Evaluation of the Sustainable Water Fund (FDW)

Intelligent Water Management Colombia

Executive Summary of the Final Evaluation Report

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January 2020

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Executive Summary

Introduction

The coffee sector is a major source of income for the rural population of Colombia. Coffee production accounts for 33 percent of rural employment, giving work to around 2.7 million people. Traditionally, considerable amounts of water are used to process coffee after harvesting in Colombia. These traditional water-using practices lead to water contamination that transgress the Colombian standards allowed for the coffee sector by roughly a factor ten. Moreover, the Colombian coffee sector is affected by changing climatic conditions. In general, water is abundant in Colombia's coffee growing areas and dry and wet periods in Colombia are associated with the phenomena of "*El Niño"* and "*La Niña"* that periodically lead to rainfall deficiency or increase, respectively. But the effects of these phenomena appear to have become stronger, possibly as a result of climate change, resulting in episodes of above-average drought and excessive rainfall.

Against this background, the Intelligent Water Management (IWM) project in Colombia intended to contribute to improved water management among coffee farmers by information and sensitization campaigns, training, hardware investments, and an improved institutional environment. IWM is implemented by the Colombian Coffee Growers Federation (FNC), in partnership with the Colombian government, the private companies Nestlé and Nestlé Nespresso, as well as the research institutions Cenicafé and Wageningen University & Research (WUR). A Public-Private Partnership (PPP) was to be established for the implementation of the project, with FNC as the lead partner. The project is co-financed by the Netherlands Enterprise Agency (RVO) with a €7.7 million grant of the Sustainable Water Fund (FDW). The grant represents almost 40 percent of the total project budget of €20.3 million.

The Intervention

The activities of IWM Colombia encompassed six different components:

- Component 1 was implemented in Year 1 of the project and related to the preparation and planning of the next phases;
- Component 2 included among others the establishment of a Water & Coffee Platform in which at least 50 institutions would participate, apart from the key partners implementing the project;
- Component 3 targeted 11,000 individual coffee farmers with interventions concerning domestic and productive water use and was budget-wise the most important part of the intervention;
- Component 4 included both river basin-level and farm-level activities concerning reforestation and bioengineering;
- Component 5 comprised activities regarding river basin management and were supposed to inform decision makers at the institutional level; and
- Component 6 concerned Project Management and the cross-cutting issues of Good Governance, Risk Management, Gender and Social Responsibility.

The activities of Components 3 to 5 were implemented in 25 municipalities that are evenly distributed across the departments of Antioquia, Caldas, Cauca, Nariño, and Valle de Cauca.

Theory of Change

We identified four main output categories: (i) farmers receive training and equipment; (ii) water and climate monitoring stations are installed, (iii) ecological restoration and bioengineering plans are elaborated, (iv) outputs on the institutional level. These outputs lead to outcomes on the three levels of implementation: (a) the level of the coffee farmer, (b) the river basin level, and (c) the institutional level. The intervention's outcomes influence the coffee farmers in three areas: they affect domestic activities of coffee farmers and their families, their farming activities, and the general quality of the watershed and the forest where the farm is located. The intervention produces only few tangible impacts that materialize on the individual's farmer level in the shorter run.

Actual Inputs and PPP Establishment

The following six partners had the intention to establish a PPP for the implementation of the project: FNC, Nestlé, Nespresso, the Ministry of Agriculture and Rural Development (MADR), WUR and *Cenicafé*, the National Centre for Coffee Research in Colombia. MADR was virtually a 'silent partner' in the PPP and was replaced in 2016 by the *Agencia Presidencial de Cooperación* (APC) – the Presidential agency that coordinates the international cooperation with Colombia – as the representative of the Colombian government in the PPP. At that moment, the PPP was consolidated from the point of view of membership.

Including investments realized in complementary projects, €4.3 million were invested in Components 1 and 6 and €16 million for activities of Components 2-5. The total resources invested were substantially less than the originally budgeted €24.5 million (of which €20.5 million from PPP partners and RVO and €4 million from additional partners for complementary projects). The main reason is that APC-MADR's financial contribution amounted to only a quarter of its committed resources and a subsequent reduction of the RVO grant.

Actual Output

IWM was very effective in implementing the foreseen activities. Use of resources from additional (non-PPP) partners in complementary projects and a favourable exchange rate change allowed for realizing more output than foreseen, even though the amount in Euros of the reported contributions of the PPP partners and RVO for the project was less than planned.

