United Nations Framework Convention on Climate Change

Private Sector Initiative actions on adaptation

Title of case study*	Integrated Biosystems applied in wastewater treatment of humid coffee processing plant
Date of submission*	31/05/2013
Name of organization(s)*	O Instituto Ambiental (OIA), State Street Nicaragua (SSN)
NWP Objective* *Select the objective(s) of the NWP that the case study responds to.*	The objective of the Nairobi work programme is to assist all Parties, in particular developing countries, including the least developed countries (LDCs) and small island developing States (SIDS), to: ☒ **improve their understanding and assessment** of impacts, vulnerabilities and adaptation to climate change; and ☒ **make informed decisions on practical adaptation actions and measures** to respond to climate change on a sound scientific, technical and socio-economic basis, taking into account current and future climate change and variability.
Objective of case study* *Describe the specific objective of case study.*	Treat wastewater from coffee processing operations, as well as domestic wastewater from local communities, with roughly 20 families, to produce clean water for reuse. In addition, in this process the system is; producing biogas (reducing methane emissions) and generating compost from coffee pulp to increase soil fertility. This leads to a higher productivity, and an increase in stronger seedling production, resulting in an increase in resilience to adverse climate change impacts.
Actions* *Describe the activities to meet the case study objective, highlighting organizations, communities and/or experts to be engaged.*	Coffee grains are processed after harvesting through using either a dry, or a wet method. The wet method is preferred in wet climates, since the conditions do not allow for the natural drying of grains. Although it produces coffee of superior quality, it also requires large volumes of water. This process produces a considerable amount of (highly acidic and nutrient rich) effluent. Usually this residue is discarded in local creeks or rivers; depleting oxygen in water, which has a negative impact on the survival fish communities. Due to the changing climate, including both changes in timing and intensity of precipitation events, a reduction on local water availability is expected. As a consequence this increases plant stress due to water deficit. Besides, a further reduction of soil fertility is expected due to the erosive processes caused by high intensity rainfall. Jarabacoa's Coffee Cluster initially called upon a design to integrate biosystems which generates biogas while treating effluent from coffee pulp production in order to avoid local water contamination. In consultation with local actors, the OIA and SSN have also realised the importance of designing systems that could be applied in conjunction with the needs of local communities. This regards both in terms of using its nutrient rich wastewater to boost local productivity and to cope with the declining availability of water due to a changing climate. Acting on the needs of the local communities would increase health indicators which, at present, are mostly affected by poor sanitation that result in an increasing number of water-related diseases. The first step in the system is the use of biodigestors to produce biogas for direct consumption for cooking, substituting local wood, as well as for electricity generation. Then, in the second step of the process, the wastewater treatment will provide a nutrient rich polished effluent to irrigate the fields with. These fields consist of mostly coffee crops mixed with banana trees for shading, which results in coffee of superior quality. The banana trees both prevent heat stress to the coffee plants and generate additional income by the production of food and fibres. Both crops benefit greatly from the increased fertility and

