Completion Report

***Improving climate resilience for small scale coffee farming systems in Uganda, through modelling of adaptation and mitigation potential in the coffee value chain*, Uganda**

NCF 6

Grantee: NIRAS

Local Partner(s): NUCAFE

Other Partner(s): Agribusiness Development Ltd, Agribusiness Finance Ltd and Mercantile Credit Bank Ltd

Project start date: 01/01/2017

Project end date*: 30/11/2020*

_16-02-2022_____	_____
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1. EXECUTIVE SUMMARY

NUCAFE in partnership with NIRAS funded by Nordic Development Fund (NDF) under the Nordic Climate Facility (NCF) 6 among other local development partners such as Agribusiness Development Ltd, Agribusiness Finance Ltd and Mercantile Credit Bank Ltd since January 2017 to November 2020 successfully implemented the project entitled, "Improving climate resilience for small scale coffee farming systems in Uganda, through modelling of adaptation and mitigation potential in the coffee value chain in Uganda". The project delivered all the 5 milestones with the overall aim of creating a resilient coffee value chain in Uganda through a bottom up perspective, on improving the market-based approach so that environmental services are accounted for in the value chain[1]. Project milestones 1-4 facilitated development and implementation of baseline report[2] recommendations in which potential adaptation and mitigation opportunities at both farm and NUCAFE factory levels were identified for benchmarking quantification of potential results and benefits. To facilitate introduction of the project and leverage its upscale, NIRAS experts attended COP 23 and COP 24 in which linkages to other development partners such as European Union (EU) were initiated and efforts ongoing to facilitate upscale of piloted greening measures in the coffee value chain.

Pilot demonstrations at farm level of adaptation measures and best practices included use of appropriate shade trees (*albizia coriaria* - mugavu, *ficus natelensis* – mutuba and *ficus mucuso* – mukunyu) under coffee agroforestry system in 11 demonstration farms within the pilot 6 Farmer Cooperatives (Ggolo, Bunjakko, Buwama, Mabira, Kabanga and Namayumba), that are suitable for Lake Victoria crescent as project area, promoted clean energy (solar and hand based flexipump) irrigation technologies as well as improved soil fertility management techniques going along soil analysis and testing best practices such as use of Biochar, a soil amendment / carbon sink approach which provided demonstration learning farms in the respective cooperatives / associations using the Farmer Ownership Model. These have continued to sustainably provide eco-friendly demonstration farmer owned and centered climate change resilient learning to smallholder farmers in the project area. Using the improved Farmer Ownership Model, a 36% above the target number of farmers, 8162 (3,637 male, 2,471 female, 1,141 male youth and 913 female youth) were trained in the different adaptation and mitigation mechanisms such as coffee climate smart technologies, solar based irrigation, improved soil fertility management, farmer ownership development, family business management and succession planning, marketing, clean cooking options and access to finance in the coffee value chain[3]. The improvement of the Farmer Ownership Model considered the ecological and environmental dimension that responds to the key sustainability questions as highlighted by the Climate Change effects. The improved version of the Farmer Ownership model was translated in 5 local languages (Luganda, Runyakitara, Rukonzo, Lumasaaba and Luo) to facilitate ease of upscale and adapting best practices in Uganda.

In an effort to enhance mutual value chain gains, NUCAFE factory was the test demonstration case at which both adaptation and mitigation measures to include; NUCAFE factory

[1] Project Appendix 1: Updated logical Framework Matrix
[2] NIRAS and NUCAFE (2017). Improving climate resilience for coffee farming systems in Uganda. A project baseline report.
[3] Milestones 2, 3 & 4 Project Progress reports dated 01/07/2017 – 31/05/2018 and 01/06/2018 – 30/04/2019).

surrounding adaptation measures of greening with shade trees, swales and improved rain stormy water management system were developed and the first of the kind grid tied industrial solar Photovoltaic (Pv) plant in East and Central Africa was successfully installed at 3% higher peak production of 172.38 kW power capacity to offset 40% of power requirements for NUCAFE's factory and replace any possible diseasal useage during power outages common on such an industrial power line[4]. The NUCAFE grid tied industrial solar (Pv) power plant and replication of solar powered irrigation pumps / systems are success indicators of the pilot project presenting enormous social, economic and environmental dividends scaleable at the national level. While NUCAFE factory will reduce processing costs by 40%, the farmers reduce coffee processing costs by 60% per kg of coffee processed as carbon neutral eco-friendly coffee through the NUCAFE factory and the facility guarantees saving the environment of tCO_2 reduction of 241.3 tons per annum. Uptake of the two measures provides high potential for support towards greening value chains with development and handling of eco-friendly products and services as well as significantly give heavy weight towards the private sector's contribution towards the country's Nationally Determined Contributions (NDCs) as per the Paris agreement article 6.2[5].

NUCAFE has under this project been able to improve NUCAFE coffee brands as eco-friendly coffee attracting specialized eco-friendly Ugandan coffee markets particularly in Europe to enable farmers earn atleast 250% per kg of directly marketed eco-friendly Ugandan coffee.