The core objective of Component 2, the establishment of a Water & Coffee Platform, was achieved. Additionally, methodologies were introduced that are contributing to improve water management in the coffee sector. Examples of this are the application of a river basin-based planning approach, participatory knowledge management and an ICT application developed for extension work at the farm level. For Component 3, over 3,500 coffee farmers – more than twice the planned number – received direct technical assistance and financing for implementation of water solutions.

Evaluation Methodology

The novelty of IWM is to provide the individual activities in a comprehensive and bundled way, focussing on the community and river basin level, as compared to treating individual farmers with individual activities. Accordingly, this evaluation assesses the effect of this novel comprehensive approach against the counterfactual situation of isolated activities using a *non-randomized difference-in-differences approach* base on survey waves among coffee farmers before and after the intervention,

i.e. in 2015 and 2017. For the baseline, we interviewed 699 treatment farms and 700 control farms. The surveyed river basins were selected in a way that control river basins resembled the IWM treatment river basins as much as possible before the project kick-off. At the follow-up, we succeeded to re-interview 1,351 farms. This means that attrition was very low at only three percent. Differences-in-differences estimations were obtained by using a regression model that controls for baseline values of the result indicators and, additionally, pre-intervention characteristics of the farms.

Semi-structured stakeholder interviews were used for the stakeholder analysis and as a source for triangulation and contextualisation of results from farm interviews.

Stakeholder analysis

A developmental PPP?

FNC was the initiator of IWM Colombia and the lead partner of the PPP. In June 2014, five of the six PPP partners signed a Partnership Agreement in which they agreed to operate as partners in the implementation of the project. MADR was also committed to be a partner of the PPP. However, by the end of Year 2, MADR had still not signed.

Although the membership of MADR in the PPP was not formalised, the partnership had both **public and private partners** and, in this sense, met the first of the five criteria of developmental PPPs as defined by the Netherland's Policy and Operations Evaluation Department (IOB).

MADR was virtually a 'silent partner' in the PPP. It did not really have ownership of the project. MADR ceased to be a (candidate) PPP core partner in 2016, when it was replaced by the *Agencia Presidencial de Cooperación* (APC) – the Presidential agency that coordinates the international cooperation with Colombia – as the representative of the Colombian government in the PPP. Hence, from the membership point of view, the PPP was consolidated.

The PPP also meets the second criterion of developmental PPPs, because – as explained earlier – the PPP partners defined a **common development goal**, which was laid down in a MoU.

In addition, the PPP partners **agreed on how the project's resources would be shared** and made a **division of labour** by defining which partner was primarily responsible for particular activities. While the APC made a financial contribution to the project, the **government's commitment** was **not fully realised**. In total, APC-MADR's financial contribution amounted to only a quarter of its committed resources.

Furthermore, neither the APC, nor the Ministry of Agriculture, played other envisaged roles in the PPP. In this sense, there was no true PPP as defined by IOB. Nonetheless, the relationship with APC facilitated the establishment and strengthening of relationships with other regional and local governmental institutions.

Concerning the fifth criterion of developmental PPPs – the **distribution of risks** between the public and the private sector – in total, 88 risks were identified and monitored. It is however **not always clear whether the risks concerned the public or the private sector** (or 'third sector'), or **whether** they were **borne by the PPP as a whole**. Some PPP partners stressed that the major risk concerned the timely disbursement of financial resources and that delay in disbursement caused delay in the project's activities in the first years. There was not only a risk of late disbursement, but also a risk of non-disbursement.

Water & Coffee Platform

It was decided to limit the PPP to a few core partners with an opening to other institutions to participate in the project. The six envisaged PPP partners are the core institutions of the Water & Coffee Platform. It was envisaged that the platform would, apart from the six PPP partners, have at least 50 members towards the end of the project implementation period. These institutions would participate with contributions in money and kind (labour hours) for implementing the so-called Complementary Projects (not outlined in the IWM project documents and not to be managed by the central level of the project). The platform was supposed to continue to function after completion of the IWM project and it appears that until now it is continuing to function. By February 2018, in total, 58 local, regional or national organisations had joined the platform.

Awareness, Multi-level Training and Accompaniment

An important activity of the IWM project was the training of coffee farmers, which was preceded by training of the trainers (i.e. IWM extension workers) at the *Fundación Manuel Mejia* and by means of e-learning courses. Training of farmers was provided by means of a mix of training methods (*i.e.* farm visits, group meetings, provision of information material) and was generally rated positively.

