated water resources management. For this purpose, the IWM Project developed a platform that generated meeting and collective action spaces.

New partners believed in the project and joined the initiative during the 5 years of implementation through the Manos al Agua Platform.

b. Involvement of communities and work on community strengthening

The community was empowered to be managers of their territory, seeking to increase the odds that the IWM Project actions are maintained after the implementation phase. In this sense, through awareness raising, training, delivery of communication tools and empowerment of women and their families, a social fabric was built, enabling coffee farmers to project themselves in the coffee business and at community level, considering their natural environment as a finite resource that needs to be sustainably managed.

With community organizations formed at river basin level, associative work models have been promoted to build trust among participants and establish a base of people to consolidate and renew the social network in the region, a *sine qua* non condition to establish transparent and efficient governance, promoting and strengthening licit production alternatives for income generation, actions to improve proper water resources management, and achieve better quality of life for river basin inhabitants.

c. Communications plan

For good implementation, a unique identity was developed as a Project tool, which enabled visibility and positioning of Manos al Agua-IWM at all interaction levels, seeking differentiation from other water-focused strategies. An image and clear, integrating messages for all actions were created. Building the brand increased visibility and positioning to mobilize stakeholders towards achievement of the Project objectives.

The integrated communications plan facilitated interaction and participation of Manos al Agua stakeholders, which contributed to effective implementation of its different components. It was based on the principles of transparency, accountability and social responsibility.

VERSIONS

d. Key elements for transfer and sustainability of actions

The transfer and sustainability process is essential in project management, seeking to transcend from an assistance approach to a participant self-management approach to ensure that results will last over time and be sustainable under a systemic approach related to economic, environmental and social factors.

The analysis to advance towards transfer and sustainability in the IWM Project was based on the continuous improvement cycle Plan, Do, Control and Act (PDCA), whose purpose was: "To contribute to appropriation and maintenance of benefits and capacities generated in the influence areas of the Manos al Agua-IWM Project."

With methodological workshops, these terms were conceptualized:

- **Transfer:** Within the framework of integrated river basin management, transfer is an integrated, collaborative and multidisciplinary process through which knowledge, technologies, resources (physical, human, financial) and responsibilities are delivered to local actors for their complete self-management so that benefits of the Manos al Agua-IWM Project are maintained or strengthened over time.
- **Sustainability:** Capability to articulate the results (economic, environmental and social) achieved in the area of influence towards integrated river basin management, ensuring that they are maintained or strengthened over time once the Manos al Agua-IWM Project activities are completed.

The transfer and sustainability strategy in Manos al Agua-IWM contributed to appropriation and maintenance of the benefits and capacities generated in the areas of influence.

To contribute to sustainability of the IWM Project in the long term, the communities' needs and their active participation throughout the implementation process were considered, from identification of problems and action alternatives to appropriation and maintenance of results once the implementation was completed. In addition, to ensure success and durability of actions, **priority was given to consolidation of relationships with the partnership members, adequate and timely use of resources, and guaranteeing relevance of the Project.**

The plan was the roadmap to guaranteeing achievement and durability of the proposed objectives, according to financial, institutional, environmental, technical and social aspects, based on sound understanding of the local context, identifying and evaluating risks for their management and monitoring, providing spaces to generate ideas and creative and innovative approaches to achieve results.

Five transfer and sustainability factors were established, which were essential to obtaining sustainable and successful results:

Awareness raising and continuous training targeted families, children, young people, women, institutional staff and public and private organizations and entities. These processes fostered leadership, empowerment, individual and collective values and principles, community organization, management capacity, knowledge and generational change, strengthening local capacities for better river basin management aimed at integrated water resource management. They were supported with a methodology of work with children and young people in the communities, and involvement of educational institutions in the rural sector.

Continued support by the **multidisciplinary** technical and professional team to consolidate Technical Assistance and Rural Extension, developing and applying participatory and socio-institutional understanding methods to promote community processes of integrated IWM river basin management.

Community participation - social capital. Individual effort was combined with collective action through generation and strengthening of community participation. The Project contributed to creation and strengthening of groups and networks in each of the intervention areas, providing fundamental elements of connection and social cohesion.

Stakeholder articulation. Good governance and Integrated Water Resources Management required dialogue and participation of different regional, national and international stakeholders that influence water regulation and use and are affected by climate change and water imbalance impacts, fundamental aspects to promote a joint strategy and generate replicability and scalability of actions.

Communication provided, in a reliable and timely manner, information and thematic knowledge and disseminated principles, purposes and progress to different stakeholders; it sought to integrate and capitalize on the partners' interest, experience, and willingness to ensure transparency about contributions and achievements during the Project lifecycle through assertive, relevant, timely, and specific dissemination mechanisms.

Details on this topic can be found in the publication on **IWM Transfer & Sustainability Systematization.**

e. Strengthening of climate monitoring in the region for early warning service

To cope with climate variability, it is of vital importance to have measuring tools that generate the necessary knowledge about climate dynamics. Understanding patterns of climatic variables and the response of the system parts (soil, vegetation, fauna, people, etc.) to them allows anticipating events and seeking ways to deal with them, improving resilience of coffee farms and communities. By strengthening the country's Coffee Agroclimatic Platform (network) with installation of new automatic weather stations, the IWM Project has enhanced this process, enabling activities in the future for better adaptation to climate variability.

The climate monitoring stations are necessary to generate daily data of variables that feed agro-hydrological models and generate historical climate series, in order to provide information on climate variability and weather behavior over time in the coffee regions. With the information generated and interpreted, the Project contributed to strengthening the climate early warning mechanism at the service of Colombian coffee growers, to thus reduce the risk posed by climate variability to coffee production.

f. Monitoring of water quality in the river basins

The Project impact was measured by monitoring bodies of water in each of the 25 river basins, seeking to determine the direct effect on water quality of the integrated actions developed. In this sense, both human and infrastructure capacity was built to develop measurement methods that respond to nature and conditions of Colombian coffee regions.

This effort not only confirmed positive impacts of the Project integrated actions, but also laid the foundation to monitor water quality according to realities of different territories and landscapes in our country.

The water quality monitoring methodology integrated 34 variables defined under international protocols, giving strength to the Project model.

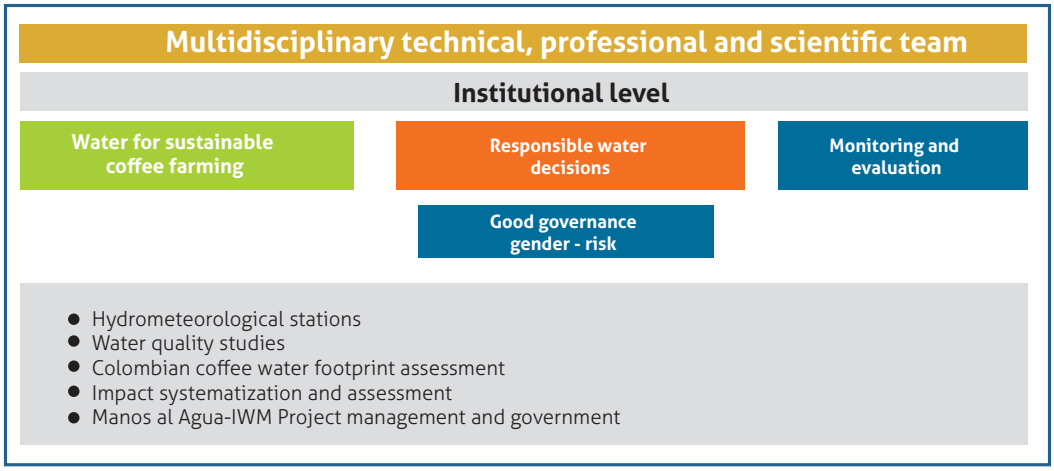
g. Gender and social responsibility strategies

As part of the IWM social component, a process was led to incorporate the gender component in all the Project activities. Given that women are key players in water governance and their participation in community spaces has been unequal, the Project considered that their empowerment would lead to changes in water use and, for this reason, aimed at promoting women's leadership in the family and community contexts to establish water management systems in coffee farming at local level.

h. Manos al Agua-IWM Project risk monitoring plan

Ensuring success of the Manos al Agua-IWM Project implied making decisions under uncertainty conditions. The size of interventions increased the level of uncertainty due to a combination of internal and external factors that affected positively or negatively the implementation. The Risk Management Plan defined parameters for identification, assessment and management of risks for each Project work plan, supporting management and good governance processes.

Implementation at Institutional Level



a. Manos al Agua-IWM Project management and governance

Management of the PPP was supported by different governance bodies that provided ongoing support to the Project Direction:

- Steering Committee (SCo). Permanent body made up of four representatives of the Founding Partners' management. The Steering Committee was made up of a President and a Secretary elected by the SCo members. The role of SCo included:

- To supervise spending of contributed funds, budget and all financial matters.
- To share information about programs and policies related to key action areas.
- To appoint the Project Manager (Director) for specific projects, according to the Top Member proposal.
- To set priorities for specific work plans proposed.
- To determine impact, scope and regions/departments for implementation of the Project activities.

- To set Project communication milestones.
- To invite and accept collaborating parties (new partners).
- To review activities and progress of specific work plans.
- To give instructions to the Technical-Scientific Committee and other Committees.
- To decide on main issues related to work plans, partnership, budget, and project adjustments, and declare a party in failure to fulfill, progress and completion.
- To issue rules and guidance for specific problems.

- Technical-Scientific Committee (TSC). The TSC was a key "decision body" within the Project governance structure, responsible for guiding technical and scientific issues, as well as the IWM Project innovation strategy. The TSC guided also the Project management phases for practical implementation in the field of technical and scientific solutions selected. Functions of the TSC were:

- To analyze findings and make decisions on the best solutions and most profitable technical recommendations for the Project and provide continued support in design and development of knowledge generation and transfer activities.
- To ensure scientific and technical quality of all the Project activities.
- To support and make decisions on development and implementation of the Planning, Monitoring and Evaluation System (PME), serving as a bridge between technical implementation and Project management.
- To advise and support the Steering Committee in making of technical decisions.

- Operating Committee (OC). The Operating Committee was an organ at the Colombian level that accompanied the Project technical and financial implementation. The functions of the OC were:

- To provide continued support, monitor and review the Project progress in its implementation phase from the technical point of view.
- To support mechanisms to measure its impact.
- To make suggestions and proposals on implementation changes or adjustments to strengthen or improve the Project progress for achievement of results.
- When necessary, to escalate recommendations to the Technical-Scientific Committee or Steering Committee.
- To support analysis and resolution of situations, from the technical point of view, during implementation of the different Project work plans and as required by the IWM Direction and Coordination.
- To ensure that the proposed Project activities were aligned with objectives of the AAA Program, Nescafé Plan and FNC institutional programs.

Manos al Agua-IWM Project closing phase

Closing of the Manos al Agua-IWM Project had a fundamental period of time of four months that ensured completion of the period of implementation and financial realization through a process balance to determine if results had been achieved and objectives and expected benefits had been reached. It involved a phase of review of completion of the Project missing technical details and oversight of works to ensure that they were completed.

The following stages of the Project closing phase are highlighted:

- Closing of procurement, as a process to complete each Project acquisition. At the end of each contractual relationship, contracts had to be settled and their status verified in logistical and financial system processes.

- Release of resources. Closing in all areas to consolidate budget realization and account for unused remaining resources.

- Results and impacts. Process of consolidation of results and analysis to determine achievements and impacts from baseline; Project cost performance analysis (Planned Value-Actual Cost-Earned Value).

- Knowledge sharing. For this purpose, the experience, results and learning achieved were captured in development, structuring and design of 16 publications.

- Final Report. Update of Project documents and preparation of both technical and financial Final Reports.

Summary

This chapter presented the four phases of the Manos al Agua-IWM intervention model: planning phase for river basin management, operational capacity building phase, start of phase of implementation in the river basins, and closing phase, each with its outstanding differentiating characteristics and elements, which supported the process during the five years of the Project lifecycle.


Manos al Agua

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

MANOS AL AGUA-IWM STRATEGY IMPLEMENTATION RESULTS

6

We created resilient territories through an integrated water resources management project in Colombia, with positive impacts on nature and communities.

This chapter presents the main implementation results of each work plan of the Project components: Water is Everybody's Business, Water for Sustainable Coffee Farming, Strategic Water Ecosystems, Responsible Water Decisions, and Project Management, Good Governance, Risk Management, Gender and Social Responsibility.

IWM Project results by component

A total of 93 activities were performed at farm, regional and institutional levels in the 24 work plans during the implementation years to achieve objectives and meet set goals.

Success of results was based on the Project's holistic approach. The work plans oriented actions to solve the problems found in the river basins, involving farmers and their families, with community and regional management actions. The IWM river basin management plan considered the farms as the basic intervention and management units to transcend to territorial level.

Water is Everybody's Business component

This emphasized the **regional** level, involving communities and coffee producers, as well as other stakeholders, in collective learning. People and institutions have become more aware of their roles regarding water and the need for dialogue. An effort was made to share the Project achievements and impacts.

Water Platform

The IWM strategy encouraged dialogue, participation and effective cooperation among various actors involved in integrated water resources management in their regulatory role or influence as river basin water users, civil society and knowledge generators (Figures 26 and 27).

RESULTS

- **58** new partners formalized their participation (Figures 26 and 27).
- **7** sectors committed.
- **48%** of new partners were from the public sector (Government of Colombia).
- Over **120** management meetings for involvement of new partners and articulation of actions.
- Additional contributions by new partners worth **1 million euros.**
- **15** regional meetings with new partners.
- Strengthening of regional coordination with actors.
- Website operating and means to support the Platform work.
- Achievement of **110%** of set goals.

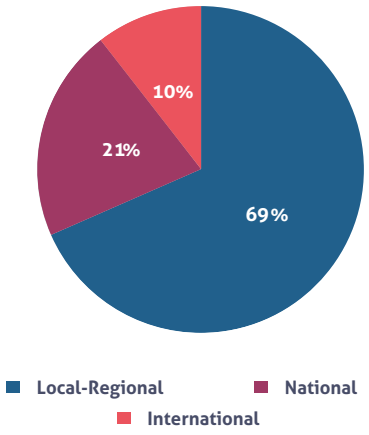


Figure 26. Distribution of new IWM Project partners by scale.

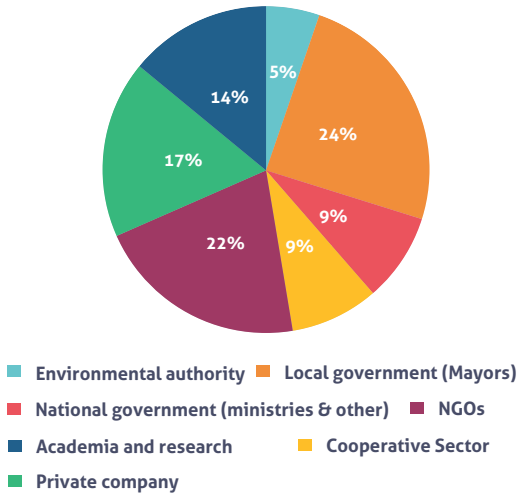
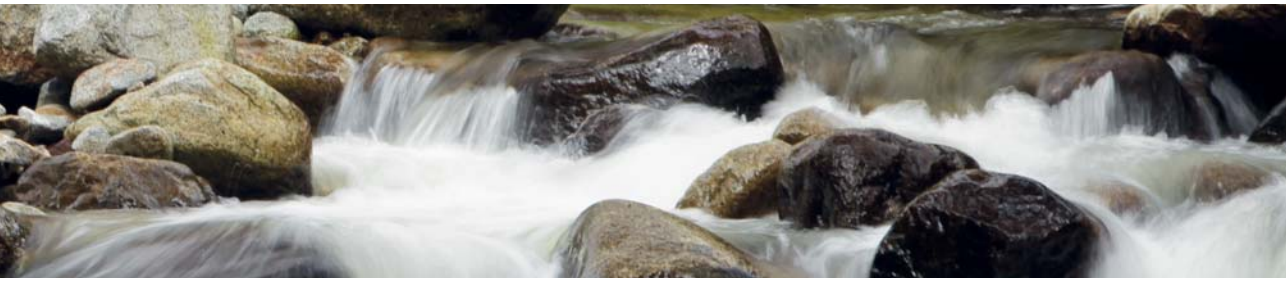


Figure 27. Distribution of new IWM Project partners by sector.

Water Learning Network

With an online platform created to share information about water, the environment and other issues related to Project results, this network included the participation of different stakeholders (Table 16) through forums, working groups, document repository, news and event calendar, among other mechanisms. The professional interaction plan included a series of webinars, virtual conferences, virtual workshops and online courses, involving actors from different areas through in-person activities.



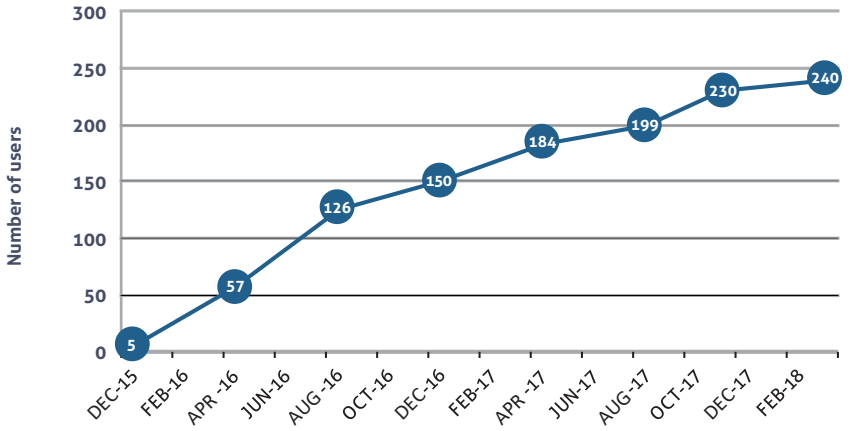


Figure 28. Evolution of user registrations in the IWM Learning Network.

RESULTS

- A Virtual Learning Network tool in English and Spanish for interaction between the main stakeholders (Figure 28).
- Over **240** active registered users in Colombia and Europe took part, including IWM staff and professionals from areas focused on the environment.
- **22** virtual sessions for expert and professional interaction, with over **460** participants.
- In-person relations with **3** seminars at European level and **1** seminar at Colombian level, with approximately **500** participants.
- Participation in **6** international conferences.
- Achievement of **160%** of set goals.

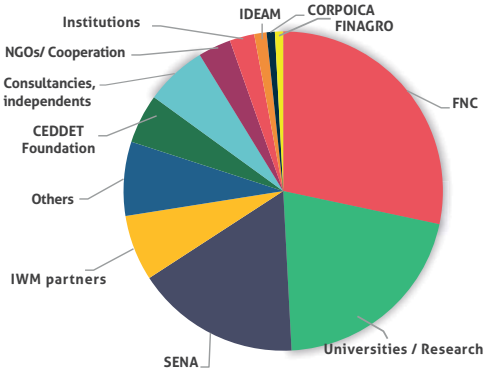


Table 16. Distribution of Network members by organization categories

Categories	Participants	(%)
FNC	68	28%
Universities / Research	50	21%
National Learning Service (SENA)	40	17%
IWM partners	16	7%
Others	18	8%
CEDDET Foundation	12	5%
Consultancies, independents	15	6%
NGOs/Cooperation	8	3%
District/departmental/ regional institutions	6	3%
IDEAM	3	1%
CORPOICA	2	1%
FINAGRO	2	1%
Total	**240**	**100%**

Community participation

For integrated river basin management, working with the community, producers and their families was essential; local capacity was built with them for good water governance. The IWM Project achieved its impact with the strength of community collaboration, which exceeded individual efforts: A key element of the Project was the Manos al Agua community groups, in which coffee-growing families worked together in the river basin.

RESULTS

- **29** local Manos al Agua groups formed and operating, with over **645** members working for consolidation and development of their territory. Five structures of departmental Manos al Agua groups defined.
- **56%** of participants in local Manos al Agua groups were women (Figure 29).
- **25** regions with communities organized for strengthening good local water governance, with a gender equity approach and participation of families in activities.
- **9** regional meetings and **1** national meeting of Manos al Agua groups. Over **400** participants in these community relationship activities.
- **760** activities with Manos al Agua groups based on their work plans.
- **93%** of Manos al Agua groups with legitimate participation in Community Action Boards (JAC), work groups for formulation of POMCAS (river basin management plans), aqueduct boards and training activities with schools.
- **31%** of groups participating in work groups for structuring of POMCAS.
- Achievement of **116%** of set goals.

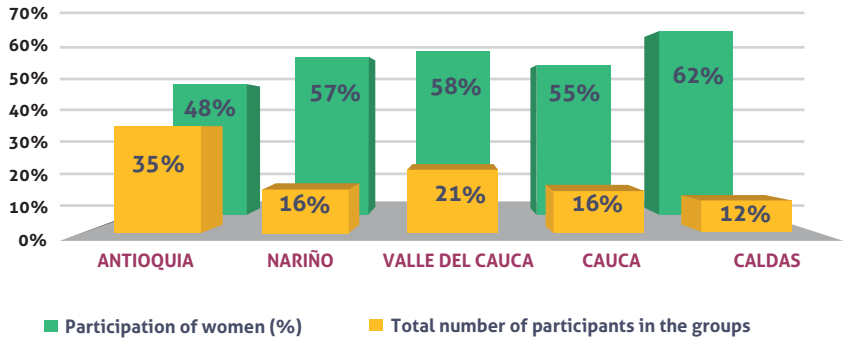


Figure 29. Distribution of participants in Manos al Agua groups per department (members and gender).

Details about the Community Participation and the Gender and Social Responsibility plans can be found in the publication **"Coffee communities for good water governance."**

Communications plan

Within the IWM Project, the communications plan was defined as the set of channels and strategies to provide information and thematic knowledge and disseminate the IWM principles, purposes, progress and results to the different stakeholders (Figure 30).

RESULTS

- Public presentation of the Manos al Agua Project in Bogotá (April 8, 2016) and The Hague (May 27, 2016) with participation of partners and stakeholders.
- Presentation at the World Water Forum (Stockholm, August 2017, and Brazil, March 2018).
- Mechanisms for national and international communication: webpage, music, radio programs, videos, brochures, and two TV programs, The Adventures of Professor Yarumo on IWM.
- Over **249** articles and news items published about the Project (internal and external).
- Over **20,000** pieces of printed material distributed (brochures, calendars, among others).
- Social media:
  - Facebook: **3,000** followers • Twitter: **+700** followers • Instagram: **+200** followers
  - YouTube: **8,000** views • Over **312,000** text messages
- In **2017**, Manos al Agua-IWM won the National Ecology Award Planeta Azul in the business category.
- In **2018**, Manos al Agua-IWM won the SCAA Best Sustainable Project Award.
- At least 7 other recognitions and awards in **2016-2018**.
- **20** publications by the Manos al Agua Project.
- **60** videos on the Project experiences and results.
- Achievement of **100%** of set goals.