	humidity caused by the nutrient rich effluent. The processing of coffee usually takes place when water availability is lower, therefore generating an added benefit of using treated and nutrient-rich wastewater on local crops, reducing the pressure on local resources and increasing local resilience. The system also incorporated coffee pulp for the production of humus for both seedling production, and increased soil fertility.
Expected results* *Describe the envisaged outputs/benefits of the case study/*	Increase integration between the client operations, whilst supporting local communities. Daily production and use of biogas which will reduce the generation of methane, a gas that has 23 times the negative effect of CO2 in the atmosphere. Wastewater treated up to optimum levels and reused for irrigation of coffee and local crops will increase production. This is due to the high level of mineralised nutrients available in the effluent. This irrigation strategy will also increase the local humidity which protects the fields from the effects of extended dry periods. Furthermore, by integrating plants that generate better conditions for the development of coffee plants will increase the revenues from both coffee and additional crop production. Compost production from pulp processing through worms, supports the growth of coffee seedlings and increases soil fertility. Stronger seedlings increases total productivity and produce superior quality grains. This creates a higher resiliency to impending variations in rain seasonality and water-deficit in dry periods for local producers. Following its success, it is expected that the systems will develop as such that they are adapted to various contexts. Examples are: • the production of mushrooms on coffee pulp substrate • producing fibers for handcrafts • paper production • biomass for compost, animal fodder and fuel • algae and fish production • and other products These systems that can be customised to any size. It is therefore easily applicable to agroindustries, which are able to turn its by-products into valuable assets locally. This generates more revenue and increases productivity through the integration of sub-systems and wastewater.
Indicators of achievement* *Describe any quantitative and/or qualitative indicator to show that the objective of the case study has been achieved.*	The soil fertility increased due to the use of compost which was created by processed coffee pulp. This resulted in a systemized production of stronger and more viable seedlings that increased farmers' resilience to climate change effects. Productivity has also been increased by the use of nutrient rich polished waste water. This, besides, had a positive impact on local health and substantially improved health indicators. A spill-over effect was found in the sharing of knowledge regarding the potential for other communities to use comparable sanitation practices. Four systems were initially built, which fostered dialogs with the government of the Dominican Republic for a nation-wide productive sanitation plan. The plan was carried out using the local workforce to build the sanitation systems. During this cooperation knowledge was transferred to local entrepreneurs, who followed on building the subsequent systems.

Disclaimer: These business cases have been cited to raise awareness about the engagement of the private sector in climate change adaptation. The information in the business cases has been provided either directly by the organization or obtained from a public source. The UNFCCC Secretariat has not verified the information and takes no responsibility for it. Users are therefore advised to verify the information before they take any action relying on the information provided in the business cases.

Region(s) relevant to case study*	☐ All regions ☒ Africa ☒ Arab States ☒ Asia ☒ Caribbean ☒ Central America ☒ Europe ☒ Least Developed Countries ☒ North America ☒ Pacific ☐ Polar regions ☒ Small Island Developing States ☒ South America
Country(ies) relevant to case study	Dominican Republic
Business sector of the organization(s)*	☐ Intergovernmental organization ☐ National/regional programme/initiative ☒ Non-governmental organization ☐ Private sector entity ☐ Research institute ☐ UN organization/agency
Adaptation sector relevant to case study*	☐ Capacity building, education and training ☒ Energy ☐ Finance and insurance ☒ Food, agriculture, forestry and fisheries ☐ Human health ☐ Oceans and coastal areas ☐ Science, assessment, monitoring and early warning ☐ Technology and Information & Communications Technology (ICT) ☒ Terrestrial ecosystems ☐ Tourism ☒ Transport, infrastructure and human settlements ☒ Water resources
Adaptation activity delivered by case study*	☒ Capacity building ☒ Climate-resilient development planning ☐ Communications and awareness-raising ☐ Disaster risk reduction ☐ Early warning systems ☒ Education ☐ Financial support ☐ Humanitarian assistance ☐ Knowledge management ☐ Monitoring and evaluation ☒ Pilot adaptation programmes/projects ☐ Risk/vulnerability mapping ☐ Training
Work areas of the NWP*[1] *Select among the nine work areas of the NWP that apply to the case study.*	☒ Adaptation planning and practices ☐ Climate modelling, scenarios and downscaling ☐ Climate-related risks and extreme events ☐ Data and observations ☐ Economic diversification ☐ Methods and tools

*** Mandatory fields**

[1] More information on the Nairobi work programme work areas is available at: <http://unfccc.int/nwp>

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	☐ Research ☐ Socio-economic information ☒ Technologies for adaptation
Target group*	☐ Academics ☐ Children ☒ Communities ☐ Policy makers ☒ Practitioners ☒ Private sector ☐ Women
Link *Further information on relevant websites.*	http://www.oia.org.br/new/english_home.asp
Description *Provide a title and brief description of the picture and of the case study. This information will appear with your image on the homepage of the NWP.*	Title: Local visits Description: Members from local organisations visit the biodigestor in Jarabacoa, observing how the biogas flow from the biodigestors to a 120CV engine that provides heat to dry coffee grains.
Credits *Provide the name of the photographer or the copyright references.*	Valmir Fachini

Biodigestor – wastewater treatment

Biodigestor – wastewater treatment