Factors potentially hindering the implementation of the IWM project were lack of awareness of scarcity of water, the small size of plots, the relatively low price of coffee, lack of interest or lack of a 'river basin vision', or the difficulty to change attitudes and practices of coffee growers. In comparison, examples of factors that facilitated or could facilitate the implementation of the project were a positive role of women in the community, training, awareness raising and the presence of the FNC. The drought or reduced availability of water as a result of the *El Niño* phenomenon in 2015/2016 was also several times mentioned as a facilitating factor.

Awareness raising, training and accompaniment were at the same time considered important for arriving at a more sustainable intervention. The IWM project's focus on a social component in addition to traditional extension (which focuses more on the technical-, coffee cultivation- and processing component) was also expected to foster sustainability. Related to this, the formation/strengthening of so-called *Manos al Agua* groups at the level of the communities was also seen as a way to foster sustainability of the project. By June 2018, 29 *Manos al Agua* groups had been established.

Value added of the partnership?

As emphasized above, strictly speaking there was no developmental PPP. Nonetheless, in the perception of various stakeholders there was a sort of PPP. Some actors perceive that the partnership had value added. A somewhat different view is that the partnership worked in terms of generating resources, but that it "did not support much in technical and social areas, although currently there is important support from Wageningen."

Perceived results of the project

Over half of the interviewees mentioned awareness or a change in knowledge or attitude regarding water as a main result. Almost half of them indicated that establishment or strengthening of *Manos al Agua* groups or associative work is a main result of the project. Other results, including reforestation and water saving or improved quantity of water were less often mentioned.

Views on sustainability of the results

Five fundamental factors were identified as contributing to achieving sustainability: (1) multidisciplinary teams in the field; (2) good methodology of awareness raising; (3) relationship with the community; (4) articulation with actors; and (5) knowing how to communicate. Various

interviewees emphasized that for the sustainability of the results, it is important that the community groups establish and strengthen relations with other institutions. The articulation of stakeholders also concerns the point raised in an interview that "government involvement is a prerequisite of sustainability. There is a need for contribution of the government to protection of the natural environment." Likewise, someone else emphasised that "the environmental themes have to be linked to all actors present in the territory." Regarding awareness raising and knowledge transfer, it has been mentioned that "with the training that has been provided, culture has been formed and with culture there has been a transfer of knowledge."

In terms of technical sustainability of IWM, examples given of technical improvements are the measurement of water quality, soil conservation and technical evaluation of zones to know whether it is feasible to plant certain types of trees. A lot of techniques have been learned in the context of IWM, which will likely continue to be deployed in the communities.

Views on the potential for scaling of the IWM project

There were no concrete plans for scaling or a second phase of the IWM project for lack of financing, but there were several requests from other organisations that would like to use the model and receive advice and materials produced by the project. In case of a second phase with a PPP set-up, it would be important that the public sector partner in the PPP would play a more active role in the project. A genuine commitment from the public sector to financially contribute to such a project would be required.

Survey Results: Take-up of Equipment and Trainings

Water-saving Coffee-Processing Devices and Techniques

IWM was successful in increasing the share of farms that do not use water in the pulping process and the share of farms that do not transport the pulped coffee with water. It also successfully promoted the use of tub tanks. IWM started to promote the association of several farmers for jointly operating community wet mills equipped with larger-scale processing devices. Around seven percent of the farmers in treatment river basins plan to participate in such community wet mills.

Adoption of water-friendly equipment and behaviour increased also in control river basins, between 2015 and 2017. This increase is partly driven by other projects or FNC's normal extension services distributing the same equipment as IWM does. Moreover, a large share of farms invested into the equipment using their own means.

Maintenance and cleaning of the equipment is in general slightly better in treatment river basins.

Coffee-processing Waste and Wastewater

Treatment river basins perform better than control river basins with regard to waste and wastewater generated in the coffee processing process. More farms got a coffee-processing wastewater treatment system in treatment basins. IWM supported the installation of so-called SMTA (modular anaerobic treatment systems). These account for around 50 percent of all treatment systems in the treatment area.