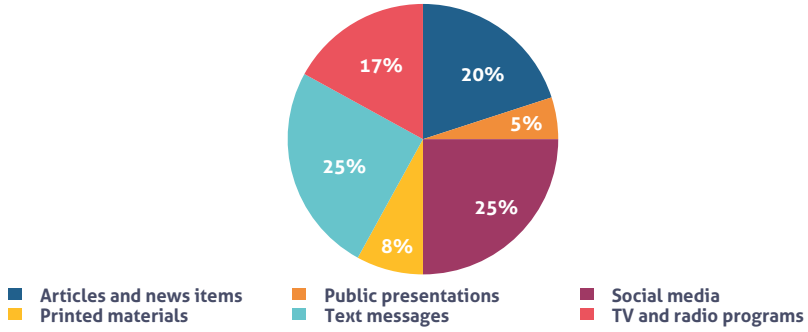


Figure 30. Level of importance of communication channels most used in Manos al Agua.

Complementary projects

Different strategies in the five Project departments increased the impact of actions: A mechanism of partnerships with other actors through the Manos al Agua Platform and a scheme of initiatives proposed by communities and developed within the framework of the community groups.

Aware of their territory and needs, communities and producers were trained and empowered to do joint management and activities, with new ideas to solve environmental problems and respond to needs of the region (Table 17).

RESULTS

- Over **50** complementary projects structured to increase IWM impact and promote sustainability of landscape management.
- **56%** of these projects were implemented.
- Total contribution of complementary projects was worth over COP 1,500,000,000.
- Achievement of 100% of set goal.

Table 17. Complementary projects structured and implemented per department.

Department	Projects structured	Projects implemented	Participation per region
Antioquia	13	7	26%
Caldas	5	0	10%
Cauca	15	9	30%
Nariño	12	8	24%
Valle del Cauca	5	4	10%
Total	**50**	**28**	

Impact of the component Water is Everybody's Business is demonstrated by the fact that, through the Manos al Agua Platform, new partners joined the Project and supported it with their own funds. In addition, community participation committees developed capacity to manage local resources in a sustainable manner. These committees were organized following a gender equity approach and with participation of all family members in activities.

Water for Sustainable Coffee Farming component

This emphasized work at farm level. The largest component from the point of view of interventions, it helped develop and consolidate coffee farms with a sustainable approach based on continuous improvement plans, through training of farmers and their families and professional continued support to ensure success of technology transfer, from research to practice, to reach higher adoption and appropriation levels.

Economic analysis at farm level

The IWM Rural Development Promoters led the process of administrative and economic training for producers and their families, with tools adopted by them to efficiently manage the business within the Program "Management of the Coffee Business."

Implementation of the process Management of the Coffee Business, with participation of the IWM coffee farmers, systematically strengthened the record keeping process, based on real data of smallholder, medium-sized and large farms, contributing to better understanding of the economic aspects of coffee production to increase profitability opportunities (Figure 31).

The IWM Project contributed to the FNC Business Management Program. Its contribution in tailoring the Business Management Course "Management of the Coffee Business" and in development of the Business Management Application, as support for the analysis of the coffee business, was relevant.

Manos al Agua backed the methodology developed by the FNC Technical Division and supported national coffee farming with a replicable strategy and mechanisms that transcend to the whole Colombian coffee sector. Table 18 shows an exercise that compares, between 2015 and 2016, production and costs of IWM smallholder (S), medium-sized (M) and large (L) farms in five coffee departments.

RESULTS

- **1,220** farms involved in Business Management and training. Strengthening of management and record keeping on farms.
- SROI impact assessment.
- Achievement of **105%** of set goal.

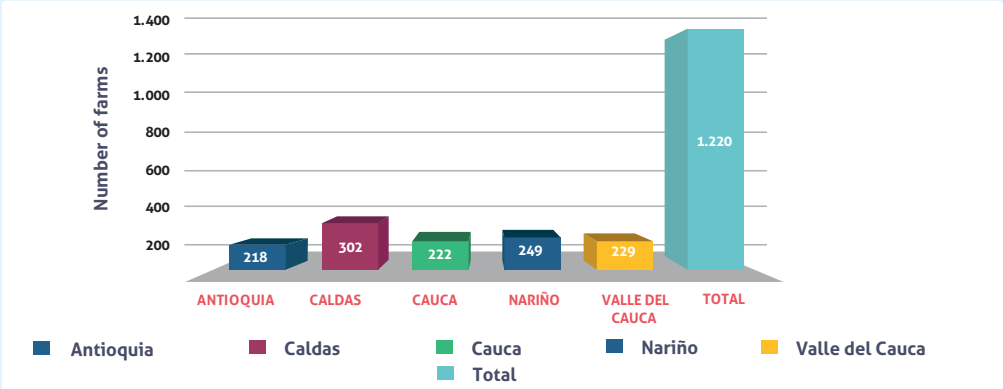


Figure 31. Farms participating in the program "Management of the Coffee Business" per department.

The importance of results of Table 18, with information taken from farms of the sample, lies in the differences that begin to appear in production and costs from one year to the other, showing evident improved production and cost rationalization, which enables control in information gathering and use of technical-economic indicators (ITECs), among other advantages.

Table 18. Comparative analysis of production and costs on coffee farms. Years 2015 and 2016.								
Report on production costs on farms- 2015								
Department	Weighted production (loads/ha)				Weighted cost ($)			
	S	M	L	TOTAL	S	M	L	TOTAL
Antioquia	23.8	27.6	22.8	23.9	$ 551,882	$ 564,205	$ 385,993	$ 618,166
Caldas	22.0	21.5	0.0	21.9	$ 454,268	$ 482,868	$ 0	$ 528,319
Cauca	15,7	14.8	17.8	15.8	$ 518,243	$ 362,714	$ 349,523	$ 508,317
Nariño	14.0	11.0	0.0	13.9	$ 529,502	$ 621,911	$ 0	$ 530,506
Valle del Cauca	14.9	18.3	17,4	15.4	$ 566,028	$ 568,736	$ 618,979	$ 573,064
	15.9	**15.7**	**21.6**	**16.3**	**$ 567,479**	**$ 574,753**	**$ 590,732**	**$ 570,277**

Table 18. Comparative analysis of production and costs on coffee farms. Years 2015 and 2016.								
Report on production costs on farms- 2016								
Department	Weighted production (loads/ha)				Weighted cost ($)			
	S	M	L	TOTAL	S	M	L	TOTAL
Antioquia	32.5	33.9	18.7	31.5	$ 528,604	$ 557,643	$ 557,628	$ 609,726
Caldas	25.5	30.1	0.0	25.8	$ 486,126	$ 482,868	$ 0	$ 557,870
Cauca	19.4	0.0	0.0	19.4	$ 446,164	$ 362,714	$ 0	$ 533,528
Nariño	17.6	17.9	0.0	17.6	$ 457,109	$ 621,911	$ 0	$ 535,964
Valle del Cauca	15.1	12.7	0.0	14.5	$ 489,853	$ 568,736	$ 0	$ 568,291
	22.2	**20,7**	**18.7**	**22.0**	**$ 479,951**	**$ 470,769**	**$ 557,628**	**$ 561.601**

Details on Economic analysis at farm level can be found in the publication "Economic impact on coffee farms in Colombia - Intelligent Water Management measurement model."

SROI impact assessment

The Social Return on Investment (SROI) analysis yielded a number of positive results of the Manos al Agua Project activities, reaching a SROI of **COP 5.06 per each Colombian peso invested,** with smallholder farmers and the environment benefiting the most.

The community said that the Manos al Agua Project was the first that, as long as they remember, carried out different actions on water care. While programs such as Nespresso and Rainforest Alliance work on environmental care and responsible coffee production, it was with the IWM Project, through the IWRM course and the Manos al Agua group, that people achieved more environmental awareness. An example of this is reflected in the initiative by the community of the "vereda" (rural district) Viboral, in the department of Caldas: through their Manos al Agua group leaders, they asked the municipal administration for the quarterly passage of a garbage truck, for which they were willing to pay a charge or economic fee, thus correcting the habit of burying or burning waste or its ending up on river banks.

Both the Project staff in the field and the community agreed that only a small fraction of results would have occurred without the Project (9.02%), except for renovation changes, as 77.8% stated that without the Manos al Agua-IWM Project they would have renewed crops anyway (though 21.4% acknowledged that it would have taken them one or two more years).

In contrast, changes related to capacities, skills, and technology adoption were unlikely, as only 0.63% would have occurred without the Project.

Stakeholders said that the Project was the main contributor to positive changes and the greatest IWM contribution was enabling, with its financial resources, actions by coffee institutions and other Programs.

The **final conclusion** in this aspect ¬¬of the Manos al Agua-IWM Project was that, for the changes evaluated, no evidence of displacement was found in results, which can be interpreted as an added value to these implementations because no problems or inconveniences were transferred to other places or communities.

Details on the SROI impact assessment can be found in the publication **"Manos al Agua Project Social Return on Investment Assessment - Case study in the Edén-Bareño river basin, in Aguadas, Caldas."**

Multilevel Training Plan

Rural Development Promoters did awareness-raising and training work with communities in the river basins to generate awareness, environmental ethics and social strengthening, which increased knowledge about soil and water conservation practices, promoting development of sustainable activities between coffee farmers and the ecosystem. Communities were expected to understand negative effects of some practices on the environment and to adopt good natural resource management practices, not only during the IWM Project implementation, but also putting them into practice in their everyday life.

The training work had an important focus on families and community groups (Figure 32), seeking to highlight the role of a woman (owner's wife) and young people (generational change).

RESULTS

- **74** professionals in the Manos al Agua-IWM Project training plan.
- Over **20 days** of in-person training for Project technicians and professionals in the 4 years of implementation.
- **4 virtual modules** developed by the Project for technicians and professionals on: Integrated Water Resources Management; Integrated River Basin Management; Associativity; Gender, Rights and Generational Change.
- Over **1,500 technicians** and professionals trained in the 4 virtual modules of the Project.
- **8 in-person training** modules developed for coffee growers, their families and the community.
- Complementary training by SENA as an ally of the IWM Project.
- Over **1,222** awareness-raising activities with **19,599** participants, **40%** of whom were women.
- Over **6,300** group activities with over **114,600** participants, including awareness-raising and training workshops; **45%** of participants were women.
- Over **9,000** training participants accredited (certificates by FMM-SENA).
- Achievement of **110%** of set goals.

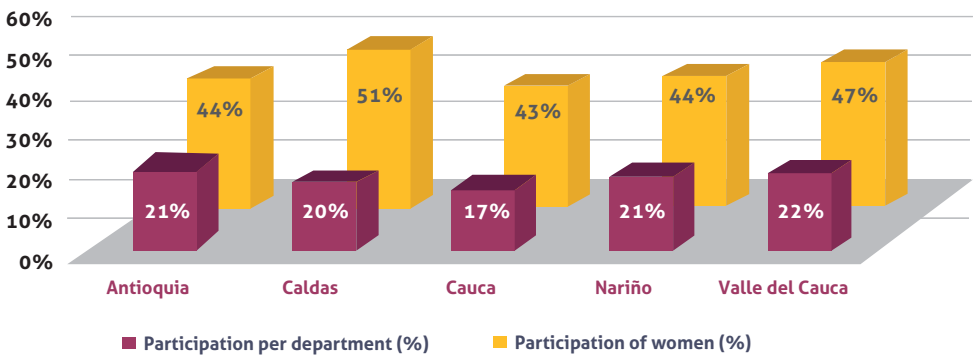


Figure 32. Distribution of participants in training activities per department and female participation.

Details about the training experience can be found in the publication **"Multilevel training in rural extension."**

Technical Assistance and Rural Extension Plan

As a core element for the implementation phase, a multidisciplinary **technical, professional and scientific team** provided continued support to farmers, their families and the community participating in the IWM Project.

RESULTS

- **100%** of IWM team members hired and trained (74 technicians and professionals).
- Multidisciplinary (technical and professional) team in the field made up of 45 professionals, providing continued support to producers and their families to develop improvement plans on farms.
- Provision of ICT tools to **45** field professionals.
- Continued support by Rural Development Promoters to producers and their families.
- Over **23,300 visits to farms** to develop improvement actions.
- **8,000 farms** with improvement plans based on their diagnoses.
- **100%** of coffee producers received technical assistance to adopt clean technologies and change behavior for better water resources management.

Details about the experience in Technical Assistance and Rural Extension, as well as work with Multidisciplinary Teams in the rural sector, can be found in the publication **"Technology transfer and rural extension - An FNC model in the Intelligent Water Management Project."**

On-farm ecological wet milling, water saving and water treatment plans

The Project showed a positive balance in implementation of water management solutions on farms (water-saving technologies, wastewater treatment systems, and water purifiers), aimed at reducing water use and achieving high decontamination levels (Figures 33 and 34).

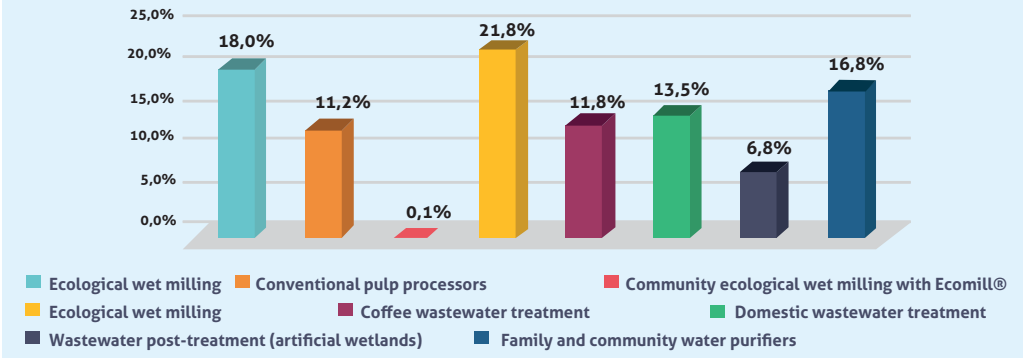


Figure 33. Distribution by type of on-farm water solution.

Figure 34. Distribution by on-farm water solution component.

RESULTS

- Over **5,603** on-farm water solutions provided.
- **29%** of IWM producers received a grant to install equipment and improve water solution processes on the farms (water saving, wastewater treatment systems, waste management, and drinking water filters).
- **2,243 farms** with water-saving solutions implemented (ecological wet coffee processing, water savers and pits).
- **1,730 farms** with coffee and domestic wastewater treatment solutions.
- **876** drinking water supply solutions in 25 river basins.
- **7** producer groups with over 100 members addressed community ecological wet milling.
- Achievement of **113%** of set goals.

Community wet milling is to be highlighted as a mechanism to encourage community work, water saving and improved disposal of waste and wastewater in the regions through **implementation of 7 community ecological wet mills for over 100 coffee farms.** They were designed taking into account harmony between technical, architectural and engineering aspects with social ones, and also their relationship with the coffee environment, efficient use of spaces required, materials and local labor, among others.

As to drinking water filters, implementation of over **800 family-type filters** for coffee farms is highlighted, benefiting a population of over **3,200 people.** Likewise, support was given to rural schools with provision of **78 community water purifiers**, benefiting over **4,600 children and young people** (Table 19).

Table 19. Summary of rural schools equipped with community water purifiers.

Department	Number of schools equipped with community water purifiers	Number of children benefited in rural schools
Antioquia	15	530
Caldas	24	1.382
Cauca	12	1.824
Nariño	11	264
Valle del Cauca	16	619
Total	**78**	**4.619**

Importance of the **Water for Sustainable Coffee Farming** component is demonstrated by the number of interventions achieved, with a positive impact on river basins. An aspect to be highlighted is that interventions on 25% of farms (those located 1**00 and 200 m away** from the bodies of water) led to a high level of response from water resources (Figure 35): "A small number of farms intervened for a high impact on the region."

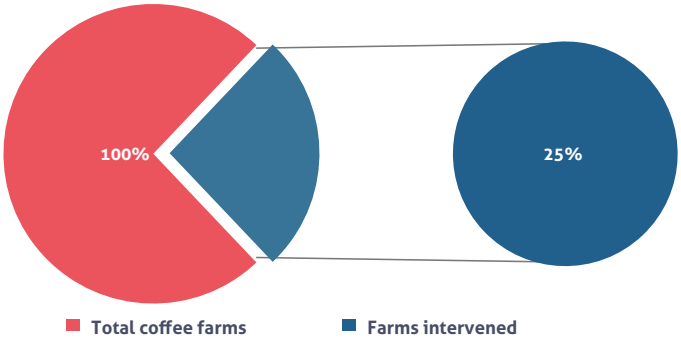


Figure 35. Percentage of farms intervened with water solutions compared to total farms in coffee river basins under the Project.

Details about the experiences in IWM community ecological wet milling and on-farm water treatments can be found in the publications "Analysis and design of projects of community coffee wet mills" and **"Appropriate technologies for water treatment on coffee farms."**

Water Fund to support water solutions at farm level

Seeking to support 10-15% of the participating farms with a grant for acquisition of water technologies, the strategy defined was crucial to channel and properly allocate IWM resources, in addition to involving new partners who joined this initiative during implementation of the Project to increase positive impact.

The Water Fund mechanism was instrumental in managing the resources generated from different actors, both national and regional, for new investments in the farms. This is a flexible tool to give transparency to donations and valuation of field interventions, of great help to building inter-institutional trust.

For each peso contributed by Manos al Agua-IWM, 23% came from resources raised to support water solutions at farm level (Figure 36).

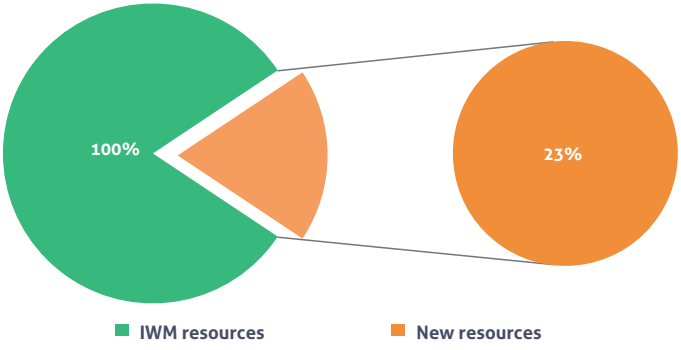


Figure 36. Relation between IWM resources and new resources raised to support implementation of water solutions at coffee farm level.

Strategic Water Ecosystems component

This component enabled actions at **farm** and **regional** levels. It contributed to conservation of natural capital and economic strengthening combined with protection of river basins, biodiversity and natural resources. It worked on landscape preservation through reforestation and ecological restoration with bioengineering works, as well as renovation of coffee plantations with varieties resistant to rust, agroforestry management and application of best agricultural practices to improve productivity of coffee farms.

Forest management plan

Increased sustainable forest use and protection and conservation of native forest species ecosystems to preserve natural watercourses that allow access to water in the quantity and quality necessary for ecosystems and supply to coffee families.

The forest process in the IWM river basins went beyond delivery of incentives and counting of trees and hectares: it entailed a whole awareness-raising and training process to achieve an aware community, needing to restore their ecosystems for the sake of all, with concrete actions (Figures 37 and 38).

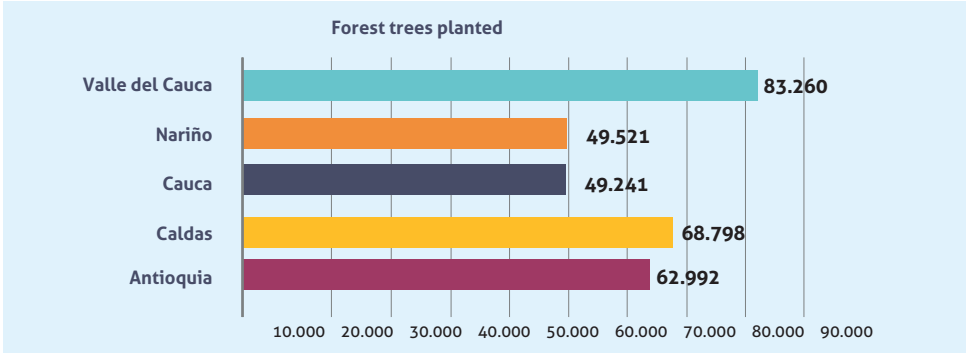


Figure 37. Native forest trees planted in the IWM departments through the Incentive and Promotion modalities.

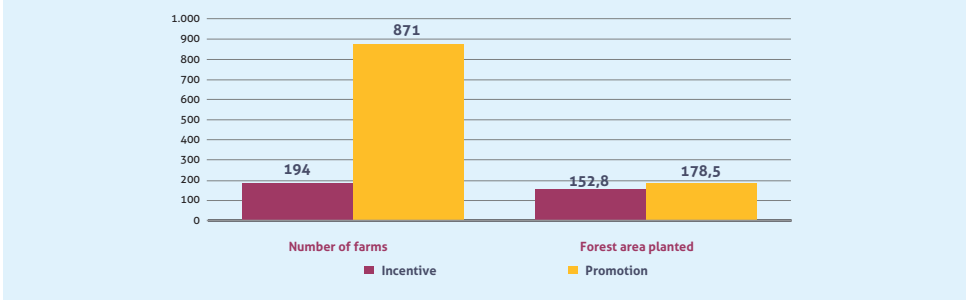


Figure 38. Distribution of participating farms and area planted with native forest trees through the incentive and promotion modalities.

RESULTS

- **5** forest nurseries established and operated by the IWM Project.
- Over **1,449 farms** performed forest management actions in the regions.
- Over **437** hectares of forest planted in the 25 river basins, with use and planting of at least **29 different native forest species**. As a milestone, over **275** hectares were planted through the promotion modality, with voluntary planting and participation of producers and the community, the result of motivation towards a social and landscape management approach.
- Over **313,812** native species trees planted.
- Georeferencing of forest plantations and location on maps of the 25 river basins.
- Achievement of **133%** of set goals.

Details about the Forest Management Plan, as well as an analysis of landscape in the IWM river basins, can be found in the publications **"Forest management of coffee river basins in Manos al Agua, towards Integrated Water Resources Management" and "Landscape analysis: Effects of land covers on pollution caused by coffee fertilization."**

Coffee crop renovation plan

Coffee crop productivity, expressed in kilograms of dry coffee parchment (dpc) per unit of resource used for its production, depends on positive effects on the plant of different agronomic and management factors and practices, such as **variety**, location (climate, soil, sunlight, shade), **density, age,** timeliness and relevance of management practices for control of weeds, pests and diseases, and supply of essential nutrients, among others.

Renovation of aged rust-susceptible coffee crops by planting resistant varieties such as Castillo® is a fundamental practice for productivity, coffee business profitability, and as a mechanism of adaptation to climate variability by strengthening coffee production systems on the farms. This practice favorably impacts key productivity factors such as: **variety, density and age.**

RESULTS

- Over **2,314 farms** renovated coffee crops with resistant varieties.
- Over **1,086 hectares** with over **5.56 million** coffee trees planted and with agroforestry management with native species.
- On-farm renovation plans with an emphasis on production stabilization.
- **1,153** soil analyses to encourage rational and timely fertilization.
- Georeferencing and location of coffee renovations on maps.
- Achievement of **128%** of set goals.

By achieving results and goals in the Renovation Plan, the IWM Project contributed to maintaining an increasingly stable and productive coffee structure in the river basins. In 2013, the percentage of coffee area planted with varieties susceptible to rust and in aging process was **38.3%** (7,800 hectares).

After work in the 25 river basins, the area planted with coffee varieties susceptible to rust decreased to **18.6%**. So, at the end of the Project, until February 2018, the coffee area with rust-resistant varieties in the 25 regions was **81.4%**; figures 39 and 40 show evolution in distribution of coffee varieties from Year 1 to Year 5 of the IWM Project.

Rust-resistant coffee varieties = Castillo - Colombia - Tabi

Rust-susceptible coffee varieties = Caturra - Typical

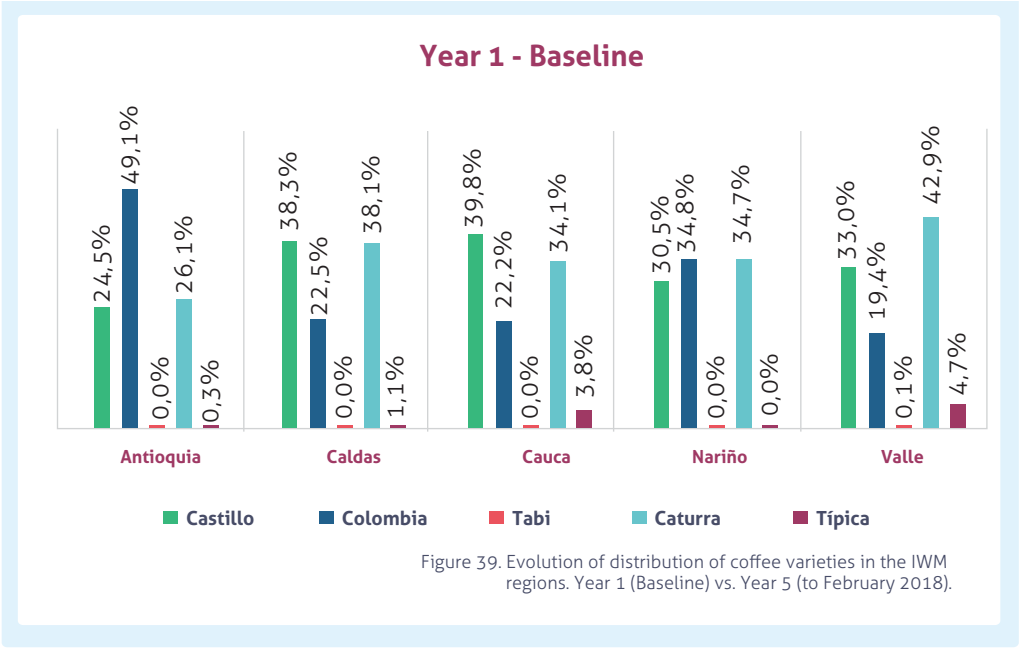


Figure 39. Evolution of distribution of coffee varieties in the IWM regions. Year 1 (Baseline) vs. Year 5 (to February 2018).

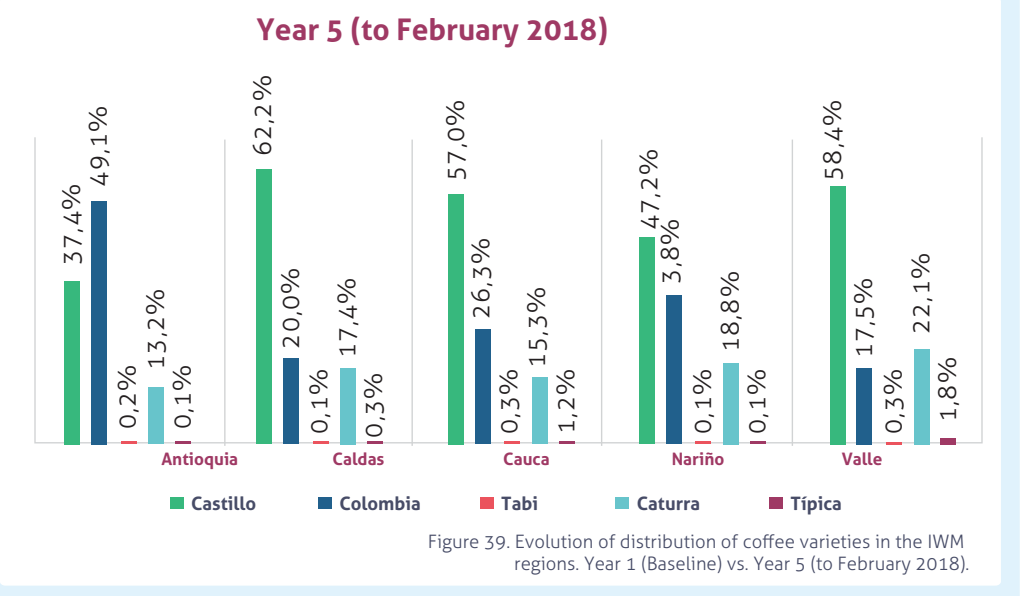


Figure 39. Evolution of distribution of coffee varieties in the IWM regions. Year 1 (Baseline) vs. Year 5 (to February 2018).

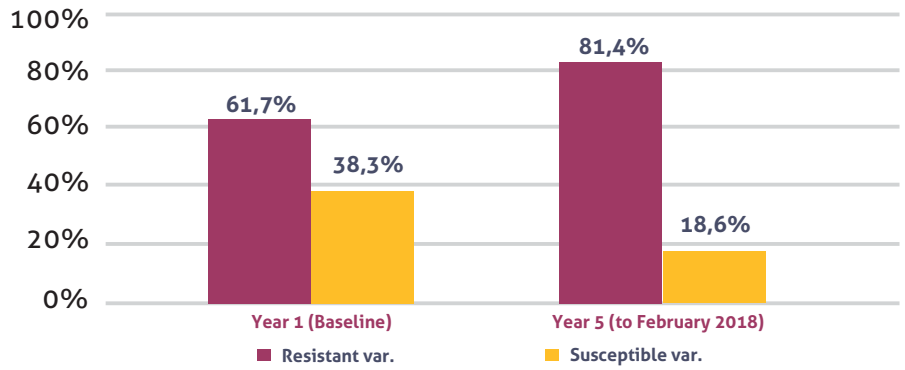


Figure 40. Consolidated distribution of resistant and susceptible coffee varieties in the 25 IWM river basins. Year 1 (Baseline) vs. Year 5 (to February 2018).

The IWM Renovation Plan led to significant positive changes in planting density and average age of coffee lots; the coffee area with densities higher than 5,000 coffee trees per hectare grew from **11,331 hectares** in 2013 to **12,442 hectares** in 2018, with density rising from **5,178** to **5,384** coffee trees per hectare. As to age, average of coffee plantations fell from **6.44** years in 2013 to **5.89** years in 2018.

Figures 41 to 43 show changes in density and age produced by crop renovation in the 25 river basins of the five coffee departments.

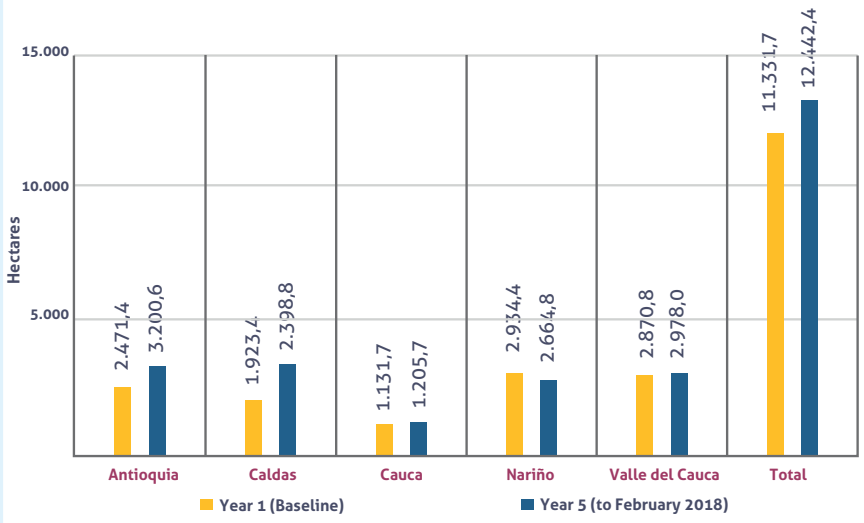


Figure 41. Evolution of coffee area with densities greater than 5,000 trees/ha in the IWM regions. Year 1 (Baseline) vs. Year 5 (to February 2018).

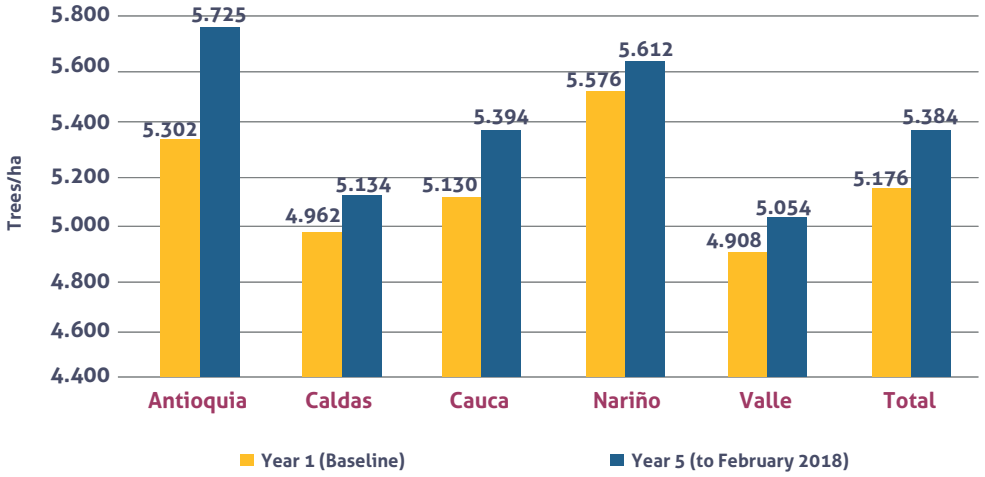


Figure 42. Changes in average coffee planting density in the IWM regions. Year 1 (Baseline) vs. Year 5 (to February 2018).

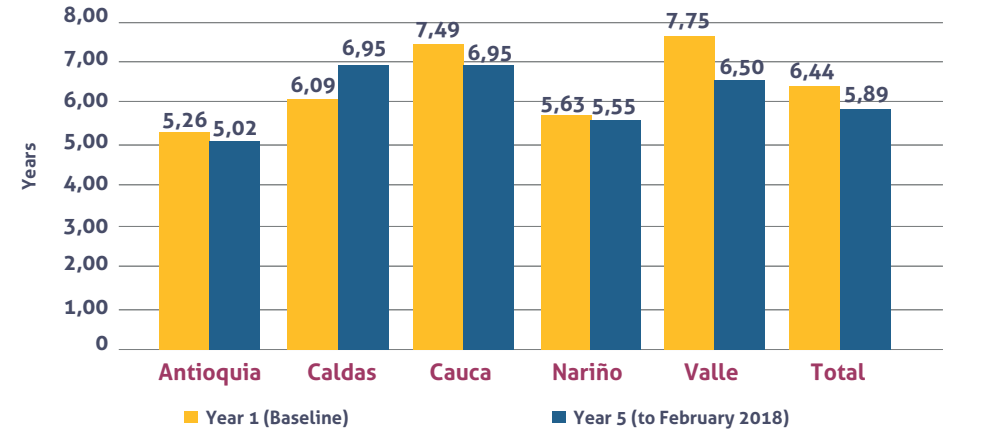


Figure 43. Changes in average coffee crop age (in years) in IWM regions. Year 1 (Baseline) vs. Year 5 (to February 2018).

Bioengineering Plan - Ecological restoration and conservation lots

With local capacity building activities for soil management/conservation and ecological restoration in the 25 river basins, the IWM Project laid the foundation for addressing this issue with economical bioengineering works and community involvement.

RESULTS

- **25** ecological restoration actions (mass movements stabilized) with bioengineering works.
- **25** farms with conservation lots for better soil management.
- Model of community participation in decision-making for bioengineering works.
- Georeferencing of ecological restoration actions and location on maps of the 25 river basins.
- Achievement of **100%** of set goals.

Details about management of ecological restoration practices and conservation lots in a river basin can be found in the publication **"Soil and water conservation-Manos al Agua Experience."**

Environmental service evaluation plan

As to Payment for Environmental Services (PES) in the municipality of Andes, Antioquia, the stakeholders involved were the Andes municipal administration, the Government of Antioquia, Corantioquia (regional departmental authority), the FNC and the Manos al Agua-IWM Project; and for the PES in Sevilla, Valle del Cauca, the actors involved were the Regional Autonomous Corporation of Valle del Cauca and the RARE organization. PES worked based on Conservation Agreements and Reciprocal Water Agreements defined with farm owners in the regions selected.

RESULTS

- Two PES schemes established.
- Payment for Environmental Conservation Service in La Chaparrala river basin, in the municipality of Andes, Antioquia.
- Over **100** conservation hectares paid with the PES of La Chaparrala.
- Reciprocal water agreements in the Valle del Cauca river basins. Over 100 farms participating in these agreements.
- **13 POMCAS** (River Basin Management Plans) consolidated. Participation in 13 river basins for structuring of new POMCAS.
- Achievement of 100% of set goals.

Responsible Water Decisions component

This component emphasized **regional** and **institutional** levels. It contributed to generation of key information for making intelligent decisions on water and land policies, economy and communities.

Climate monitoring and contribution to early warning service

The Manos al Agua-IWM Project expanded and strengthened the monitoring network of the Colombian Coffee Agroclimatic Platform through provision and installation of Automatic Weather Stations in 25 coffee river basins (Figure 44), emphasizing mainly the meteorological components related to coffee farming at river basin level, determining the climatic aspects that could affect optimal plant development and possible production reduction.

RESULTS

- 25 river basins participating in the Manos al Agua-IWM Project with climate monitoring (automatic weather stations).
- Water monitoring in three coffee regions.
- Automatic weather stations connected to the Colombian Coffee Agroclimatic Platform.
- **Basin water balance model** developed and applied to IWM river basins.
- **Early warning** mechanism strengthened.
- Over **3,000 farms** with support and recommendations on management based on early warnings.
- Achievement of **100%** of set goal.

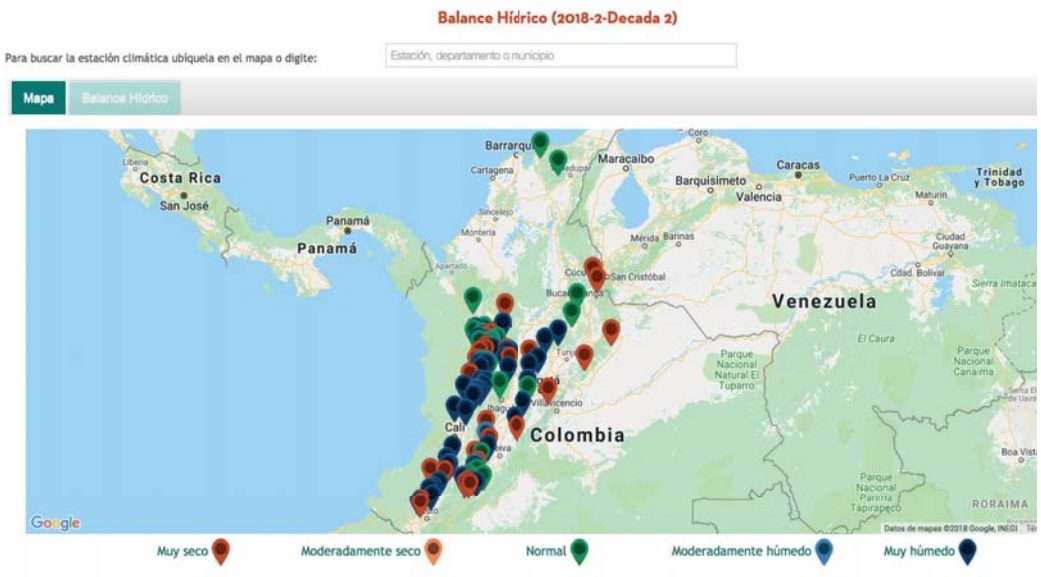


Figure 44. Coffee Agroclimatic Platform - Location of climate monitoring stations.

The work led by Cenicafé improved recommendations to strengthen production systems and the early warning mechanism to address activities in wet and dry conditions. Over 3,000 IWM farms were provided with support and recommendations on management based on early warnings (Figure 45).

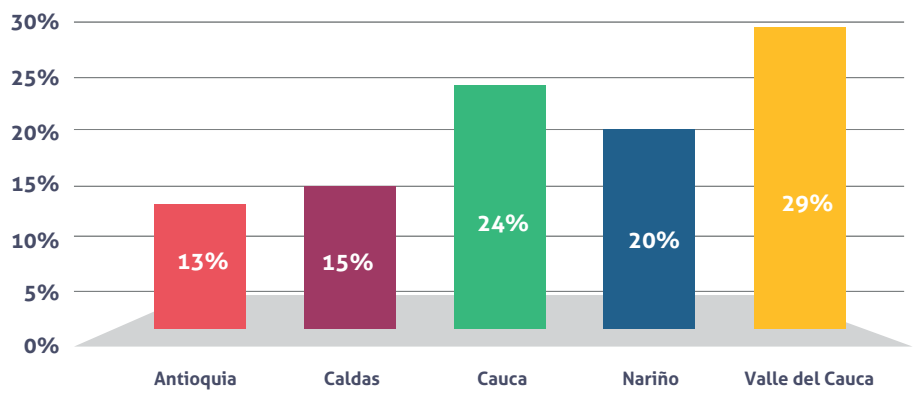


Figure 45. Participation (by region) of farms with recommendations and early warnings.

Details on the climate monitoring plan and use of information at the service of coffee farmers can be found in the publication **"Climate monitoring: A tool at the service of Colombian coffee farming."**

Monitoring of water quality in coffee river basins

Water quality monitoring aimed to evaluate effects of the Manos al Agua-IWM Project interventions on water quantity and quality in the 25 coffee river basins. To achieve this objective, two monitoring points were selected: Point 1 (P1), located upstream from the area of implementation of the Project strategies, and Point 2 (P2), downstream from the implementation area.

RESULTS

- **Seven campaigns to monitor** water quality in the IWM river basins over three years (conventional and dynamic monitoring).
- Dynamic monitoring in five river basins.
- Over **25,000 analyses** of samples during three monitoring years.
- Achievement of 100% of set goal.

According to the overall water quality index of the fourth monitoring campaign in the 25 river basins, water quality decline in the study stretch (P1-P2) was attenuated 86.11% on average by comparing initial and final conditions (with improvement in 80% of river

basins) and 16.10% by comparing initial and average conditions, with improvement in 76% of river basins.

According to the seventh (dynamic and conventional) monitoring campaign, 92% of river basins (23 of 25) responded to the IWM implementations when comparing initial conditions (before the Project implementation) and average conditions at the end of Year 4.5; the only river basins without evident improvement were Quilcacé (Sotará, Cauca) and Barragán (Caicedonia, Valle). However, they improved over 100% when their conditions in the fourth and seventh monitoring campaigns are compared (Figure 46).

Water quality monitoring measured positive impacts of the Project and showed that coffee processing is not, by far, as polluting as it was thought for so long. Throughout most of the year, domestic, livestock and industrial pollution exceeded effects of pollution generated by coffee processing.

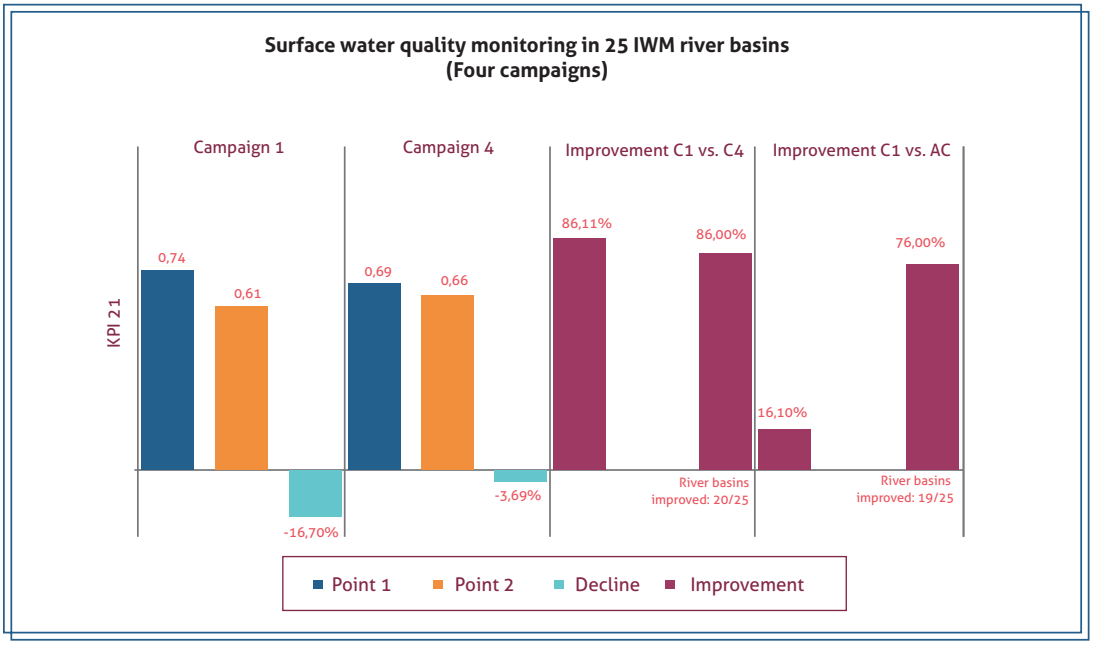


Figure 46. Overall index of water quality in the river basins (KPI).

Details on monitoring of water quality in the river basins can be found in the publication **"Guide to evaluation of quality of surface water in coffee river basins of Colombia."**

Colombian coffee water footprint

It has often been said that the coffee sector is a large water consumer due to high water footprint estimation. For this reason, Manos al Agua-IWM decided to measure the actual Colombian coffee footprint through field experiments (for green, blue and gray water footprints), demonstrating an important green footprint volume, coming from rain, as a source of environmental impact, but lower than blue or gray water footprints.

RESULTS

- Collaboration between Water Footprint Network (WFN), International Center for Tropical Agriculture (CIAT), Colombian Coffee Growers Federation (FNC), Cenicafé, and Wageningen University & Research (WUR) in measurement and assessment of Colombian coffee water footprint.
- Colombian coffee water footprint assessment study.
- Technical Guide to Colombian coffee water footprint.

The study results can be found in the document **Technical Guide to Colombian coffee water footprint** structured and prepared by the work team of the organizations and institutions WFN, CIAT, FNC, Cenicafé and WUR.

Project Management, Good Governance, Risk Management, Gender and Social Responsibility

In this component, regional and institutional levels were emphasized. All activities were supervised using best project management and implementation practices, continuously monitoring different key performance indicators (KPI) across the 24 work plans. At Project level, IWM extensively assessed social impact based on accounting/assessment of stakeholders, community relationships, social cohesion and lessons learned, among others.

Monitoring and evaluation (RedGIA)

Performance results were positive in the 29 KPIs. Table 20 shows progress of results of Year 5 vs. baseline.

Table 20. Results of Year 5 vs. Year 1 for the 29 Project KPIs.