When it comes to usage and maintenance of the treatment systems, farmers in treatment river basins do not perform better than control basins. This contrasts with qualitative interview results indicating that IWM claimed that SMTAs would hardly be used in absence of the IWM intervention. Those farms that have an SMTA in control river basins even clean it more often than farms in treatment river basins. This effect might be driven by the fact that SMTAs do not have to be cleaned very frequently. Since

most of the SMTAs in the treatment groups had been received from IWM they were relatively new and possibly there was no need to clean them so far.

The usage of pits for pulp composting increased slightly in the treatment basins, while it even decreased in control basins. Accordingly, the measured effect is clearly positive. Also, when looking at the characteristics of the pit, treatment farms perform slightly better since their pits are better equipped (with a drainage tank) and farmers rotate the pulp more frequently.

Domestic Water Saving Devices

IWM promotes water-saving devices also for domestic use. This includes low-water consumption toilets and flow restrictors. The use of these devices increased both in the treatment and control area, but stronger among treatment farms. Possibly, also a part of the increase among control farms is driven by the IWM intervention, since some IWM sensitisation campaigns took place over radio-programmes and in schools where possibly also control river basin children attend

Domestic Water Treatment

Water filters, which are promoted by IWM, are used only by a small share of farms. In general, farms in treatment river basins increased water purification, but also control farms did, even though to a smaller degree. The double-difference is positive, but statistically not significant. Ownership of domestic waste-water treatment systems increased due to IWM by almost 10 percentage points. In treatment river basins, almost 60 percent of all farms have it in 2017.

Domestic Solid Waste

The share of farmers separating their domestic solid waste into organic and inorganic waste is very high both in treatment and control river basins, but no difference induced by IWM is observable.

Soil Protection and Forestry Management

The share of farms practicing recommended conservation practices decreased among treatment farmers for all practices apart from the establishment of protection areas and coverage with noble weeds. However, also among control basins conservation practices are performed less in 2017 than in 2015. The measured effect for establishment of protection areas and coverage with noble weeds is positive and statistically significant.

The share of farmers that realizes burnings decreased slightly both among control and treatment river basins (which is the desirable direction of change), but no significant impact of IWM can be observed.

The IWM intervention had a clearly positive impact on reforestation activities: the share of farms practicing reforestation activities is almost 20 percentage points higher in treatment river basins than in control basins.

Meteorological Stations

IWM substantially increased the awareness of farmers regarding meteorological stations by the project, with a double difference of almost 20 percentage points. Still, only 26 percent of the farmers in treatment basins were aware of the meteorological stations.

Training

For virtually all topics, treatment farms participated on average more in training than farmers in control river basins. IWM training on “wastewater management” and “protection of plant and animal species” showed the largest double differences: the share of farmers who participated in such training rose around 28 and 24 percentage points more in the treatment basins than in control basins. Several other trainings showed double differences of around 20 percentage points. For some trainings, the

share of farms participating also increased in the control group, partly due to spill-over effects. Excluding the farms with spill-over effects does not alter our results substantially. The intensity of training in treatment river basins was on average only slightly higher than in control basins: the average length of trainings in the treatment river basins is 3.4 hours, compared to 2.8 hours in the control area.

Survey Results: Outcomes and Impacts

Water Conservation Attitude

Many statements regarding water usage and attitudes towards water conservation are widely accepted by households, already at baseline. Especially for domestic water conservation, farms widely agree with water saving practices. The statements are more controversial for processing water conservation. For most statements, attitudes shift in favour of water conservation not only in treatment basins, but also in control basins. However, double-difference estimates show no statistically significant effects at conventional significance levels. Nonetheless, effect sizes are just on the edge to be detectable. Accordingly, we cannot clearly rule out positive effects of at most around six to ten percentage points. Furthermore, our estimates might be biased by spill-over effects from treatment to control areas, though no substantial impacts can have happened, even if the true counterfactual situation was a zero change.

Sustainability Labels

While no intended effect of IWM, the share of farms that have sustainability labels increased effectively in treatment river basins, while the proportion decreased in control river basins. The effect comes partially from the fact that less farms in control river basins participated in Nespresso's and Nescafé's initiative.

Gender

Overall, we do not find significant effects on women empowerment by looking at (i) female decision power, (ii) equality of the relationship, and (iii) perceptions about female stereotypes. The only significant effect concerns women deciding over medical treatment of household members.

Group Membership

Overall, the IWM intervention had no effect on group membership. Only if we look at changes on the department level, we see a substantial increase of household members belonging to groups in Valle del Cauca.