	KPI	Unit	Target	Year 5 (June 2018)	Progress (%)
				All river basins	
1	Total area dedicated to improving management	ha	29,000	28,942.72	100%
2	Area of coffee plantations under improved practices	ha	14,800	14,223.22	96%
3	Area prepared and resistant to water shortage/excess due to extreme events	ha	9,000	12,413.79	138%
4	Number of interventions to improve water management	No.	3,546	4,678	132%
5	Number of people trained	No. producers	112,000	114,626	102%
		No.technicians	1,400	1,502	107%
6	Number of people reached by relevant communication activities	No.	16,000	29,644	185%
7	Number of participating households that use water more efficiently	No.	1,650	3,316	201%
8	Attitude of participating farmers to introduced practices and technologies	Index	0.90	0.85	95%
9	Knowledge of participating farmers about introduced technologies and practices	Index	0.80	0.86	108%
10	Actual use by participating farmers of introduced technologies and practices	Index	0.80	1.00	125%
12	Percentage of agricultural businesses that reach break-even point or can be held by the country's finances	%	100	100	100%
14	Cost-benefit analysis of farms based on real data	Index (B/C)	0.80	1.00	125%
15	Cost-benefit analysis of the participating companies (Nestlé - Nespresso)	Index	0.80	0.95	119%
16	Farm cash flow analysis	% farms	100	100	100%
13	Trends in crop and farm yields based on real data	kg/ha/year of dpc	913	1,375	151%
19	Coffee production levels in relation to water shortage/excess (indicator of resistance to drought and floods)	Index	0.90	0.95	105
20	Occurrence of landslides in relation to water excess (indicator of impact of extreme events)	Index	0.80	1.00	125%
11	Infrastructure is still functional at the end of the project	Index	1.00	1.00	100%
18	Amount of money spent on operation and maintenance of installed equipment	Index	0.80	1.00	125%
21	Surface water quality according to specific context regulations. Organic pollutants and eventually pathogens, heavy metals, sediment loads and pH (indicator of improvement and achievement of water quality objectives).	Index-Quality level	0.80	0.67	84%

Continuation ->

Integrated model of coffee river basin management in Colombia -Manos al Agua experience 135

Continuation ->>

Table 20. Results of Year 5 vs. Year 1 for the 29 Project KPIs.

	KPI	Unit	Target	Year 5 (June 2018) All river basins	Progress (%)
22	COD grams per kg of coffee - Lower discharge of pollution to groundwater	Index (% reduction)	0.80	0.64	80%
23	Fines for pollution in the Project communities (local indicator of compliance with environmental legislation)	No.	0.80	1.00	125%
24	Number of regions with river basins in the Management Plans (POMCA)	No.	20	13	65%
25	Development or ratification of national or corporate sustainable water policies	No. policies	1	1	100%
		No. farms	118	882	747%
26	Participation of both gender stakeholders in decision-making processes at all levels	% women	37	46.5	126%
27	Project stakeholders participate in the Water Platform for dialogue and collaboration	No.	50	58	116%
30	Development of a Social Responsibility policy	Index	1.00	0.93	93%
28	Percentage of vulnerable population in total beneficiary population	Index	0.80	0.98	123%
29	Prevalence of waterborne and sanitation-related diseases	Index	0.80	1.00	125%

Figure 47 shows baseline of the 29 KPIs, with a performance level rated **0.14 (very bad** on a rating scale of 1.0); at the end of implementation in Year 5, performance level for the entire Project was 0.95 (**Excellent**). Figure 48 shows evolution of the 29 KPIs (consolidated index) and comparative performance of the Project in Year 1 and Year 5.

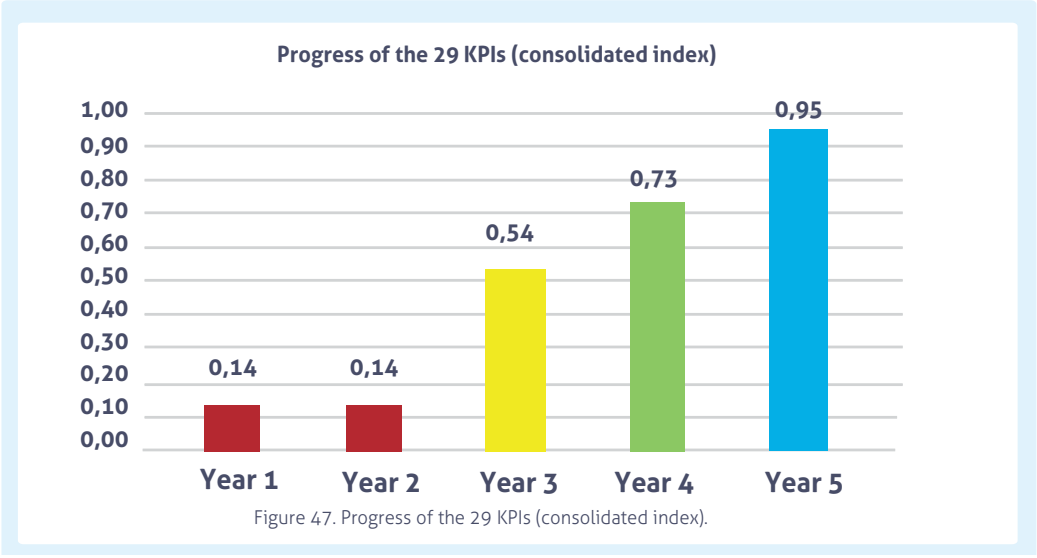


Figure 47. Progress of the 29 KPIs (consolidated index).

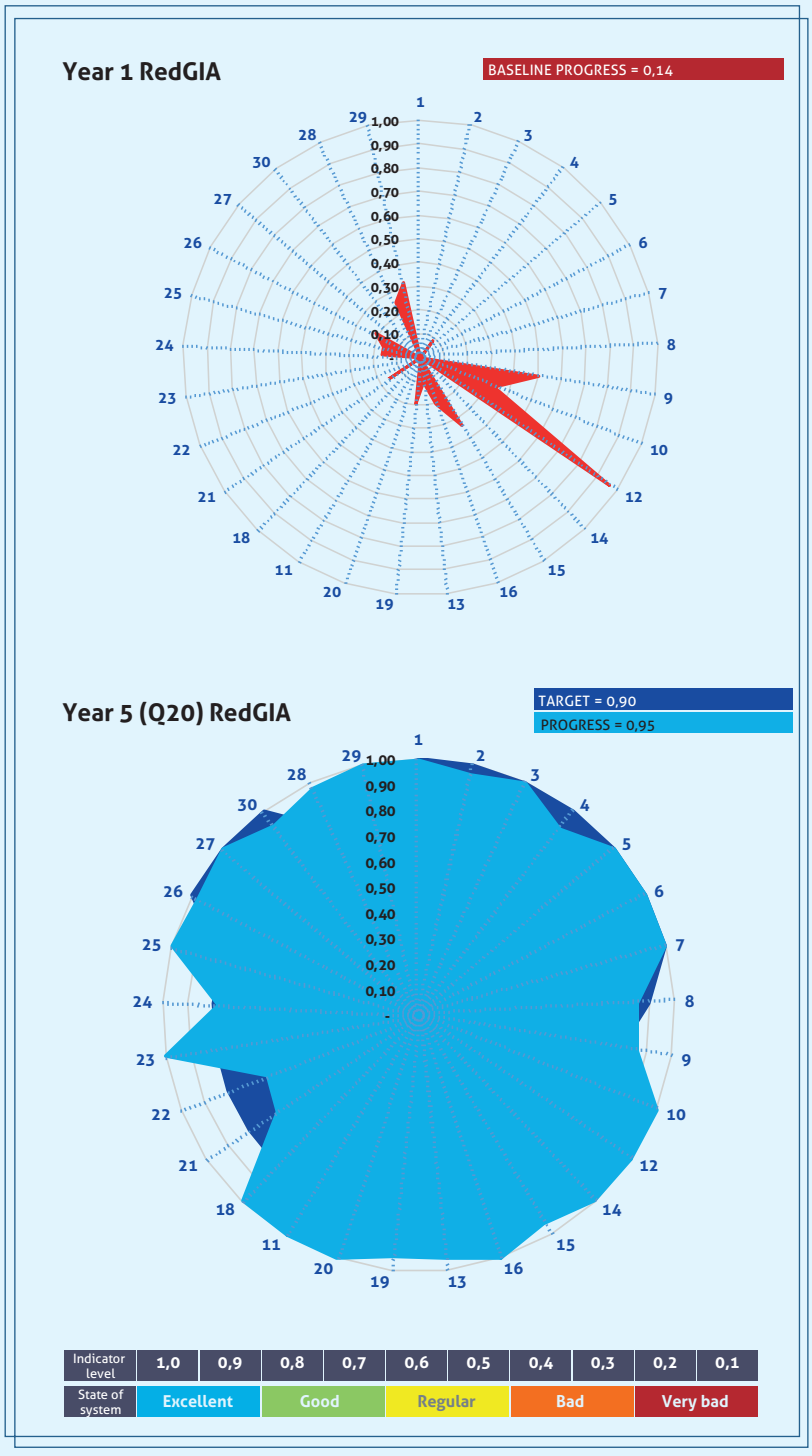


Figure 48. RedGIA comparative results of the 29 Project KPIs. (See all of 25 figures in digital annex).

Digital Annex 1 shows the RedGIA comparative results for each of the 25 river basins at the beginning and at the end of the Manos al Agua-IWM Project.

With support by the University of Wageningen (WUR), impact assessment at IWM river basin level was analyzed using the QuickScan tool. Details and results can be found in the publication **"QuickScan."**

Gender and social responsibility plan

The gender and social responsibility strategies were implemented across all work plans and impacts were expressed in several ways. Involvement and assessment of women participating in different activities and community groups were very high. The Project worked on social responsibility policy elements in different spheres and all regions.

RESULTS

- Within the framework of the IWM Project gender equity policy, 51% of the Project's technical and professional staff was women.
- Training of IWM staff on gender equity.
- Over 840 gender equity activities with over 21,000 participants.
- 56% participation of women in Manos al Agua community groups.
- 45% participation of women in group training activities.
- Social responsibility policy developed and applied.
- Document of Code of Ethics and Good Governance developed by the Project. Document presented to the Project target audiences (internal and external).
- 800 social responsibility activities with over 20,000 participants.
- Over 2,000 farms informed about social responsibility policy elements.
- 53% participation of women in social responsibility activities.
- 20 suppliers aligned with social responsibility policy.
- Achievement of 100% of set goals.

Figure 49 shows the five indicators of 37% women's participation in different spheres, a goal achieved.

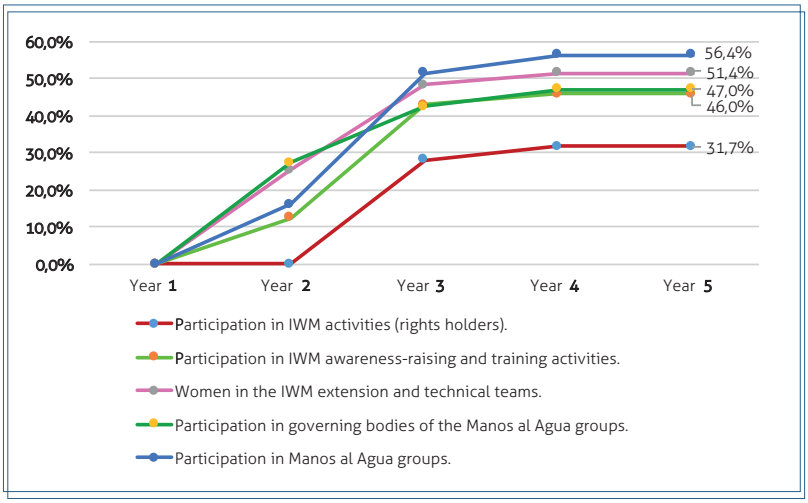


Figure 49. Evolution of result indicators of women's participation in different spheres (average for the 25 IWM coffee river basins).

Social component results can be found in the publication **"Coffee communities for good water governance."**

Manos al Agua-IWM Project risk monitoring plan

A risk management system tailored to IWM needs efficiently reported, controlled and monitored intensity and potential impact of 88 risks identified, 21 of which were prioritized according to OECD guidelines to achieve objectives, facilitating decision-making processes in uncertainty conditions (Figure 50).

RESULTS

- By January 2018, **93%** of risks (80 risks) had reached a **low priority status** (Figure 51). This result was mainly due to an inherent cause of the Project: as actions were implemented, exposure to risks was decreasing. Of all prioritized risks, 66% corresponded to categories of technical and external risks.

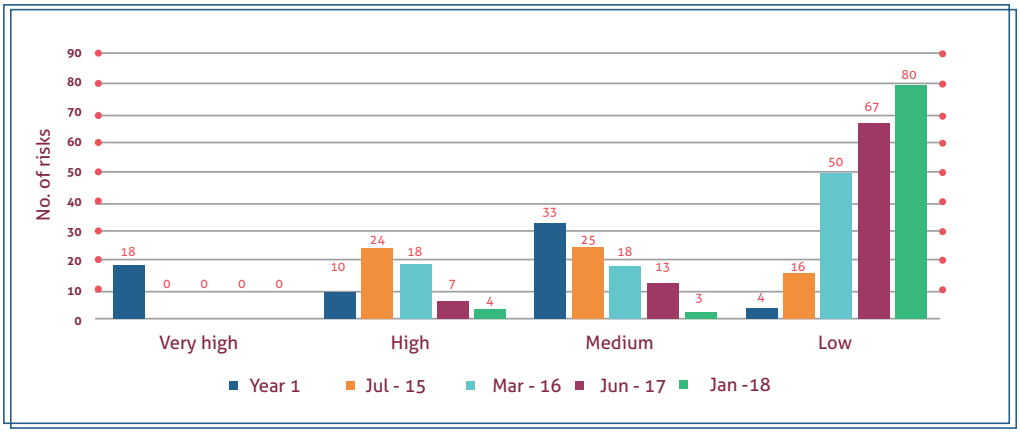


Figure 50. Monitoring of risks by priority type (February 2013 to January 2018).

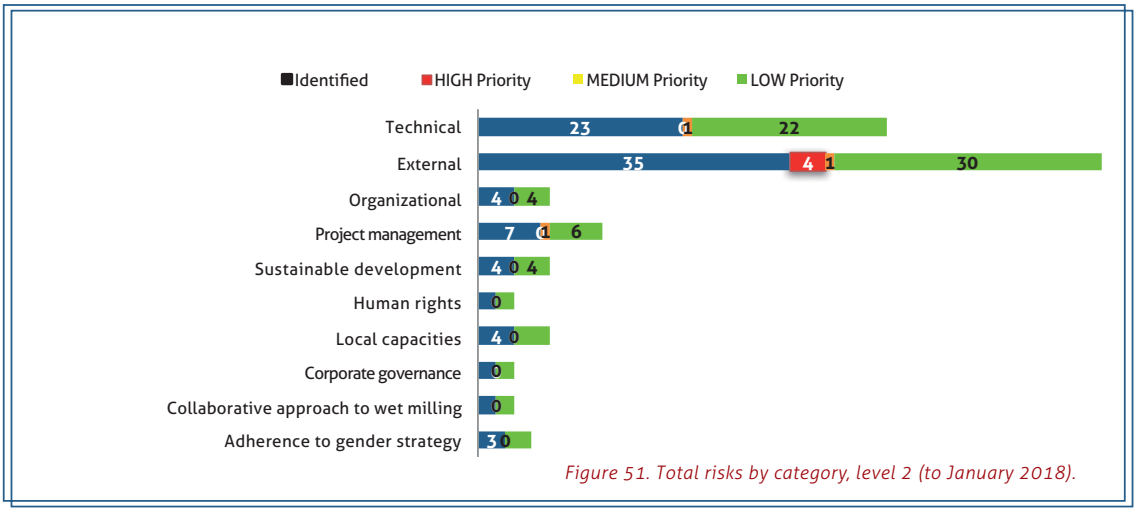


Figure 51. Total risks by category, level 2 (to January 2018).

During the IWM Project implementation, only 8% of risks materialized, and the measures necessary to mitigate impacts were taken. All activities to manage each risk were recorded on the respective risk history of the monitoring matrix. Figure 52 shows the final status balance of risks identified.

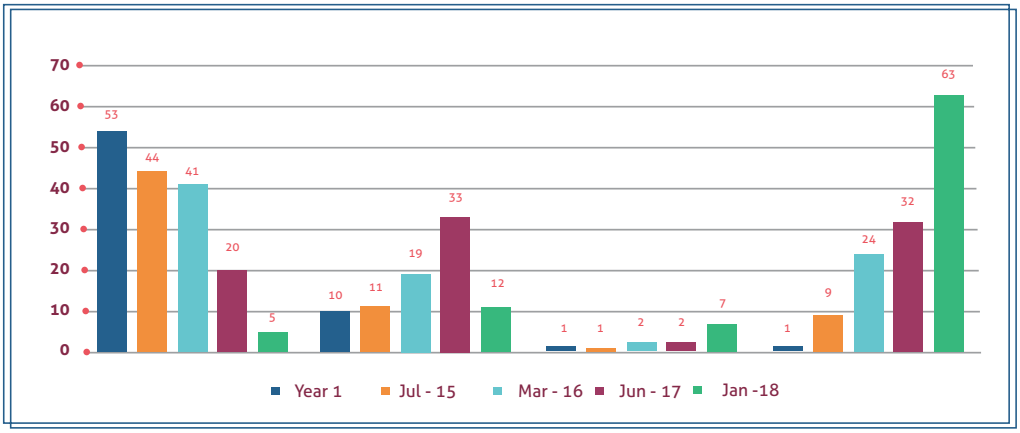


Figure 52. Comparison of risks by status (February 2013 to January 2018).

Project Management Plan

In the IWM Project, a management plan was structured to ensure technical and financial implementation. The results achieved are the following:

Cash flow of contributions by founding partners

Contributions to the Project by each founding partner were met with a slight distortion in Year 2, leading the management team to propose adjustments in the following years to ensure implementation of actions and budget realization.

At the end of the Project, the cash flow was fully met according to the amounts agreed on in the Project Management Agreement (PMA). Figure 53 shows behavior of cash flow of the IWM Project.

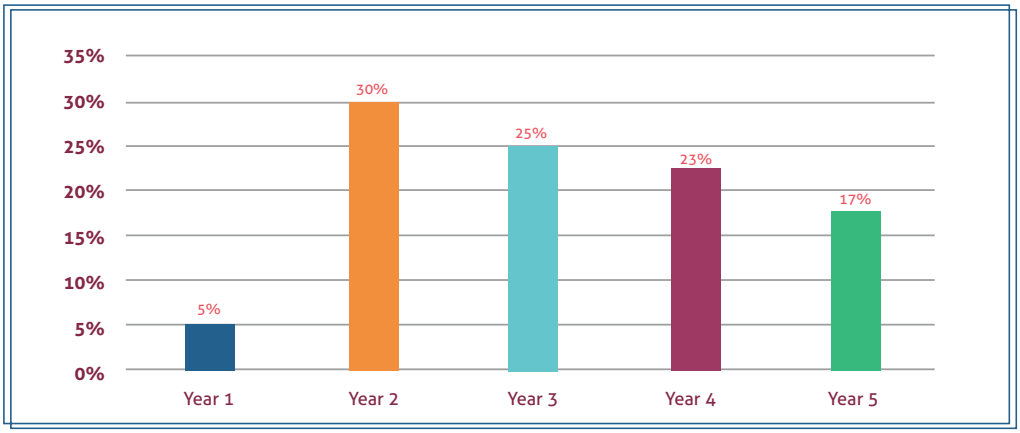


Figure 53. Percentage distribution of Project income per year.

Budget realization

For financial realization, control and monitoring of the IWM budget, the Project management team implemented logistical processes for acquisition of goods and services by the Cenicafé administrative units and the five Departmental Committees of Coffee Growers (accounting and budget).

Budget was realized according to plan. The Project total cost was COP 51,000,000,000, and budget was realized by categories (Hardware-Project Management-Other TA-Monitoring & Evaluation) established in planning.

Figures 54 and 55 show budget realization per year and percentage distribution of the Project cost categories aligned with the budget categories.

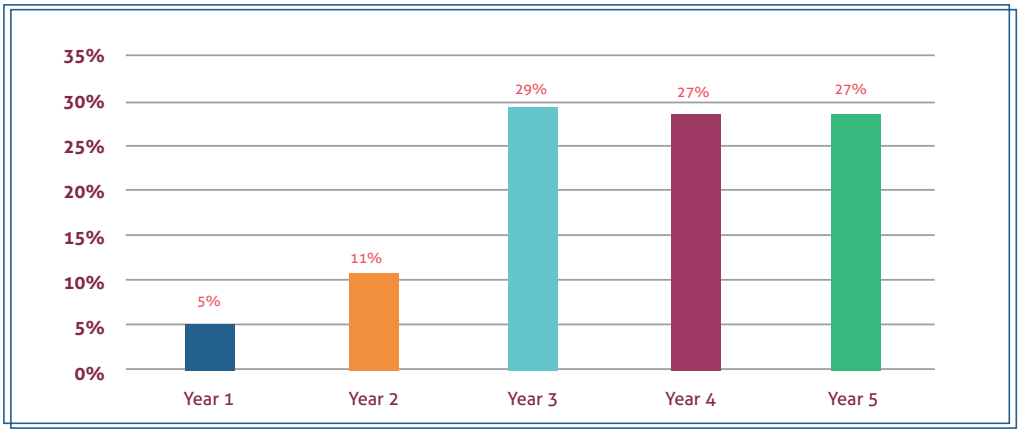


Figure 54. Percentage distribution of Project budget realization by year.

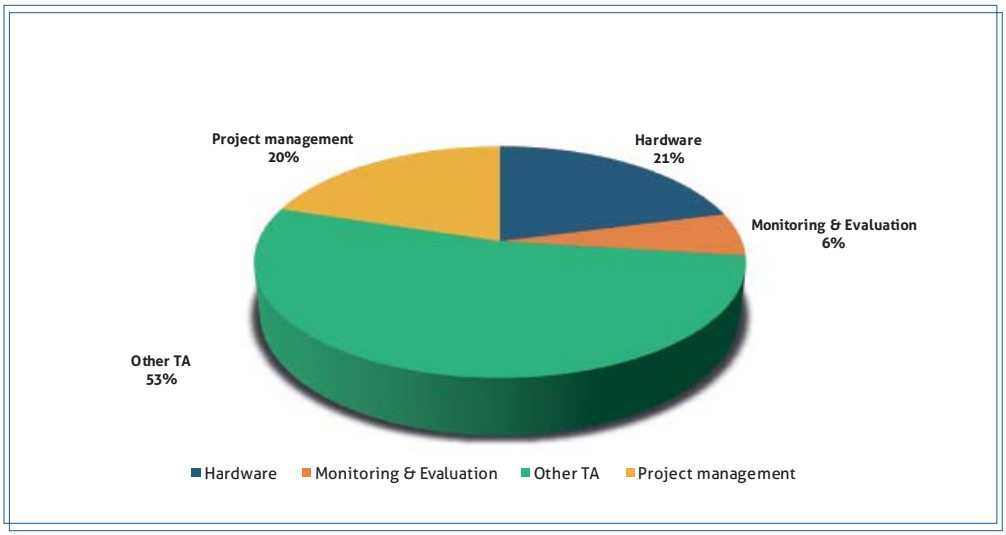


Figure 55. Distribution of IWM Project budget realization by category.

Project cost performance measurement

To measure the IWM Project cost performance and progress, the Earned Value Management (EVM) methodology was applied, a technique that integrates scope baseline (WBS) with cost and schedule baselines to generate a performance baseline, which facilitated evaluation and measurement of Project performance and progress by the management team. EVM tracked three key dimensions for monitoring each work plan and control account:

Planned Value (PV): Cost of scheduled work.
Earned Value (EV): Budgeted cost of work performed.
Actual Cost (AC): Actual incurred cost of work performed (total realized).
Estimate to Complete (ETC): Expected cost to finish all the remaining Project work.

Variances, trends, forecasts and earned value performance were analyzed for evaluating the Project performance, comparing cost performance over time, activities ahead of or behind schedule, work plans that could be over or under budget, and funds necessary to complete work of the IWM implementation activities. Figure 56 shows the Project cost performance.

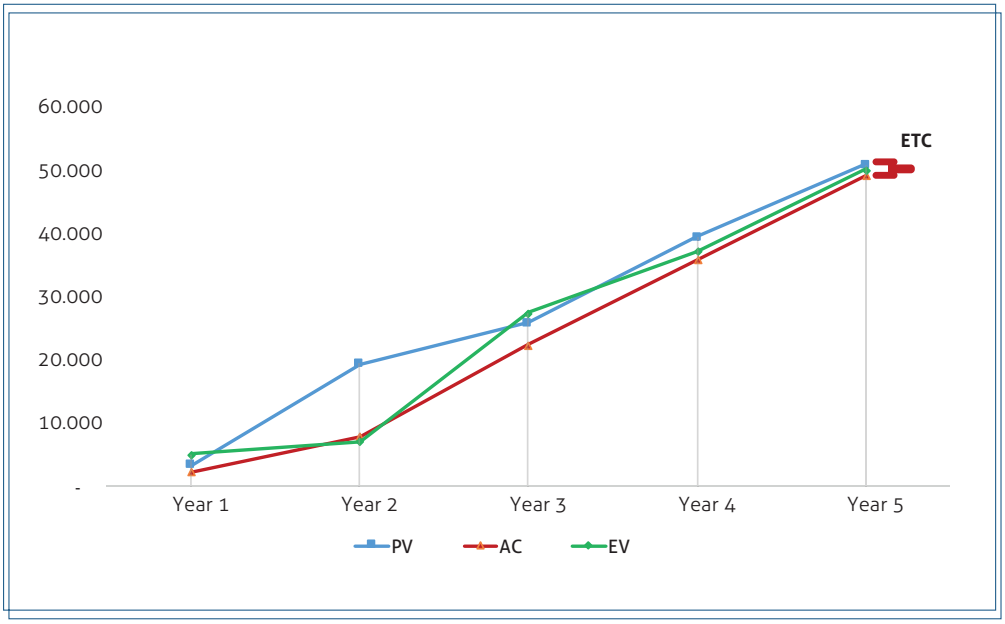


Figure 56. Measurement of IWM Project cost performance during the five years.

- The Project work value showed favorable returns due to efficiency in investment costs in each implementation year.
- Project work and achievement of deliverables progressed at the pace forecasted in the budgeted schedule; only in Year 2 the Project experienced some liquidity adjustments. At closing of the Project, a high realization of scheduled work (ETC) was achieved.
- The value of Project deliverables was in line with the budgeted plan, as invested resources and technical efforts showed yields higher than expected.

Performance of Project Governing Bodies

As support to the Project Direction and Management, the PPP governing bodies played a leading role and participated actively to achieve both technical and financial implementation (Table 21). In the 5 years of the Project, 100% of scheduled sessions were held.

Table 21. Performance of governing bodies of the Manos al Agua-IWM Project.

Government bodies	Number of Sessions		
	Target 2018	Results	Progress (%)
Steering Committee	20	24	120%
Technical-Scientific Committee	24	26	108%
Operating Committee	20	16	80%
Total	64	66	103%

Results from the point of view of location of actions in the territory

The basic criterion for implementation of **water solutions at farm level** was proximity to bodies of water **(100 and 200 m away from the main water body and its tributaries as prioritization zone).** To support work across the river basin region, a larger coverage was sought in environmental management actions with an emphasis on forest management, soil management, coffee productivity and climate monitoring (called **complementary actions**).

An example of a river basin map with location of implementations is shown below (Figure 57). **Digital Annex 2** shows maps of the 25 river basins with locations of water solution implementations on farms and complementary actions.

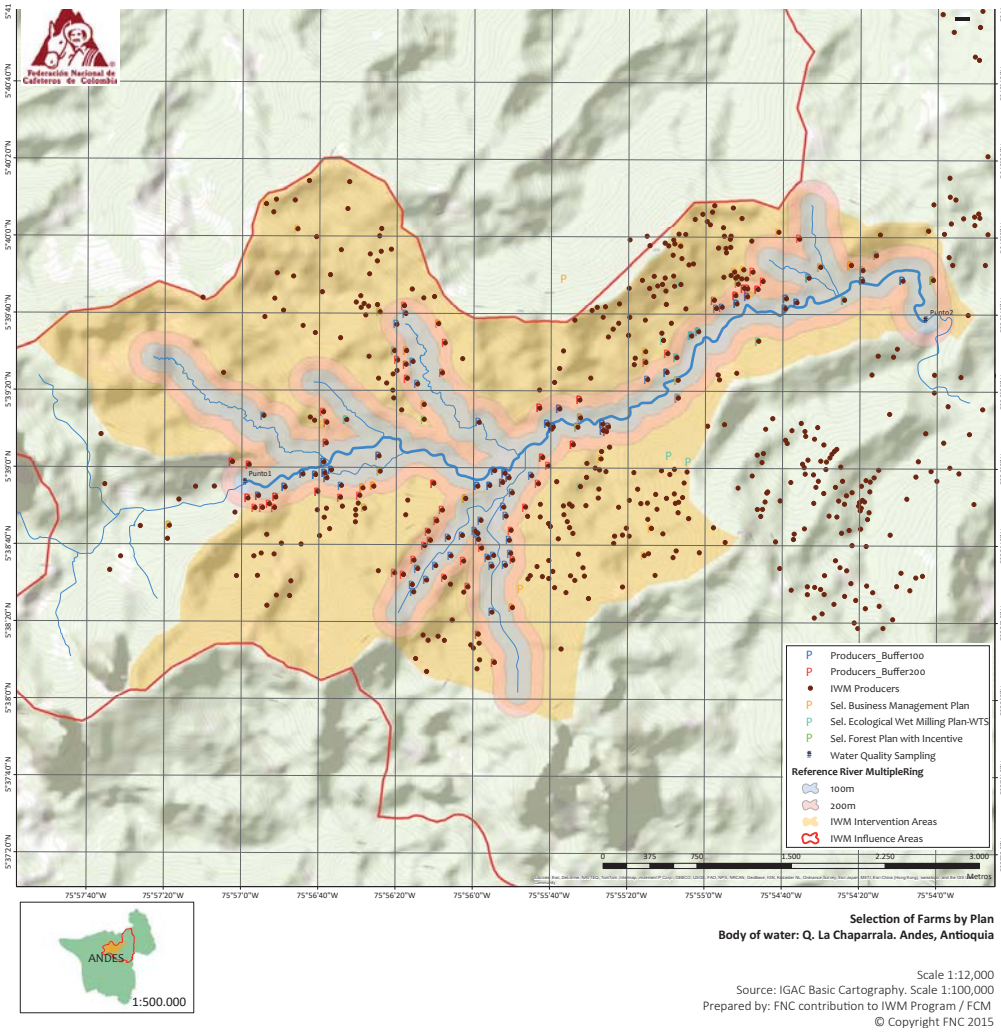


Figure 57. La Chaparrala river basin, in Andes (Antioquia); location of water solution implementations on the farms.

Manos al Agua-IWM is a sound example of a high-impact Project developed with active participation of the public and private sectors and communities, which yielded tangible results in the regions, their landscape, natural capital and inhabitants of the river basins.

Summary

This chapter presented the results achieved at farm, regional and institutional levels thanks to implementation of the actions established in the Project components Water is Everybody's Business, Water for Sustainable Coffee Farming, Strategic Water Ecosystems, Responsible Water Decisions, and Project Management, Good Governance, Risk Management, Gender and Social Responsibility.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

IMPACT OF THE MANOS AL AGUA-IWM PROJECT ON RIVER BASIN MANAGEMENT

7

Peace and the environment must be in harmony. Manos al Agua-IWM has contributed to a peace strategy built with natural capital, environmental management and social work. River basins are natural spaces where articulation of actors, community participation, environmental work and economic development are the basis for reconciliation.

This chapter describes the main impacts achieved with the Manos al Agua-IWM Project implementation. All the Project components were interrelated and had an impact that cannot be attributed to any individual action. The impact of the Project is the result of the holistic approach of the whole process.

> ***Manos al Agua-IWM generated knowledge that enabled Colombian coffee producers to gradually move from being one of the main "water users" to being custodians of the landscape where they live through sustainable management of natural resources. The approach used in the Project has been unique in Colombia, as it is the main initiative to address water resources in an integrated manner.***

Medium- and long-term impacts

The holistic approach of Manos al Agua sought final value by emphasizing the process itself and where to generate impacts, trying to connect all the components. Positive effects on river basin management and integrated water resources management were achieved at different levels and varied over time, in a step-by-step process that supported the strategy to consolidate processes and obtain economic, social and environmental impacts.

Results and positive effects achieved are expected to last over time and increase significantly as producers, their families and the community have internalized benefits provided by natural resources and the environment, combined in an integrated way with economic and social actions, as part of a system (the river basin as their territory) that provides all the basis for their development and wellbeing.

Tables 22 and 23 list different medium- and long-term impacts achieved with the IWM Manos al Agua Project:

Table 22. List of medium-term impacts achieved.	
Medium-term impacts	**Balance**
Lower water use in coffee wet processing and in household activities (sanitation)	- **19%** of farms with water-saving solutions implemented (ecological wet coffee processing, sanitary water savers). - **28.5%** of pollution reduced in the river basins through adoption of clean technologies. - Over **2.3 million kg of COD per year** of total pollution prevented in the river basins. - Water saved by **61%** in processes of **20%** of farms.
Lower water pollution through treatment, management and adequate final disposal of wastewater.	- **15%** of farms with coffee and domestic wastewater management solutions.
Lower waste on farms through adoption of proper management and improved disposal. Increased application of technologies and best agricultural practices on farms as support to river basin management.	- **35%** of farms with best sustainable management practices.
Changes in coffee production with use of rust-resistant varieties and application of fertilizers based on soil analyses. Strengthened coffee productivity through renovation of coffee crops by planting (improved planting densities).	- **20%** of farms renewed coffee crops with rust-resistant varieties. Over **1,086** hectares with over **5.56 million** coffee trees planted and with agroforestry management with native species. - **66%** of farms, with crop yield trends based on real data, have managed to keep or improve production by at least 5%.
Strengthened organizations through training, participatory processes and benefits achieved. Improved management capacity of inhabitants and their organizations.	- **100%** of regions with organized communities for strengthening of good local water governance, with an approach of gender equity and participation of families in the activities. - Departmental Manos al Agua groups structured and interacting. - **100%** of community activities carried out by the Manos al Agua groups based on their work plans. - **31%** of Manos al Agua groups with participation in work groups for structuring of POMCAS.
Intensive use of soil conservation practices, agroforestry and reforestation for benefits on the farm (moisture, foliage and improvement of the environment).	- **32%** of farms with forest management plans and good soil management practices in coffee farming.
Lower prevalence of water-borne diseases through improved supply of drinking water (safe water) for human consumption.	- **10%** of farms with drinking water supply solutions in the 25 river basins. - **100%** of regions with community drinking water supply solutions in rural schools. - **4,619** children and young people with improved drinking water supply.

Table 23. List of long-term impacts achieved.

Long-term impacts	Balance
— Improved coffee business management capacity of coffee farmers and their families.	**— 10%** of farms involved in Business Management and in training process with strengthened management and record keeping on the farm.
— Improved soil stability as a result of forest practices and water management.	**— 100%** of regions with ecological restoration actions (mass movements stabilized through bioengineering works) and conservation lots for better soil management.
— Recovery of degraded areas as a result of reforestation and proper soil use.	**13%** of farms with forest and soil management plans. **20%** of farms with good soil management practices in crops.
—Water quality and quantity increased by integrated effect of interventions on coffee river basins.	**—92%** of river basins have improved water quality and quantity as a result of the Project integrated actions (technology adoption and behavior change).
— Adoption of river basin management practices and technologies as a result of benefits achieved at farm and river basin levels. — Lower environmental risks as a result of combined effects of all practices.	
— Population aware as a result of environmental education and visible results. Valuation of environmental services as a result of users' awareness.	**—100%** of regions with consolidated awareness-raising process. **— 100%** of regions (producers, families and communities) participating in group training with emphases on river basin management and integrated water resources management. **— 45%** of participants in training activities were women. **— 77%** of participants in training were certified (certificate granted by FMM-SENA) — Two processes of Payment for Environmental Services consolidated: A conservation PES in the river basin of La Chaparrala (municipality of Andes, Antioquia) and several reciprocal water agreements in river basins of Valle del Cauca.
— Strengthened inter-institutional relationships and articulation of actors to address water problems and river basin management.	**— 100%** of regions with work for participation of new partners and articulation of actors. **— 48%** of new partners were from the public sector (Government of Colombia).
— Community participation in structuring of river basin management plans (POMCAS).	**— 52%** of river basins are part of River Basin Management Plans. **— 40%** additional progress in approaches to structuring of new POMCAS.

At the beginning of the Project, evident failures and improvement needs led the Manos al Agua-IWM Project team to establish the strategy to achieve greater adoption of clean technologies and best practices. Improvement in adoption levels and behavior change towards positive and friendly actions, both individual and collective, were fundamental.

The probability for a coffee-growing family to adopt a practice or technology after participating in the IWM Project was much higher than for families who did not have the chance to participate. The IWM Project strategy rescued on-farm water solution devices and systems that were abandoned by producers due to a gap in the process to ensure appropriation and adoption of this type of technology.

Over baseline, greater adoption of on-farm water management solutions was achieved and therefore important water saving in coffee wet milling and lower direct discharges to bodies of water, substantially contributing to better water quality in the 25 river basins. Figures 58 and 59 show improvements in water solutions, water use in pulp removal and direct discharges to water sources achieved in Year 5 compared to baseline in Year 1.

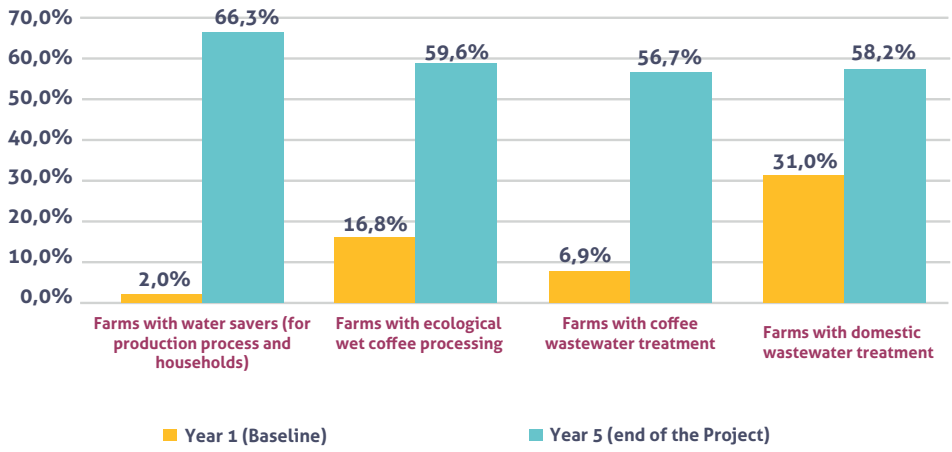


Figure 58. Water solutions on farms in prioritization areas between Year 1 and Year 5 of the Project.

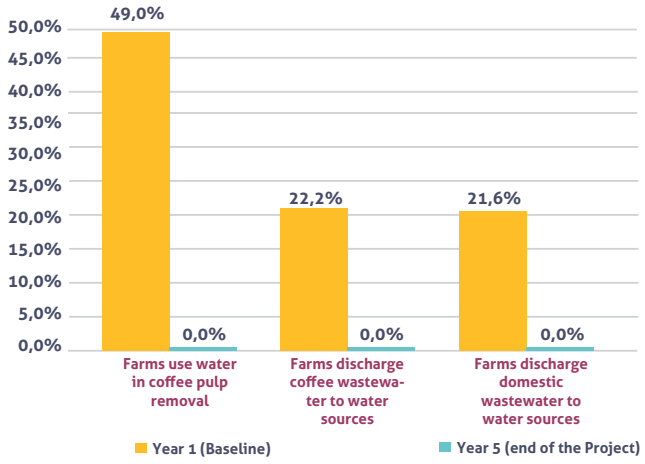


Figure 59. Water use in pulp removal and farm wastewater discharges in prioritization areas between Year 1 and Year 5 of the Project.

Other achievements and impacts at closing of the Project in Year 5 compared to baseline in Year 1 are shown in Table 24.

Table 24. Progress and impacts of the IWM Project from baseline.

Baseline		Impact
Producers do not use devices to save water at home and in the production process.	Only 2% of producers use devices to save water at home and in the production process.	At the end of the Project, 63.3% of producers use water-saving devices at home and in the production process in the prioritized area.
Low rates of permits for discharges.	1.2% of respondents said they have discharge permits.	At the end of the Project, 271% more farms over baseline in Year 1 have a permit for discharges or water concession.
Low rates of water concessions.	5.9% of respondents said they have a water concession.	
It is evident that coffee pulp is removed with water.	49.3% of respondents said they use water for pulp removal.	At the end of the Project, no producer uses water for pulp removal in the prioritized zone, saving water and reducing pollution.
High rates of use of traditional fermentation tanks (high water consumption).	62% of farmers use traditional fermentation tanks. Only 16.8% have tub-tanks on the farms.	At the end of the Project, 11% of farms use traditional fermentation and 34% use tub-tanks in the prioritized area, saving water in the process.
Lack of knowledge of amount of water used in wet coffee milling.	0.8% of farmers said they know the amount of water used in coffee pulp removal.	At the end of the Project, 18% of producers were aware of the amount of water used in the process.
No proper pulp management on large number of farms. Conditions of pits have to be improved.	39.8% of respondents reported having a pit for coffee pulp treatment.	At the end of the Project, 53% of farms adopted composting roofed pits for pulp management in the prioritized area.
Low rate of coffee and domestic wastewater treatment.	6.9% of population surveyed has coffee wastewater treatment.	At the end of the Project, 56.7% of farms have coffee wastewater treatment systems in the intervention area.
	31% of population surveyed has septic tanks on their farms.	At the end of the Project, 58.2% of farms have septic tanks in the prioritized area.

Continuation ->

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Continuation ->

Table 24. Progress and impacts of the IWM Project from baseline.		
Baseline		Impact
Low rate of coffee and domestic wastewater treatment.	21.5% of population surveyed has grease traps on their farms.	At the end of the Project, 30% of farms have grease traps in the prioritized area.
Discharges to water sources and to land of untreated coffee and domestic wastewater.	21.6% of respondents discharge untreated domestic wastewater to water sources, and 61.8% discharge it to land.	At the end of the Project, none of the farms discharge untreated domestic wastewater to land in the prioritized area.
	22.2% discharge coffee wastewater to water sources and 71.8% to land.	At the end of the Project, no farm discharges untreated coffee wastewater to water sources in the prioritized zone.
Crops planted with susceptible varieties.	On IWM farms, 38.3% of coffee area is planted with varieties susceptible to rust and older than 9 years.	At the end of the Project, only 18.6% of the coffee area is planted with rust-susceptible varieties.
Coffee crop productivity.	15% of producers fertilize based on soil analysis.	At the end of the Project, 24% of producers fertilize in a rational and timely manner based on soil analysis.
Lack of knowledge about water quality aspects.	No water quality monitoring.	At the end of the Project, 100% of regions with a water quality monitoring system implemented.
Unawareness of water quality is reflected in water appearance, stability of banks, hydrological alteration, and habitat for different aquatic species.	Low habitat health level.	92% of river basins have improved their water quality (physicochemical, microbiological and habitat status).
Poor participation of women and men in human rights and gender training.	20% of women and 55% of men participate.	During the Project, 45% participation of women in training activities was achieved.
Poor participation of surveyed population in different local base groups (organizations of producers).	85.5% of surveyed population does not participate in local organizations.	An additional 6% of producers participating in community organizations around water management.
	25% are women.	During the Project, 56% participation of women in community Manos al Agua groups was achieved.
	75% are men.	
Low level of record keeping on the farm.	17% of IWM respondents keep some type of cost/income record on the farm.	At the end of the Project, 28% of producers keep full cost/income records on the farm, with real data, and do economic analysis.
Records are not systematically or fully kept. Cost information gathered is not reliable.	Only 9.4% keeps full records.	
Lack of awareness raising and training of river basin inhabitants in aspects related to their care.	43.7% of respondents have participated in water resources management topics.	During the Project, 100% of producers participated in training on water resources management.
Population with low level of training on empowerment, community participation, peaceful conflict resolution and human rights.	43.7% of respondents have participated in social matters.	During the Project, 100% of producers participated in training on social matters.

Results and impacts achieved, taking into account what was structured in Theory of Change of Manos al Agua-IWM at the beginning of the Project (Figures 60 to 64), are shown below.