The share of farmers who participate in the IWM established *Manos al Agua* groups is not very high. This does not come as a surprise since each group consists only of around 25 members. Again, Valle del Cauca stands out with a disproportionately high number of farmers being member of the Manos al Agua group.

Water Shortage and Water Excess

The share of farms affected by water shortage was even higher in 2016 than in 2014, both among treatment and control river basins. This can be explained by the fact that in 2015/2016 the "El Niño"-phenomenon has been particularly strong, causing severe droughts throughout the country. Of course, measures of IWM to increase water quantity such as planting trees at water sources are unlikely to produce immediate results. Effects of these activities will only be observable in the longer run.

Neither can any changes be observed with regard to landslides and erosion. Here it also remains to be seen in the longer run whether IWM activities, especially the reforestation activities, produce positive

impacts. Because treatment farmer effectively planted more trees than control farmers, it can be expected that it leads to positive impacts in the longer run.

Water Quality and Quantity

Tests of water quality and quantity have not been part of this evaluation. Hence, we have to rely on data collected by the project itself. The project measured water quality and quantity of the main river in all treatment river basins before and after the start of the implementation of the project's activities on the ground and finds substantial increases in water quantity. We argue that the results cannot be attributed to the IWM intervention due to methodological shortcomings and a lack of plausible attribution channels.

In terms of water quality, we would like to highlight the following issues, which are partly also acknowledged in IWM publications:

1) The IWM publications show that the coffee landscape and rivers have a high natural attenuation capacity and can partially recover naturally from contamination generated by the coffee sector.
2) The KPI indicator used by the project to measure water quality shows substantial variation over time. However, the indicator does not always react to the harvest period. Apparently, other pollution sources than coffee processing are more important here for water quality.
3) IWM documented an increase in water quality in 19 out of the 25 IWM treatment river basins in 2017. No substantial differences between "no-improvement" and "improvement" river basins can be observed in terms of equipment adoption. Hence, whether an improvement in water quality has been achieved or not is apparently not driven by the level of activity of IWM.
4) Given the current level of knowledge, it is not clear that measured contamination levels always require action from an environmental and health perspective.
5) In any way, from the farmers' perspective, action is needed because the Colombian law clearly defines maximum acceptable pollution levels for dumping coffee wastewater into surface water bodies.

Concluding Remarks

IWM was very effective in implementing the IWM intervention. The interventions managed to reach even more beneficiaries than originally planned by securing additional funding sources along the way and a very efficient implementation. In spite of the limited role of the Colombian government partner in the PPP, the partnership generated a high degree of leverage and allowed for the inclusion of other actors and implementation of additional activities via the Water & Coffee Platform.

IWM claims that the project is different in that it promotes a more comprehensive approach of accompanying technical assistance with information and training campaigns, as well as targeting the institutional framework. It takes a community and landscape perspective ("the river basin") as opposed to interventions that consider exclusively the individual farmer perspective and expects the bundled promotion to create higher environmental awareness and to produce more sustainable result.

IWM can be seen as an intensification of already existing strategies and was able to reach more than previous and alternative promotion endeavours in terms of equipment promotion. Adoption of promoted equipment is higher in treatment river basins than in control basins. The same is particularly true for reforestation activities. More trees have been planted in the treatment river basins than in the control areas. However, for the rationale behind the bundled and comprehensive approach, namely the expectation to create environmental awareness and to sustain the project dynamics over time, our assessment is more mixed.

The establishment and strengthening of Manos al Agua groups seem to have the potential for social capital construction. Some of them have established links with local governments and direct contacts with coffee buyers. These groups can be an important factor for the sustainability of the project's results, even though several of these groups also need to establish stronger relationships with other local actors.

The level of knowledge on the effect of the coffee sector on surface water bodies has substantially increased through the IWM intervention. To our knowledge, the IWM measurements are unique in Colombia with regard to the level of detail and the realistic context in which data has been collected. However, we do not agree with the conclusions from the water measurements that the IWM project draws. We conclude that the insights from water quality measurements question the relevance of the IWM intervention from the pollution point of view, since it might have been more relevant to tackle other pollution sources. However, from the farmers' perspective, action was needed because the Colombian law clearly defines maximum acceptable pollution levels for dumping coffee wastewater into surface water bodies that many farmers exceeded. The IWM results suggest that the law's threshold might be defined in a too restrictive way and the results might be very valuable to draw the attention of Colombian policy makers towards other pollution sources and to reconsidering pollution thresholds for the coffee sector.