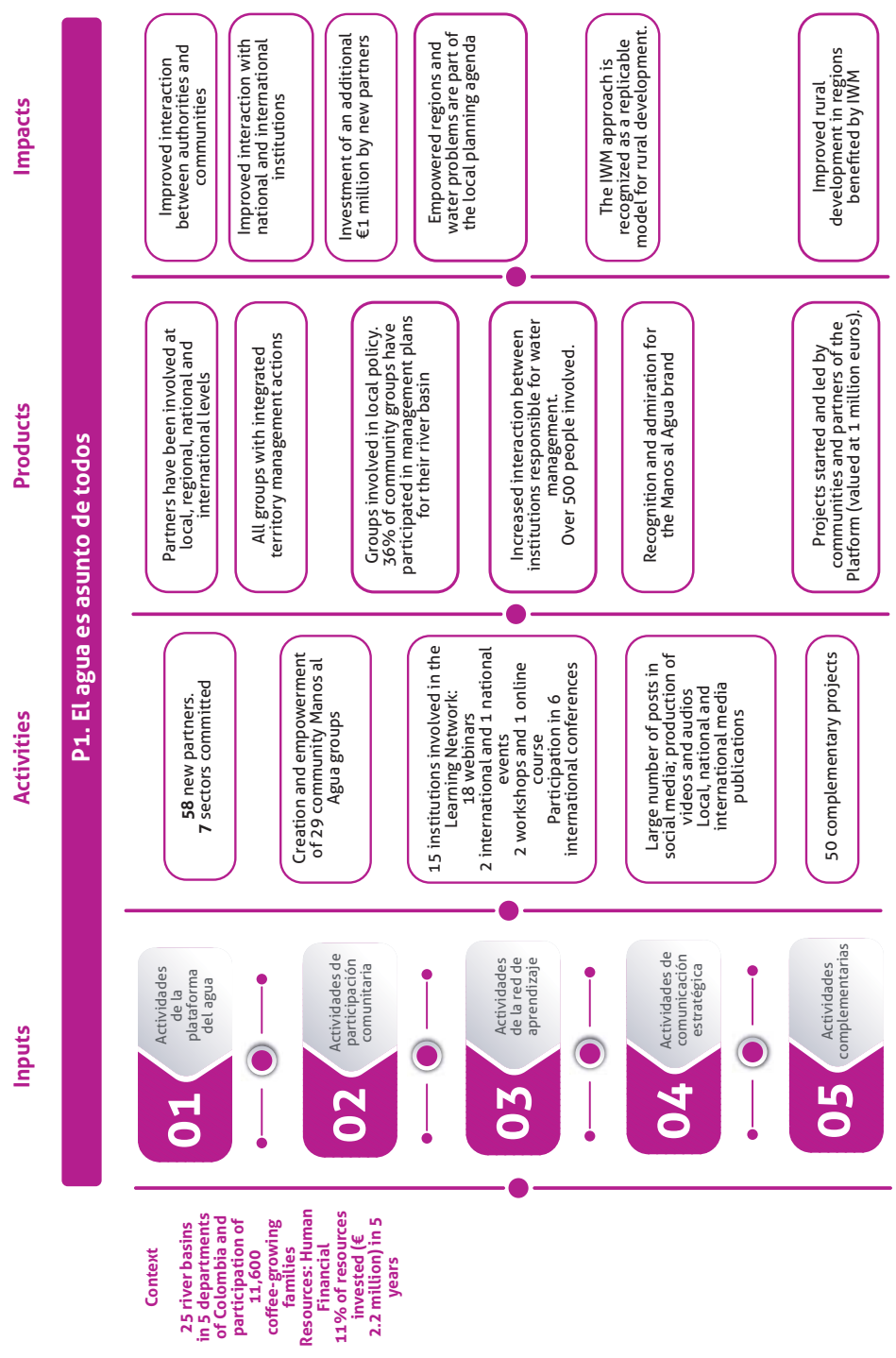


Figure 60. Results achieved under the Theory of Change approach. (Water is Everybody's Business).

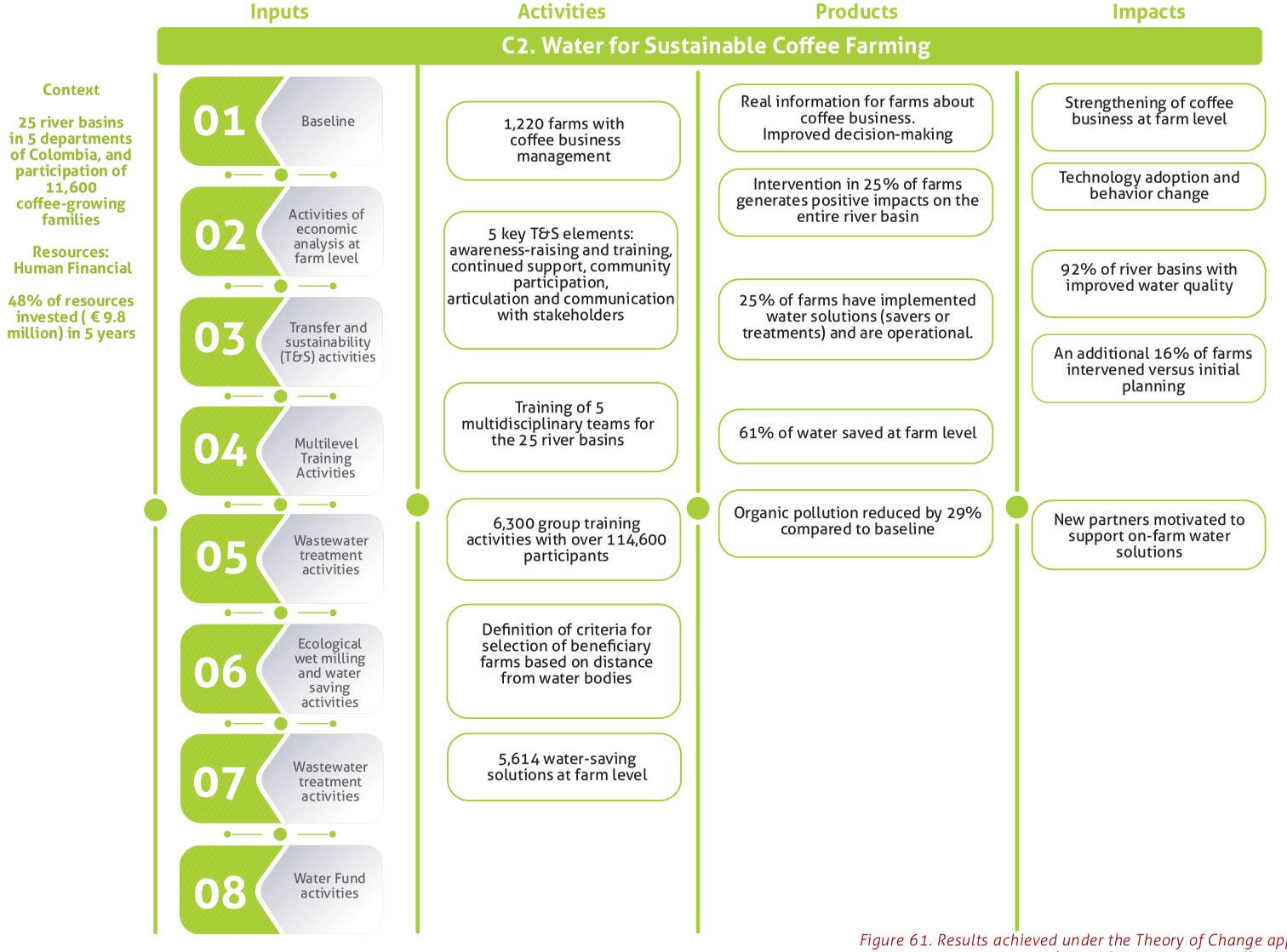


Figure 61. Results achieved under the Theory of Change approach. (Water for Sustainable Coffee Farming).

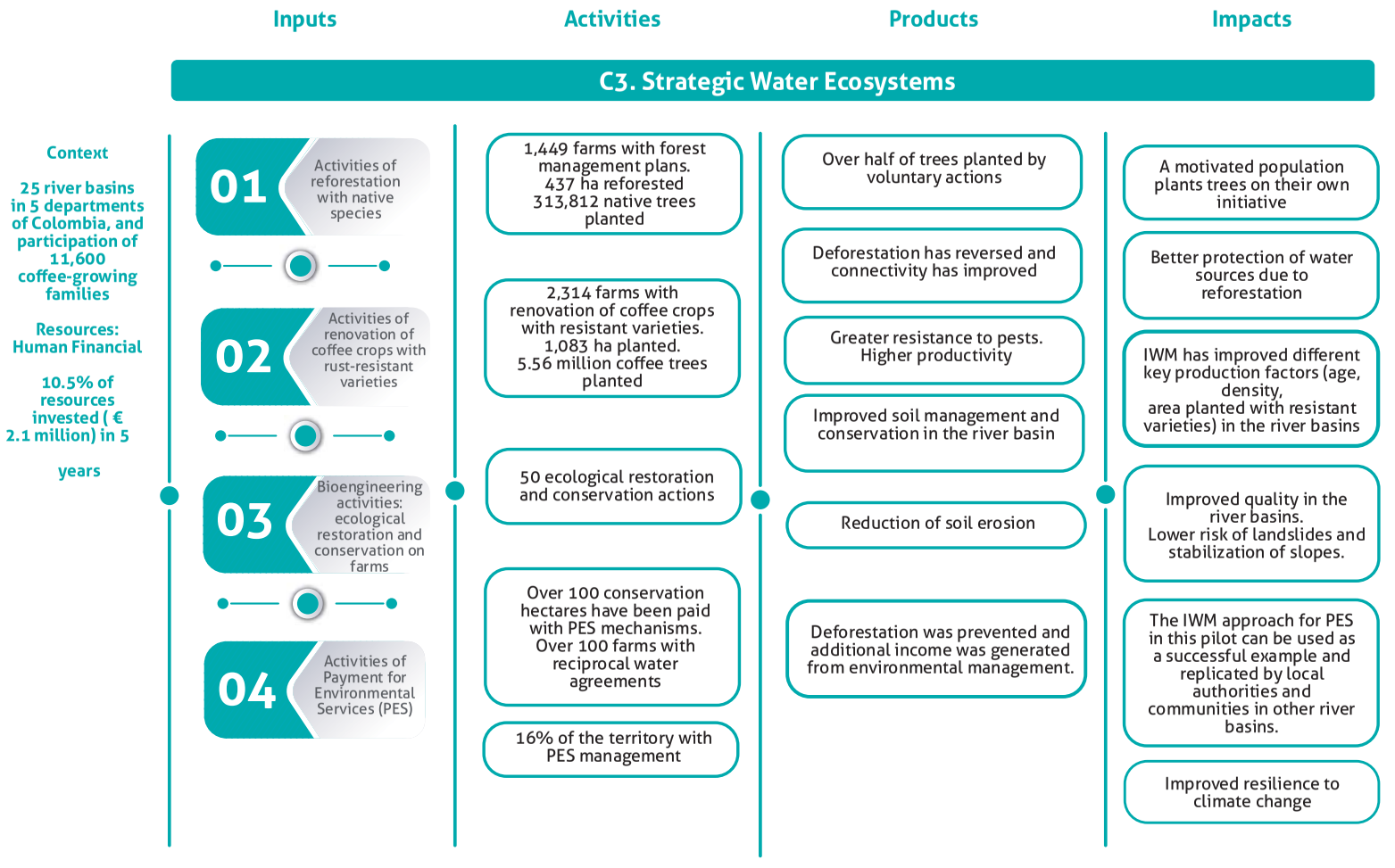


Figure 62. Results achieved under the Theory of Change approach. (Strategic Water Ecosystems).

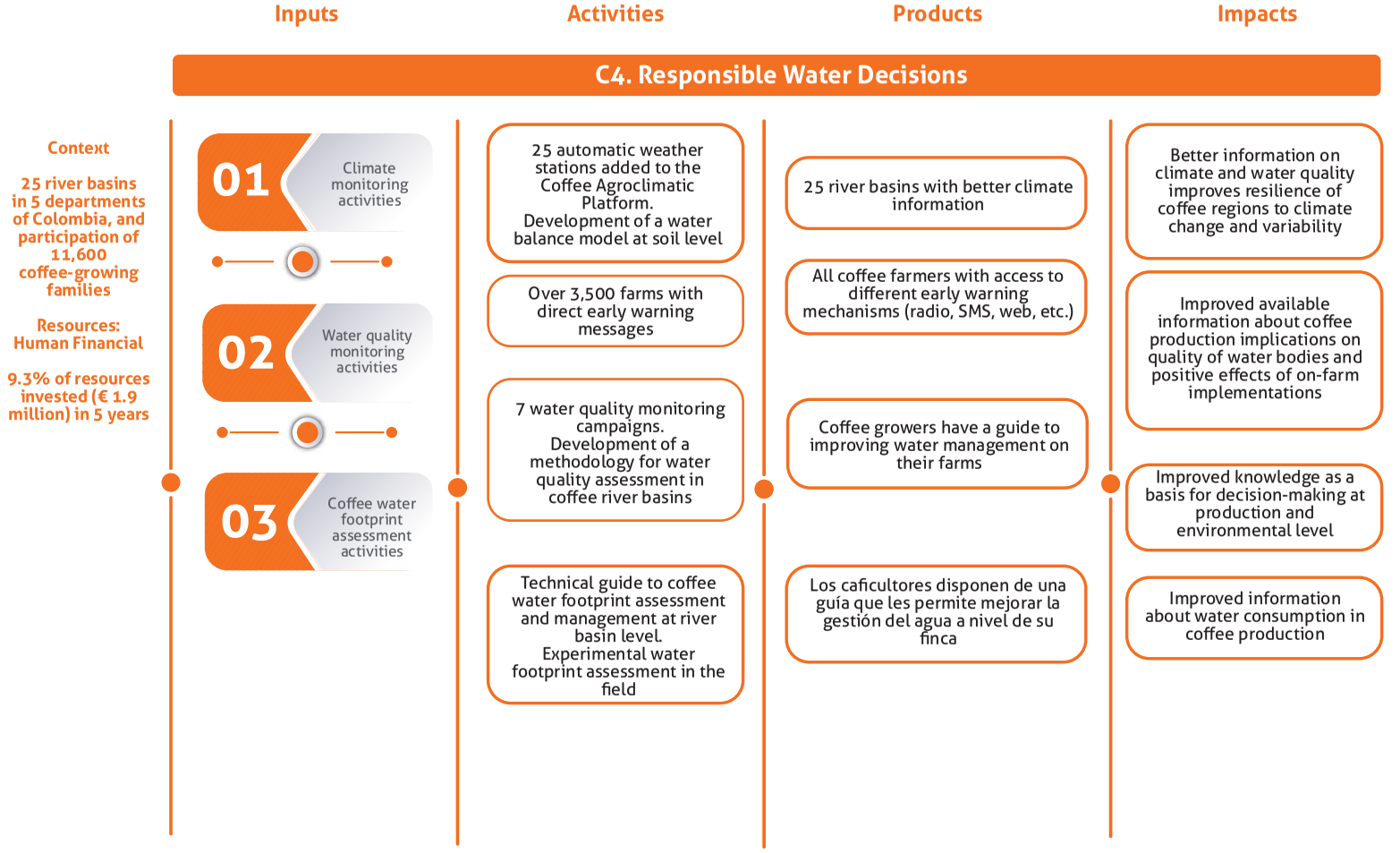


Figure 63. Results achieved under the Theory of Change approach. (Responsible Water Decisions).

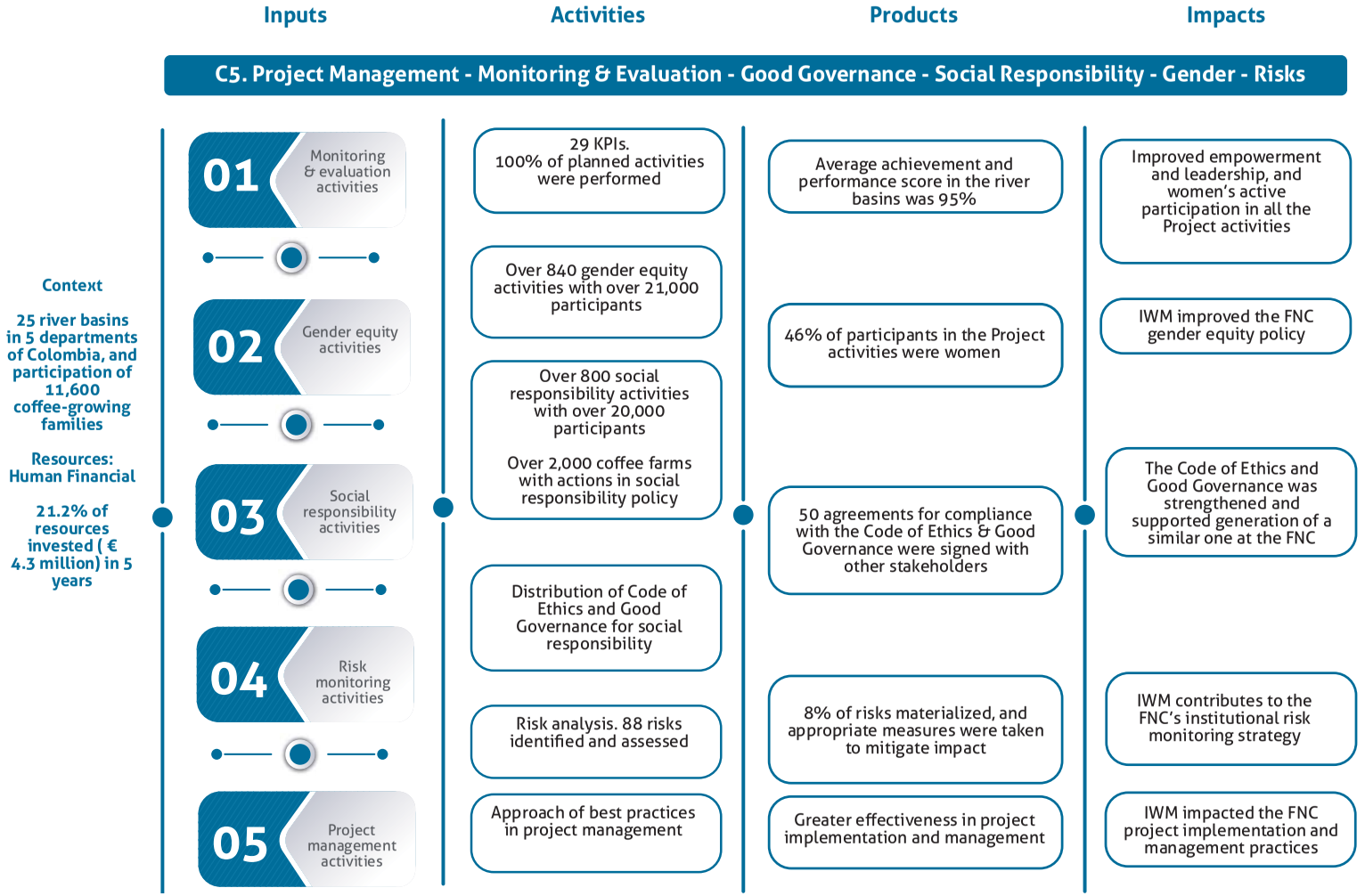


Figure 64. Results achieved under the Theory of Change approach. (Project Management).

On-farm water saving in ecological wet coffee processing and with sanitary devices

Water saving through interventions in ecological wet coffee processing and sanitary devices was calculated by comparing characterization before and after the interventions. This required ensuring a good adoption process on the IWM farms.

There were **1,443** water management interventions in wet coffee milling; equipped with new pulping machines and dry hoppers, farms used no water in pulp removal at all. Likewise, water consumption by using tub-tanks, Becolsub and Ecomill®, duly installed on the farms and in contrast to conditions and technologies before intervention, was calculated by considering specific consumption values of wet milling technologies (adjusted for calibration values).

As to sanitary water savers, taking into account the implementation of over 1,070 solutions, 4-member families on average per farm, an estimated net supply of 200 L/ day per person, and 10% water saving by devices, the estimated volume of water saved, which wouldn't be demanded by the sector and would be available to nature and the river basin community, would be **26,280 m3/year.**

Figure 65 shows prior consumption and percentage of water saved on the farms intervened in each of the IWM Project departments, with over 2,243 farms with water-saving solutions implemented (in coffee processing and with sanita

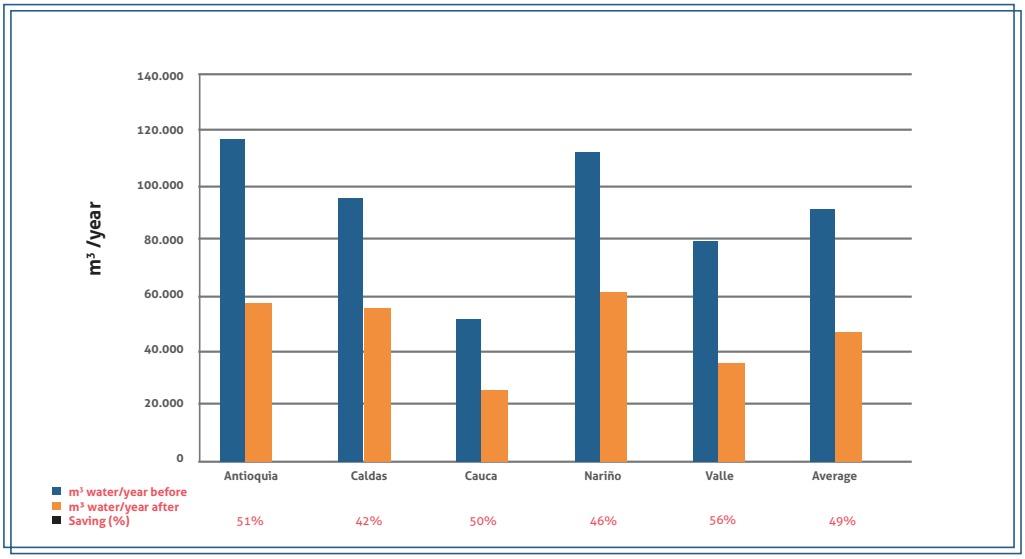


Figure 65. Water saving percentages for the departments of Antioquia, Caldas, Cauca, Nariño and Valle del Cauca as a result of IWM Project implementations.

Reduction of potential wastewater pollution at farm level

To determine the type of system to be installed in each river basin, field visits were made to guarantee the best interventions. Together with the Committees of Coffee Growers and some Regional Autonomous Corporations, the most suitable system for local conditions was identified.

To ensure successful interventions, both Rural Development Promoters and coffee farmers were trained in the intervention areas during the field visits (Figure 66).

Figure 66. Training of coffee growers and Extension Service on treatment systems.

Designs and protocols were completed for construction and evaluation of reuse pits, Modular Anaerobic Treatment Systems (SMTA the acronym in Spanish), septic systems and artificial wetlands, and treatment systems installed in the departments were evaluated.

Pollution load reduction. Pollution load reduction was determined based on over 3,346 wastewater treatment implementations, both for coffee and domestic wastewater. Table 25 summarizes pollution load reductions by department.

Table 25. Reduction of pollution load depending on interventions.

Department	Pollution in river basin by coffee wastewater (t of COD/year)	Pollution in river basin by domestic wastewater (t of COD/year)	Reduction of load in coffee wastewater (t of COD/ year)	No. of interventions with coffee wastewater treatment systems	Reduction of load in domestic wastewater (t of COD/ year)	No. of interventions with domestic wastewater treatment systems
Antioquia	1,868	41	784	373	23	376
Caldas	2,175	69	377	316	26	436
Cauca	828	84	147	443	17	276
Valle del Cauca	2,201	41	806	275	27	420
Nariño	825	51	222	231	13	200
Total	7,896	287	2,336	1,638	107	1,708

According to calculations in Table 25, there was total reduction of 2,336,257 kg of COD per year for coffee wastewater and an average reduction of 467,230 kg of COD per year per department, as well as total pollution load reduction of 106,598 kg of COD per year for domestic wastewater and average departmental reduction of 21,320 kg of COD per year. For determining pollution load reduction, the following aspects were considered (Table 26), depending on types of systems installed and current implementation state (full or partial systems):

Table 26. Wastewater treatment systems installed and purification rate

Coffee wastewater		Domestic wastewater	
System installed	Purification rate	System installed	Purification rate
Full SMTA	80%	Full septic system	80%
Reuse pit	80%	Septic system and wetland	90%
Partial SMTA	40%	Partial septic system	40%
Biodigester	80%	Septic tank	30%
Artificial wetland	10%	Grease trap	5%

Systems installed. Figure 67 shows different solutions installed on some farms of the IWM Project.

Figure 67. Implementations: a. Reuse pit; b. SMTA; c. Artificial wetland.

The water quality study within the component "Responsible water decisions" sought to assess effects of the Manos al Agua-IWM Project interventions on quantity and quality of water in the 25 coffee river basins. To achieve the study objective, two monitoring points were selected: Point 1 located upstream from the area of implementation of the Project strategies, and Point 2, located downstream from the implementation area.

Based on results of water quality monitoring, the Project intervention had a positive effect on water quality in the 25 IWM river basins.

The IWM Project has improved knowledge about the influence of coffee production on rural producing areas of Colombia: its negative impact on quality of water in coffee river basins is lower than previously thought. According to the IWM Project, impact is higher at harvest time, but lower than estimated, thanks to integrated actions in technological adoption, behavior changes in producers and communities, and high capacity for natural self-purification of water bodies.

In general, the following positive impacts were observed:

In 92% of the river basins, water quality improved between the two monitoring points P1 and P2, the former located upstream from the coffee area and P2 downstream. This improvement is reflected in attenuated water quality decline between Point 1 and Point 2.

- Water quality at P1 is generally better than quality at P2. During the Project, water quality at P1 still deteriorated due to exogenous pollution sources, but quality decline between Point 1 and Point 2 was attenuated, an evidence of improvement.
- The key performance indicator on water quality (KPI21) showed an average 70% pollution reduction between Point 1 and Point 2. The number of river basins that reached "good" quality downstream from the coffee zone (Point 2) increased from 16% at the beginning of the Project to 40% at the end of Year 5. At Point 1, there was a decrease from 56% to 40%.
- Dynamic monitoring, a more intensive method with greater number of monitoring points and frequency, found that pollution peaks, at harvest time, are lower in bodies of water receiving discharges from farms with IWM implementations. It also identified other pollution sources, such as discharges from municipal seats and wastewater from livestock production projects, among others.
- It can be confirmed that interventions on the selected farms, located within 100-200 m from the body of water, resulted in better water quality in the whole river basin.

Total volume of water saved in the Project regions

a. Direct water saving as a result of implementations

How much water has been saved or kept at acceptable quality levels for the environment and coffee communities as a consequence of the IWM Project interventions?

Total volume of water saved through the IWM Project is an estimated 98 million m^3/year. This volume can be broken down as follows:

- Total volume of water saved as a result of implementation of water-saving solutions is an estimated **305,300 m^3/year:**

  Reduction of water used in wet coffee processing as a result of implementation of water-saving technologies is an estimated **198,720 m^3/year** (1,193 on-farm implementations).

  Domestic water saving as a result of devices implemented is an estimated **26,280 m^3/year** (1,070 household implementations).

  Water saving as a result of awareness-raising campaigns and technical assistance, targeting mainly coffee-growing families and their communities is an estimated **80,300 m^3/year** (11,630 families reached).

- Unpolluted freshwater as a result of effluent treatment and management until achieving acceptable quality water is estimated at **97.72 million m^3 per year.**

  Unpolluted freshwater as a result of discharges prevented in wet coffee processing through implementation of coffee pulp management and wastewater treatment technologies was an estimated **93.44 million m^3/year** (20,898 m^3/year of wastewater treated by 1,386 implementations).

  Unpolluted freshwater as a result of discharges prevented through domestic wastewater treatment was an estimated **4.28 million m^3/year** (191,756 m^3/year of wastewater treated by 1,737 implementations).

- Drinking water supplied by domestic water purifiers was an estimated **5,454 m^3/year** (876 LifeStraw® filters).

b. Water improved by the IWM Project

The approach used by IWM is based on integrated water resources management, with interventions that directly affect water quality and quantity, but also with other types of actions that had an important indirect effect, among which are interventions relative to soil and crop conservation, reforestation, bioengineering works, waste collection and campaigns to raise awareness and empower communities.

All this resulted in a positive impact on quality and quantity of water available. Although difficult to quantify, this impact was evaluated thanks to the water quality monitoring performed.

As a result of the IWM Project, it can be highlighted that:

- Water quality evaluated with the Overall Quality Index KPI21 downstream from the coffee zone **improved 11%** throughout the Project.
- The number of river basins that reached "**good**" quality in the KPI21 index rose from **16% at the beginning of the Project to 40% at the end**.
- 92% of the 25 river basins intervened showed improved water quality throughout the Project.
- According to the KPI21 index, **water quality deterioration** in the coffee zone stretch was attenuated **86%** during the Project.

c. Water made available by the IWM Project

General impact of all the IWM Project activities on quality of water bodies can be expressed in volumetric terms using the "Water Sustainability Benefit Accounting Method (WSBAM)." It estimates the volume of water made available to nature (WA) based on the quality increase observed, in the bodies of water located downstream from the coffee zone, after the Project implementations.

- It can be concluded that the volume of water made available (WA) as a result of all the IWM Project actions is estimated at **167 million m^3 per year.**

Lessons learned to make Manos al Agua-IWM river basin management profitable and sustainable

The main lessons learned and practical profitability and sustainability considerations that are differentiators in the Manos al Agua-IWM Project to continue river basin management work with an emphasis on integrated water resources management are listed below:

Implementation

Implementation of a project in the rural sector has to introduce elements that connect producers, their families, and the community:
• The concept of territory, the river basin as a system.
• **Water as fundamental element for life, production, integration, decision-making and territory management.**
• Identity - Manos al Agua brand.

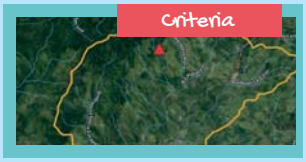
Problem

It is essential to identify the problem and address it in an articulated way to propose and define the intervention mechanisms most suitable for conditions of the area to be positively impacted. Water problems make it necessary to achieve participation of local actors with a focus on management and understanding of the river basin, with motivation and a specific purpose to achieve benefits and advantages.

Partnerships

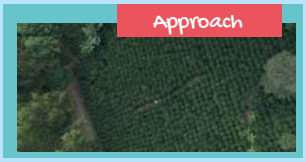
Public-Private Partnerships are to be promoted as interaction and cooperation mechanisms for sustainable development, setting key guidelines and common elements to convince different stakeholders of these types of initiatives, the importance of river basin management, and the need for strengthening work on integrated water resources management.

Criteria



• Criteria for selection of river basins, delimitation of river basins.
• Criteria for selection of producers and farms.
• Criteria for prioritization of activities as key factors for achievement of results.

Approach



The landscape approach is important for addressing environmental recovery capacity, and soil and water resources protection, with involvement of the community through motivation and the connecting elements: territory and water.

Action plan

The river basin action plan must include a holistic vision in the process, involving actions in the technical-economic, social, environmental and good governance components, promoting work on the farms, and actions in the regions in an articulated way.

Teams

Multidisciplinary teams that strengthen technical assistance and rural extension. Research provides continued support for technology transfer and knowledge circuit.

Intervention

• Intervention in **25% of farms, those located within 100 and 200 meters from water bodies**, enabled a high level of response of water resources in 100% of the intervened river basins: "A small number of farms intervened for a high impact on the region."
• Technology adoption on the farms and behavioral change of producers, families and the community are success factors.
• Regions are impacted by starting with organized work on the farms.

Application

• Application of gender equity approach in the entire project structure as cross-cutting element that permeated and strengthened development of the different processes.
• Women in the implementation work team as examples of leadership, women with responsibility and leadership at family and community levels, and equal participation of men and women, with quality functions, in different project activities, among others.

Community

• Young people and children must be involved in community awareness-raising and training activities or competitions to promote generational change in coffee farming.
• Rural schools are also to be involved.

Legacy at general level

Manos al Agua contributed important elements to work in the Colombian rural sector, and its general legacy includes:

- Experience and lessons learned in implementation of projects in the rural coffee sector.
- A Manos al Agua model for Integrated River Basin Management (territory understanding and management approach).
- Experience in community work and participation with Manos al Agua groups.
- Strengthening of local relationships among living forces (Water Platform).
- Experience in multilevel training of experts, extensionists (role of instructors who provide rural extension), producers and their families.
- Teaching methodology, development of educational modules and materials, and continued support.
- Community wet mills in Nespresso areas in Cauca and Nariño.
- Experience in monitoring of water quality in river basins - Identification of species (macro- and micro-invertebrates).
- Strengthening of Coffee Agroclimatic Platform at the service of Colombian coffee farming.
- Improvement of quality of life with access to safe water for human consumption through provision and management of drinking water filters.
- Project impact assessment: experience with tool QuickScan applied in river basins and impact of interventions on farms.
- Alignment of the strategy with the global environmental climate initiative and agenda (COP 21-SDG-Paris Agreement).

Legacy at coffee institution level

For coffee institutions, the 5-year Manos al Agua-IWM experience generated a series of elements, tools and knowledge as a legacy to be used for consolidation of a prosperous and effective FNC, which works for empowered coffee growers to make the best decisions on their economic and social development, respecting the environment.

To coffee institutions, Manos al Agua-IWM and its legacy became a cutting-edge strategy for environmental, economic and social work to promote sustainable rural development in coffee river basins.

As a legacy at the level of coffee institutions, the following contributions can be listed:

- To the process of project formulation, planning and management.
- To the risk assessment process at institutional level.

- Experience in the systematization process.
- To the FNC Code of Ethics and Good Governance structuring process.
- To Gender Policy.
- To SIC@ (information and imagery update).
- Experience in ICT for Rural Extension.
- To the FNC Business Management Program.
- To Rural Extension process.
- To Rural Extension training.
- In research and strengthening of technology transfer.
- To climate monitoring and strengthening of the Coffee Agroclimatic Platform.
- To the FNC communication process.
- Criteria for selection of farms and prioritization of actions to address project implementation.

Manos al Agua, an initiative for the post-conflict era in Colombia

Peace not only means balance and stability of the parties in a territorial unit where safe conditions derive from absence of unrest, violence or war, but involves coexistence of people and their environment.

> ***Manos al Agua has contributed to a peace strategy built with natural capital, environmental management and social work. The river basins are natural spaces where articulation of stakeholders, community participation, environmental work and economic development are the basis for reconciliation.***

Results of diagnosis made in the Manos al Agua planning phase (2013-2014) showed that water-related conflicts were more important than believed, with an average 28% of people living in the 25 river basins that said they have already had this type of conflict.

Water is an essential natural resource in all aspects of social development and welfare that impacts production factors, power generation, and nutrition and health of people, contributing to stability of ecosystems. Risks related to imbalance of water resources due to excess, scarcity or pollution increase poverty and are a source of conflicts and violence, affecting sustainable development and well-being of families in Colombian rural areas.

As part of the five years of work with the Manos al Agua-IWM initiative, the problem of water-focused territory management in the rural coffee sector was addressed as an example of integration and articulation for other sectors, with intervention mechanisms tailored to conditions of the areas to be positively impacted.

Manos al Agua catalyzed collective effort through an integrated process with a new work approach in the rural sector, suitable to support the post-conflict strategy of the Colombian Government's National Development Plan, where territory-tailored actions and coordination of relevant state entities are essential to make rights of rural populations effective, as they have been the most affected by the internal armed conflict in Colombia.

The Manos al Agua strategy provided a replicable model, learning and knowledge to strengthen joint work of the coffee sector with environmental authorities and the government sector in general, an essential factor to address problems around water (as vital element) in the regions and consider, in the medium and long term, initiatives for the post-conflict process in Colombia.

As support to the post-conflict strategy and with the experience achieved, Manos al Agua can provide a model for the prioritized areas to promote and achieve **peacebuilding, sustainable rural development, and environmental conservation and sustainability.**

Peacebuilding: Emphasis is put on working with the community to strengthen coexistence and reduce water-related conflicts. It is a strategy to work with families, children and young people to involve this population in activities and spend fruitful time, promoting, through games, understanding of their region, importance of water resources, value of coffee as a life project, peaceful coexistence and rights.

Sustainable Rural Development: Efforts promote social, environmental and production management of the territory that is the river basin, where water is the key element for integration, development, prosperity, coexistence, rural poverty reduction, and closing of the urban-rural gap.

Production inclusion will be instrumental to promote and reinforce actions in sustainable production chains, like those already generated through sustainable shared value programs in the cluster managed by the FNC with the support of Nestlé and Nespresso, present in these same coffee regions. Strategies are promoted for climate change adaptation and environmental sustainability, adjusting the coffee production system and including landscape conservation and management tools, as well as strengthening family coffee farming.

Environmental Conservation and Sustainability: Strengthening of projects focused on biodiversity, environmental conservation, deforestation reduction, soil management, water saving in wet milling, reduction of pollution in wastewater from farms (coffee production and households) and use of economic tools (for example, to develop at least one Payment for Environmental Services).

Success of Manos al Agua will enable people who have been affected by the armed conflict to find conditions to live with dignity within the law and contribute to peace, security and coexistence through a model to manage their territory with ecofriendly production, community participation and stakeholder involvement.

"Peace and the environment must be in harmony"

Summary

This chapter presented the main impacts achieved through implementation of the Manos al Agua-IWM Project: Medium- and long-term impacts with an emphasis on water saving in wet coffee processing and households, reduced potential pollution by farm wastewater and in the river basins, better water quality, and strengthened community participation and stakeholder articulation, among others.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

THE PATH OF COFFEE RIVER BASIN MANAGEMENT TOWARDS IWRM

8

This chapter presents a concrete and practical proposal of the main elements to continue work in the areas where the Manos al Agua-IWM Project was implemented, in order to keep the level reached and consolidate the impacts achieved, as well as guidelines to address the start of a strategy in new river basins.

Basic elements of river basin management towards Integrated Water Resources Management (IWRM)

The Manos al Agua-IWM experience and results achieved in the 25 river basins enabled understanding of the dynamics of these territories as systems. The integrated river basin management plan, with an emphasis on water management, generated knowledge to establish basic elements to address a strategy of this nature.

It is essential to emphasize that the approach of an initiative like Manos al Agua in the rural sector by decision makers and public and private organizations, institutions and companies will depend on the interests, specific work to be done, and the need for and availability of resources, the latter being essential to establish the proposal scope; activities should focus on reasonable objectives and achievable results based on available resources.

For river basin management work with an emphasis on IWRM, the following basic aspects should be taken into account:

a- To identify the problem and needs of the affected population to be supported and involved. Addressing water-related problems must be based on a participatory diagnosis, engaging the target audience and the beneficiary population to understand the reality and provide practical and effective solutions.

b- The organization responsible for the initiative must have experience; administrative, managerial and technical capacity; convening power, and relationship capacity. The organization must offer credibility and trust.

c- To promote integrality of the strategy. Actions must be proposed from the technical-economic, environmental, social and good governance points of view.

d- To address work at farm, regional and institutional levels.

e- To have a region and landscape management approach, starting with work on farms in an orderly way.

f- To introduce elements that connect and motivate farmers, families and the community with the process.

g- To select and delimit the territory where work will be done. This makes it possible to connect and focus. It facilitates continued support, follow-up, monitoring, and evaluation to determine achievement of results.

h- To clearly and concretely define criteria for selection of producers and farms, and criteria for prioritization of activities as key factors for achievement of results.

i- All on-farm implementation activities must be addressed with a management plan under a continuous improvement approach. Establishing the activities to be developed must include decision of producer and their family according to reality, farm needs, and financial resources available.

j- To define specific indicators to monitor and analyze scope of actions.

k- To prioritize and delimit the intervention area based on the objective and expected result.

l- To define a line of main implementation actions with direct impact on water bodies at farm level and a line of complementary actions at farm and regional levels.

Main actions at farm level	Complementary actions at farm and regional levels
• Productivity/Renovation of coffee crops with resistant varieties and BAPs. • Water saving in wet milling and households. • Wastewater treatment. • Solid waste management and disposal. • Water purification for human consumption. • Forest management to protect riverbeds and springs. • Soil conservation and ecological restoration through bioengineering.	• Forest management with landscape connectivity and management approach (community management). • Solid waste collection along channels of water bodies (community management). • Ecological restoration through bioengineering works. • Community work and stakeholder articulation.

m- To define an orderly and reliable information management scheme, supported by mapping of implementation actions in the delimited territory.

n- To promote involvement of families and participation of women, children and youth.

o- To structure guidelines to establish the 5 transfer and sustainability determinants for development of sustainable initiatives and projects:

1. **Awareness raising and continuous training:** Targeting families, children, youth, women, institutional staff, and public and private organizations and entities.
2. **Continued support** by a multidisciplinary technical and professional team for Technical Assistance and Rural Extension, seeking to achieve changes and increase adoption and appropriation of the technologies and practices introduced.
3. **Community participation:** Creation and strengthening of community groups and networks in the intervention areas, providing two key elements of connection and social cohesion: territory and water.
4. **Stakeholder articulation:** To promote dialogue and participation of different local, regional, national and international stakeholders in the initiative, aiming at a joint strategy for greater impact and replicability and scalability of actions.
5. **Communication:** Both internal and external, ensuring timely and reliable information, thematic knowledge, dissemination of results, and visibility of the initiative as support mechanism to promote stakeholder articulation.

Figure 68 shows conceptualization of the basic aspects and elements to undertake a region management strategy with an emphasis on water resources management.

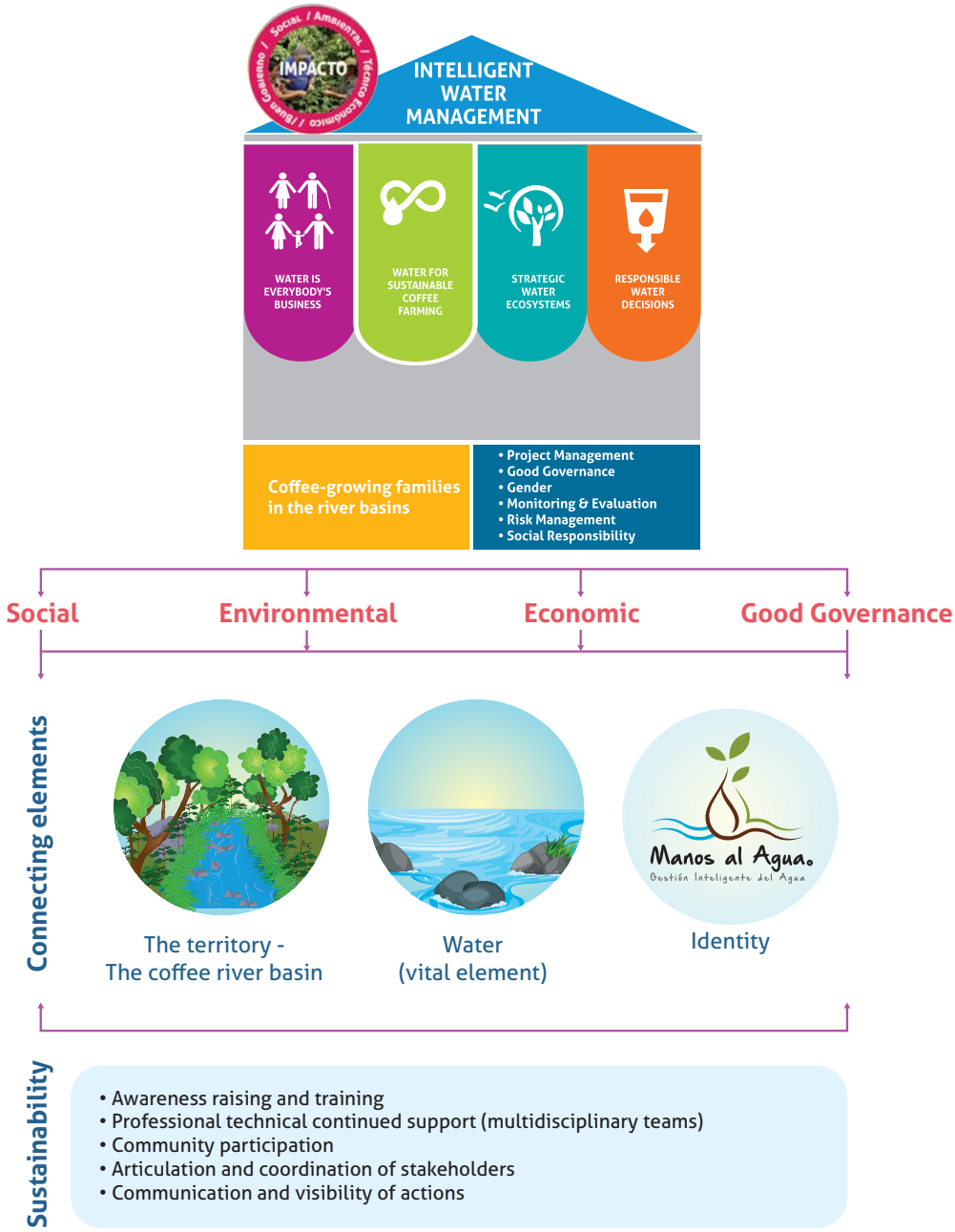


Figure 68. Basic aspects and elements of a river basin intervention strategy with an emphasis on Integrated Water Resources Management.

Lines of action to continue and strengthen work in the Manos al Agua coffee river basins

Knowing the scope of activities developed and seeking to consolidate the process of management of coffee river basins towards Integrated Water Resources Management, the following lines of action are proposed, which should continue to be developed at technical-economic, social, environmental and good governance levels.

The actions mentioned below are part of the institutional services to coffee growers in Colombia, strengthened by Manos al Agua by having generated knowledge, tools and strengthened processes to give a different vision to sustainable territory management, with a coffee river basin management approach, seeking to improve water management to support Colombia's coffee industry.

Technical-economic implementation lines of action

1. Agronomy and Productivity

- **Renovation of coffee crops by planting resistant varieties and stabilization of production.** To continue promoting renovation of aged, rust-susceptible coffee crops. To address the renovation process through the FNC institutional program to transform 18% of rust-susceptible coffee area in the IWM areas with better planting density and maintaining the production stabilization approach by improving average age of coffee plantations.
- To support the renovation process with application of best coffee farming practices.
- Alignment with the institutional strategy **"More Agronomy, more Productivity."**

2. Soil management and conservation on coffee farms

- To promote adoption of soil conservation practices in **coffee lots** to reduce effects of erosive processes.
- To promote implementation of **ecological restoration** practices with economical bioengineering works to reduce effects of inadequate water carrying on slopes and area losses because of mass movements.

3. Agroforestry management on coffee farms

- To provide assistance to coffee production systems through agroforestry management with native forest species, based on climate and soil conditions of each farm.

4. On-farm water solutions

- In this line of action, work must be done to complete regional coverage beyond 200 m from the main water body and its tributaries.

- **Ecological wet coffee processing and byproduct management.** To continue work of rationalizing water consumption on the farm, strengthening ecological wet coffee processing and byproduct management as an important practice to prevent high water volumes with some pollution degree. Rationalizing water use in wet coffee milling will improve wastewater treatment (system efficiency and lower cost).
- **Water saving in households.** To continue work of rationalizing water consumption on the farm, strengthening water saving in households with sanitary savers and good practices to avoid water waste and leaks.
- **Wastewater and discharge management.** To continue technological adoption of coffee and domestic wastewater treatment systems. This line of work should be holistic and include management of different types of wastewaters generated on the farms (coffee production and households).

5. Continued support to community ecological wet mills

- In the departments of Cauca and Nariño, through the Committees of Coffee Growers, the Extension Service staff should provide support to consolidate the community work scheme. The approach, once the IWM Project is finished, is to consolidate the system operation and sustainability by organized producers.

6. Business Management on coffee farms

- To continue the process of training and continued support to farmers and their families in the FNC Coffee Business Management program, seeking to strengthen economic analysis at farm level through systematical record keeping, based on real data from the farms, to know in depth the coffee economic activity and increase profitability opportunities.

7. Specialty coffee programs

- To keep the line of generating business opportunities through specialty coffee production with the support of the FNC programs and added-value clusters with clients such as Nespresso and Nestlé, among others.

Lines of action for environmental implementation

1. Forest management with landscape models and tools

- **At farm and regional levels.** To promote planting of native forest species by involving farms and communities in a voluntary participation process; this promotion mechanism does not require payment of incentives. Efforts should be made to expand forest enrichment and cover, with a high participation of farms and communities, emphasizing regional and landscape management. The following aspects should be taken into account:

- To prioritize reforestation areas taking into account landscape management criteria:

a. At least 100 m around water springs.

b. Available areas on a strip at least 30 m wide, parallel to floodplains on both sides of channels of rivers and streams, either permanent or not, and around lakes or reservoirs.

c. Available land with slopes greater than 100% (45°).

d. Available areas of lower forest edge density.

e. Available areas that increase connectivity of riparian forests.

2. Ecological restoration through bioengineering works

- To promote implementation of ecological restoration practices with bioengineering works to reduce effects of bad water carrying on slopes and area losses due to mass movements.

Lines of action for social implementation

1. Continued support in community participation

- Committees of Coffee Growers should provide continued support to consolidate the social base of organizations as managers of their territory, with an emphasis on:
    - Relationships with other community groups.
    - Articulation with organizations and approach to institutions.

2. Gender

- Committees of Coffee Growers should contribute to keeping alignment with the FNC Gender Equality Policy, with an emphasis on:
    - Empowerment and leadership.
    - Community participation.

Institutional and Good Governance lines of action

1. Intervention model replicable in the rural sector

In this component of Good Governance, the Manos al Agua Project generated knowledge, tools and an intervention model replicable in the rural sector, which will enable the FNC to position itself as an organization that works for sustainable rural development, providing elements and information for strengthening and management of public policies.

Lines of action at institutional level to strengthen good water governance include:

- Manos al Agua-IWM model as part of post-conflict projects.
- Public-Private Partnership schemes for development of new initiatives.
- Stakeholder relationships and articulation for learning appropriation, coordinated actions and collective vision focused on sustainable rural development.
- Corporate social responsibility.

Lines of action to address the start of a strategy in new river basins

Understanding the river basin as a system and the integrated vision of interventions (environmental, technical-economic, social and good governance), aiming at management of the region and water resources, have laid the foundation to propose lines of action that involve new regions.

As a model, Manos al Agua-IWM will serve as support to coffee institutions and institutions and organizations in other production and economic sectors that work for sustainable rural development in Colombia.

The lines of action required to approach work in a new river basin are described below. The basic elements mentioned at the beginning of this chapter should be taken into account to promote river basin management towards IWRM:

1. To define medium- and long-term initiatives or projects, with a duration of at least 3 years. Short-term projects fail to generate sustainability.
2. Once intervention resources and scope have been defined, the following phases should be carried out:

a. Start and planning

The planning phase requires time. A good planning process will provide support for appropriate start of implementation and closing of the process.

> In Manos al Agua-IWM, the planning phase lasted 20% of the Project total time (1 of 5 years).

The planning phase should include the following steps:

- To define database of participants, update spatial areas and geo-reference.
- To conduct diagnosis, characterization and baseline.
- To define criteria for selection of farms.

- To define priorities in river basin management.
- To delimit priority areas for interventions.
- Theory of Change approach.
- To define objectives, expected results and targets.
- To define a Project Management Plan.
- To define work plans and lines of intervention.
- To formulate the River basin management Plan (to be delivered in writing to the field teams).

b. Operational capacity building

This is a fundamental step to start implementation in a safe and reliable way. It involves building a technical and professional team that will lead the Project actions and activities.

The operational capacity setup phase should include the following steps:

- Formation of technical and professional work teams based on position profiles. The implementation staff should preferably have a multidisciplinary nature.
- Training and education (in rural extension, coffee technology, river basin management and IWRM).
- Project presentation and delivery of awareness-raising and multilevel training methodologies and tools to the implementation team.
- Supply of ICT tools for field work.
- Delivery of guidelines - River basin management Plan (in writing).
- Allocation of work area, delivery of a list of participating producers and farms and of river basin maps.
- Field recognition activities.

c. Implementation in the river basins

This is the development of all activities defined in planning in order to meet the objectives established for achievement of results.

In this implementation phase, development of the following actions, which are essential to fulfillment, should be considered:

- Awareness raising and presentation of the project.
- Implementation of work plans.
- Risk monitoring.
- Operation control and monitoring.
- Control and monitoring of cash flow of partners' contributions.
- Budget realization.
- Preparation and presentation of partial technical and financial realization reports.
- Performance of project government bodies.

d. Closing

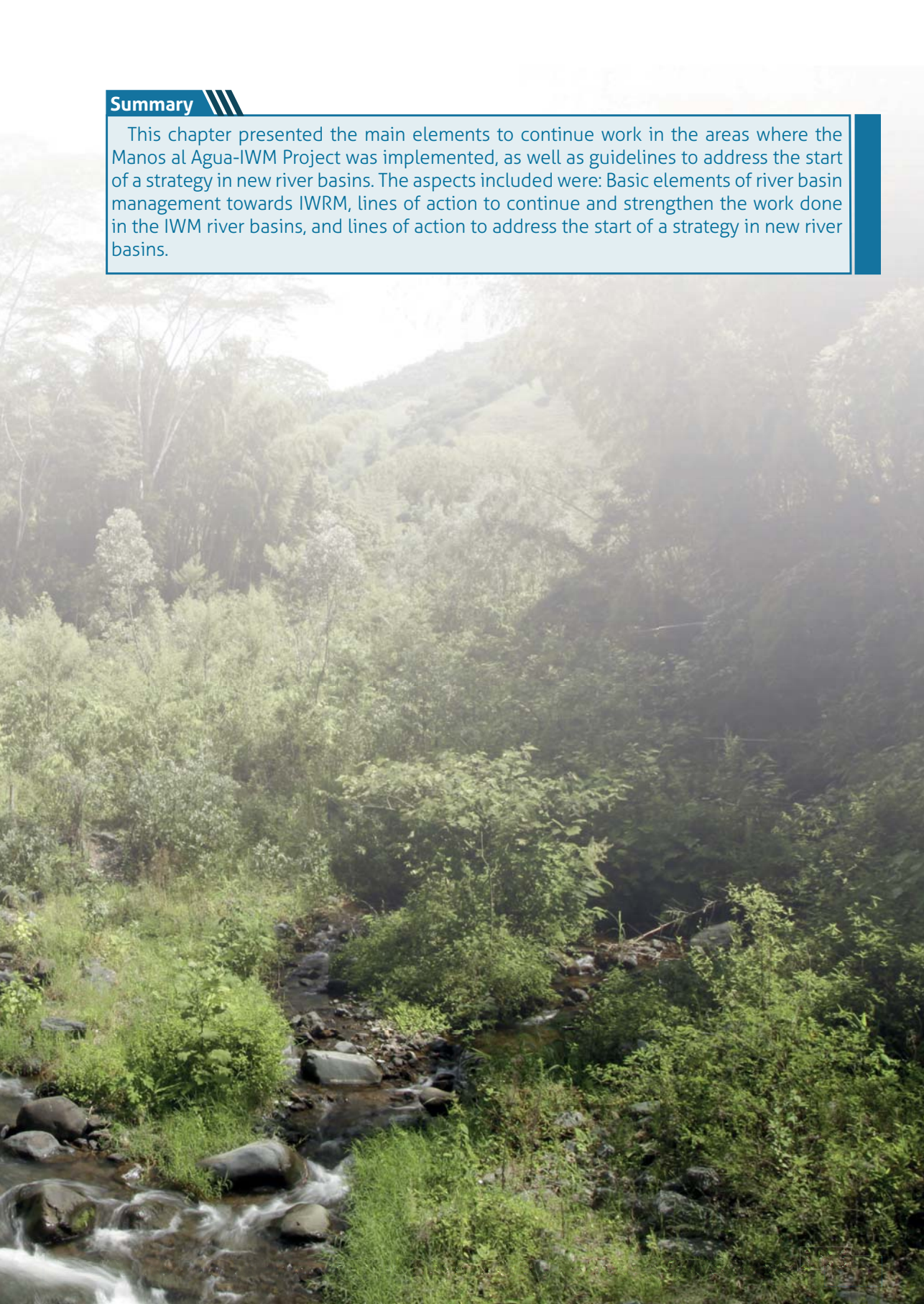
By completion of the Project and in the final stage of the implementation phase, closing activities should begin. This phase should include the following actions:

- Closing of procurement.
- Measurement of Project cost performance.
- Release of resources.
- Knowledge sharing (documentation and publication).
- Results and impacts.
- Final report.

In the River basin management Plan, at least the lines of action at implementation level should be established. The scope of each line of action will depend on budget availability and operational capacity.

Summary

This chapter presented the main elements to continue work in the areas where the Manos al Agua-IWM Project was implemented, as well as guidelines to address the start of a strategy in new river basins. The aspects included were: Basic elements of river basin management towards IWRM, lines of action to continue and strengthen the work done in the IWM river basins, and lines of action to address the start of a strategy in new river basins.

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Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

CONCLUSIONS

9

CONCLUSIONS

On the experience and learning achieved with the Manos al Agua-IWM Project, the team participating in this process shares the following conclusions:

On process conceptualization and guidelines

- **Water-related problems in the coffee sector**, as a result of climate variability and human activities that pollute and degrade natural resources, have caused considerable losses to coffee producers and uncertainty over their production and life projects around coffee. The **focus on management and understanding of coffee river basins towards Integrated Water Resources Management** was a strategy of the coffee sector to recognize water importance and propose a sound initiative for the future and well-being of the rural population.
- The **Public-Private Partnership** as a tool of collaboration between public agencies and private companies showed, through the IWM Project, that **cooperation can achieve tangible results for communities where it occurs, focused on proper water resources management.** The Partnership created a replicable model for other regions and sectors to adopt new strategies that promote sustainable development and peaceful coexistence around river basins in Colombia.
- Manos al Agua-IWM showed that **a grant may become seed capital** to ensure participation of other organizations and entities. The experience of private partners supporting the public sector achieved greater investment participation, which in turn supported the implementation strategy in the areas prioritized.
- Water issues in the Colombian coffee regions should lead to **structure and implement integrated strategies** in a sustainable context, involving **governance** elements that, together with **social, technical-economic and environmental** actions, should enable viability of the coffee business and contribute to development and welfare of communities.

On integrated coffee river basin management

- In water-related initiatives like this, it is fundamental to decide on and define **the river basin as a system**, as **a planning and management unit**, an aspect that should meet the need to organize and work on this system's elements, depending on its own conditions and characteristics, making the most of the advantages and benefits that it offers. Management of the river basin as a system delimited the water landscape and empowered its inhabitants to identify the territory as a management element, drawing attention of local actors (authorities, organizations, institutions and communities) to water problems and river basin management.

- Manos al Agua-IWM has promoted territorial development starting from the river basin. **Water is the integration and management element**, which articulates several sectors and activities in the territories defined around the river basin.
- **Manos al Agua-IWM was designed to impact regions, starting with work on farms in an integrated manner;** landscape and territory management was the core of the strategy. A total of 24 work plans were comprehensively structured to promote and strengthen region management, an integrated river basin management approach with strategic focus on water resources.
- Definition of **criteria for selection of coffee river basins and for delimiting** them is necessary to ensure work organization based on the elements that constitute them.

On Manos al Agua-IWM intervention model phases

- The **diagnosis** of river basins and farms therein made it possible to understand and confirm conditions and needs, which guided development of the river basin management work strategy focused on water resources. The situation found under the social, environmental and economic components was very similar in the 25 river basins in this process.
- **High rates of farms reporting water scarcity problems, water-related conflicts and pollution generated by the sector showed that water problems were more serious than previously thought** and justified the actions undertaken within the framework of the IWM Project (with an integrated river basin management vision).
- The **actions proposed by IWM** to improve water quality, save water and encourage ecofriendly agricultural production practices went beyond development and adoption of technologies, seeking to change behavior and attitudes of the beneficiary population to water resource management.
- **Criteria for selection of farms and producers** based on **proximity to water bodies** and delimitation of priority intervention areas were **key elements** to strengthen results and achieve a positive impact on the whole region.
- **Multidisciplinary continued support,** an **awareness-raising and training** strategy, **community participation, stakeholder articulation** and strengthened **communication mechanisms** to make actions visible are key success factors in rural development projects.

Results of implementation of the Manos al Agua-IWM strategy

- Three elements were crucial for greater effectiveness in the implementation phase, in order to achieve results both at farm and regional levels and strengthen work with the community as cohesive elements:
  - The concept of territory, the river basin as a system.
  - Water as essential element for life, production, integration, decision-making and management of the territory.
  - Generation of identity with the initiative.
- A total of **93 lines of action at farm, regional and institutional levels,** established and developed in the 24 work plans during the implementation years, **changed attitudes in people and communities** to achieve objectives and meet the set goals. A direct positive impact on water bodies was an evident improvement of their quality in 92% of the river basins.
- To positively impact water resources in the river basins, working on 25% of farms (those closer to the bodies of water) and not **100%** is crucial. Efficient use of resources is evident as actions to be developed are ordered and prioritized. With the **strategy 25-100**, intervention on **25%** of farms, located 100 and 200 m away from bodies of water, had an **impact on 100% of the region.**
- Application of a **gender equity approach** in all the structure of the Project was very important as a cross-cutting element that permeated and strengthened development of different processes: Women in the professional implementation team as an example of leadership, women with responsibilities and leading roles at family and community levels, equal participation of men and women, with quality functions, in the different Project activities, among others.

On systematization of the experience, transfer and sustainability of the Project

- Systematization of the experience, applied to different project phases, is a tool to generate learning curves in organizations. Appropriate documentation will serve to advance to more efficient use of resources and positive project impacts.
- One of the achievements highlighted by different stakeholders in all the work plans was increased **awareness of water care** and promotion of **community work**, recognizing also the key role played by **women**. This should be strengthened through collaborative work and generation of strategic partnerships at community and institutional levels.

- Perception of some stakeholders (coffee farmers and technicians) about the Manos al Agua-IWM Project, given the size of water problems in the river basins, helped propose different water resource management options in the coffee regions and carry out implementations based on **technologies and best agricultural and environmental practices** to contribute to environmentally, economically and socially sustainable coffee farming.

On integrated coffee river basin management

- The **landscape intervention approach** was one of the greatest strengths of Manos al Agua-IWM as an essential point to deal with problems in the regions; it should be included in future programs and projects for **the post-conflict era in Colombia.**
- The landscape approach addressed capacity for environmental recovery, soil and water protection, and participation of the community (coffee producers in this case) to improve their well-being and quality of life, in addition to meeting food security needs.
- To measure environmental, social and economic impacts, it is necessary to have a good diagnosis, establish a baseline and define monitoring and evaluation mechanisms, managing a sound and reliable database.
- In river basin management projects, real changes and impacts occur in the medium and long term.
- Technology adoption, improved facilities, technical support, better knowledge, behavior changes, innovation and research embody valuable learning to strengthen and maintain impacts in the future.
- Among impacts on coffee river basin management, at both farm and regional level, the following are of great relevance:

Adoption and appropriation of technologies and practices.

Water saved in ecological wet coffee processing.

Water saved in rural households with use of sanitary devices.

Total volume of water saved in the region.

Reduction of potential pollution by farm wastewater.

Reduction of pollution in the river basins and better water quality.

Strengthened community participation.

Stakeholder articulation.

Participation and influence on environmental and regional policies.

Integrated model of coffee river basin management in Colombia - Manos al Agua Experience

RECOMMENDATIONS

10

RECOMMENDATIONS

Based on the IWM Project experience, the following recommendations are made to develop integrated river basin management focused on water resources and needs of communities.

For process conceptualization and guidelines

- To identify the problem and deal with it in an articulated way is essential to propose and define intervention mechanisms that best meet conditions of the area to be positively impacted. Water problems require participation of local actors with a river basin management and understanding approach, motivation and a specific purpose to achieve benefits and advantages.
- Public-Private Partnerships should be promoted to consolidate cooperation between public institutions and private companies, setting key guidelines and common elements to convince stakeholders of the value of these types of initiatives, importance of river basin management, and the need for strengthening work on integrated water resources management.
- A Project must look for sustainable strategies based on participation of the different stakeholders, organizations and communities. This participation must occur from the beginning of the process, for which it is essential to establish a scheme of relations of living forces for a common goal and purpose. A relationship platform scheme can contribute to these types of initiatives.
- A Project that promotes integrated water resources management must take into account the concept of territory, the river basin, and its implementation must be addressed in an integrated manner, in a sustainable context, involving governance elements where technical-economic actions go together with environmental management activities, supported by social actions.

For integrated coffee river basin management

- In river basin management projects, connecting elements, such as the concept of territory, "the river basin as a system," and importance of water (vital element), should be provided, as they are essential to promote community relationships, stakeholder articulation and structuring of initiatives for the post-conflict era in Colombia.
- In the case of rural development projects with a sectoral approach, their vision must go beyond what is inherent to the proposing and implementing sector. Having an integrated vision, which motivates and commits all stakeholders, is essential to achieve changes.

- In river basin management focused on IWRM, it is necessary to involve people, coffee producers, their families and communities. Success in management of natural resources present in the river basin system should contemplate human participation, their actions, needs, and capacity to organize and propose improvements to conserve its resources.
- To know and understand river basins as systems is fundamental to achieve the proposed objectives. From the beginning, clear and precise criteria must be set for selection of coffee river basins, as well as for delimitation of the intervention areas therein, in order to organize the actions to be performed in the territory.

For intervention model phases

- Implementation capacity and continuous presence of the organization responsible for the project are success factors. The organization in charge must have experience, administrative, managerial and technical capacity, convening power and relationship capacity. And it must offer credibility and trust.

- A river basin management project must include the following phases:

1. Planning phase.
2. Operational capacity building phase.
3. Implementation phase.
4. Process closing phase.

- The planning phase is essential for success of implementation and, therefore, at least 20% of total time of the project must be allocated to this activity.

- The operational capacity building phase is important to establish the necessary conditions so that, in the implementation phase, activities, times, costs, results and expected impacts can be developed or achieved.

- The action plan at river basin level should define lines of work aimed at solving the problems found. It is recommended to establish the necessary activities, encourage integration and involvement of producers and communities, and define expected results and goals to be achieved, as well as the implementation schedule.

- The river basin action plan should involve the community and strengthen their participation, so that they assume responsibility for management, collective work, oversight, resource management through projects and participation in decision-making and in structuring of river basin management plans with environmental institutions of the Government sector.

- For work at river basin level with an emphasis on water resources management, it is important to define criteria for selection of farms close to bodies of water. Likewise, it is essential to strengthen technology adoption and of best practices as a relevant factor to positively impact the territory.

A river basin action plan must include at least the following:

- To establish clearly and accurately the work to be done, taking into account reality in a specific way (based on diagnosis).
- The steps to be followed, methodology, staff responsible and resources required.
- An integrated approach, defining work at farm, regional and institutional levels.
- To be result-oriented, with well-defined goals.
- To homogenize selection and intervention criteria to unify treatments and actions.
- To be understandable and of easy implementation.
- To be a structured document to be delivered in writing to the implementing team.
- Region maps with delimitation of river basins, location of farms and a list of producers participating in the process.

Focused on implementation results

- Research and development of new technologies to address water pollution, with innovative, effective solutions to water and climate challenges, are important elements in these types of initiatives to strengthen implementation and ensure higher adoption levels.
- Multidisciplinary teams must be created to enhance technical assistance and rural extension, with continued support from research, to ensure technological transfer and strengthen the knowledge circuit.
- Establishing and presenting concrete indicators (to monitor and analyze scope of actions) is instrumental to convince the community, local and government authorities, politicians and users of the importance of resources and services provided by the river basins.
- The results to be achieved in a river basin, with an emphasis on water resource management, in general must lead to the following benefits:

Direct:
Change of behavior of producers, their families and the community.
Understanding of the river basin as a system.
Adoption of introduced technologies and practices.
Water consumption reduced and more water saved in different processes on the farm.
Management and reduction of pollution by domestic and coffee wastewater from farms.
Improved water quality in coffee river basins.
Promotion and strengthening of good water governance.

Indirect:
Resilience to climate variability. Improved health conditions. Influence on development and consolidation of water policies. Better quality of life. Communities near the benefited river basins with better water quality.

To work on a river basin approach, the following benefits must be sought:

- At farm level, producers must identify the advantages of soil conservation, wastewater management, crop management, rational use of agrochemicals, crop yields, improved productivity, lower production inputs and costs, agroforestry, better use of natural resources, water saving, water quality, and greater water supply, among others.

- At regional level, monitoring helps measure and achieve better water quality, forecast weather, regulate the water system, issue early warnings, and develop plans to deal with floods and droughts, contribute to community's balance, understand the territory and external factors associated with river basin management, and lead the community to better understand the river basin services.

- At institutional level, strengthened tools and public policies, rational approach to resources, inter-institutional relationships and articulation, and an information system to improve decision-making.

- Outside the river basin, guaranteed provision of services such as water to supply populations and for irrigation, production, power generation, recreational areas, and forest and agricultural products, among others.

For systematization of the experience

- The systematization process and its results can be the reference point for a deeper analysis to advance in consolidation of the Integrated River Basin Management model with an emphasis on water resources.
- The methodology proposed for systematization of the Manos al Agua-IWM Project experience should be considered as a reference for other projects to be implemented by the FNC and thus contribute to alignment with the project management methodology.
- The systematization process must occur in the four project phases. It is not convenient to start systematization in the project closing phase.

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BIBLIOGRAPHY

CENICAFÉ. Construyendo el modelo para la gestión integrada del recurso hídrico en la caficultura colombiana (Building the model for integrated water resource management in Colombian coffee farming). Chinchiná, April 2011. 91 Pages.

MANUEL MEJÍA FOUNDATION. Visión Integral del Manejo de la Microcuenca (Integrated vision of river basin management). Virtual training course. Bogotá, Colombia, 2016.

MINISTRY OF THE ENVIRONMENT, HOUSING AND TERRITORIAL DEVELOPMENT. Política Nacional para la Gestión Integral del Recurso Hídrico en Colombia (National Policy for Integrated Water Resources Management in Colombia). March 2010. 124 Pages.

MINISTRY OF THE ENVIRONMENT AND SUSTAINABLE DEVELOPMENT. Guía técnica para la formulación de los planes de ordenación y manejo de cuencas hidrográficas (Technical guide to formulation of basin organization and management plans). Bogotá, Colombia, 2014. 104 pages.

WWAP. IWRM Implementation in Basins, Sub-basins and Aquifers: State of the Art Review. UN. 2009.

ANNEXES

DIGITAL ANNEX 1. RedGIA comparative results of the 29 Project KPIs.

DIGITAL ANNEX 2. Maps of the 25 river basins with actions implemented.

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