To strengthen resilience capacity of farmers and players in value chains, alignment to Uganda NAMA and NAPA with replicating adaptation and mitigation approaches piloted under this project initiative is paramount. Enhancing increased uptake of green solutions (industrial solar Pv. and solar powered irrigation) in a market-oriented manner with a national organization coordinating framework, strategically calls for establishment of a green finance facility well blended to leverage impact upscale and access of Ugandan eco-friendly coffee in the global market.

2. ACHIEVEMENT OF RESULTS

2.1 Achievement of Outputs and Objectives

Expected outcomes and Outputs	Indicator(s):	Achievement of the outcome and outputs:
Outcome 1: To empower and create shared value among coffee farming families, the community and the buyers through enhanced access to market-driven payments for environment services from	- At least 6,000 farmers empowered with favourable adaptation and mitigation practices using the Farmer Ownership Model. - Farmers increase incomes by at least 30% per kg of coffee	- 8,162 farmers and were empowered with adaptation and mitigation measures using the Farmer Ownership Model. - Enabled beneficiary farmers earn 250% per kg of directly marketed eco-friendly coffee.

[4] NIRAS and NUCAFE (October, 2020). NUCAFE Industrial Solar Power Plant Procurement, Installation and Commissioning report.
[5] NIRAS and NUCAFE (March, 2020). Upscaling green energy solutions for resilient and sustainable value chains in Uganda. A technical dissemination report.

Expected outcomes and Outputs	Indicator(s):	Achievement of the outcome and outputs:
the farm to the factory.	marketed.	
Output 1.1: Baseline report prepared.	-Baseline report submitted to NDF	-Project baseline report was prepared and submitted to NDF.
Output 1.2: Sensitization workshop for Stakeholders and beneficiaries on project relevance held.	-Stakeholder workshop conducted	Initial sensitization of the stakeholders was undertaken drawing support from National Coffee Research Institute (NaCORI), Ministry of Water and Environment (MWE) Climate Change Department(CCD) and Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). A national workshop and sharing session with the National Coffee Steering Committee was facilitated.
Outcome 2: To identify and undertake favourable adaptation and mitigation measures to create a sustainable coffee value chain.	Identified and implemented adaptation and mitigation measures in the coffee value chain.	*Adaptation and mitigation measures both at the farm and factory level were identified with a selection of some such as shade trees, Biochar, improved soil fertility management were implemented at the farm level while shade trees, rain stormy water harvesting and industrial solar power plant were implemented at the NUCAFE factory.*
Output 2.1: Design and develop technical note on adaptation and mitigation possibilities for the coffee value chain in Uganda	Technical note developed and prepared jointly by NUCAFE and NIRAS	This was undertaken with identification of potential possible adaptation and mitigation measures as part of technical dissemination report 6.2. This was completed and shared with NDF.
Output 2.2: Empower Farmers with favourable adaptation and mitigation practices.	Implemented adaptation and mitigation practices at farm and NUCAFE factory levels.	*Mitigation and adaptation measures at farm level were identified and implemented through a combined approach of training and establishment of 11 demonstration farms with 1 shade tree multiplication centre where farm level measures were piloted. The farm level measures piloted include; Shade trees, solar/flexipump irrigation, Biochar with assessment of best approaches in improved use of soil fertility management practices such as soil analysis that was undertaken at each of the demo farms. Other beneficial approaches such as Bee keeping, clean cooking stoves and drought index insurance were promoted for farmers' uptake.* *At the NUCAFE factory level, adaptation and mitigation measures to include shade trees, swales, rain stormy water harvesting as well as mitigation industrial solar power were established.*
Outcome 3: To identify and provide adaptation and mitigation measures to be undertaken in Uganda's NAPA and NAMA development	-Potentially identified and scaleable adaptation and mitigation measures for Uganda's NAPA and NAMA	Reports 6.1 on business model upscaling and 6.2 technical dissemination identify and are aligned to Uganda's NAPA and NAMA highlighting potential beneficial adaptation and mitigation

Expected outcomes and Outputs	Indicator(s):	Achievement of the outcome and outputs:
	development	feasible.
Output 3.1 & 3.2: Prepare improved version of the Farmer Ownership Model guidebook and manual in English and 5 local languages	The Farmer Ownership Model improved and translated in local languages	*The Farmer Ownership Model was improved and translated in 5 local languages to include Luganda Runyakitara, Rukonzo, Lumasaaba and Luo*
Output 4.1: Establish demonstration of green power at NUCAFE Factory of 168 kWp capacity.	-Established demonstration of green energy power at NUCAFE factory with capacity of atleast 168 kWp	*- the first of the kind 172.38 kWp capacity industrial solar power plant was successfully executed through a Solar Turn EPC key contract with Astonfield Solesa Solar Kenya and was commissioned on 15th August 2020.*
Output 4.2: Training and empowering farmers and young entrepreneurs in CSA[6].	-At least 40 CSA training events with a total 2,000 participants conducted.	*- Support to the farmers through training and empowerment under different leverage initiatives was facilitated enabling empowerment of 2,122 farmers and young entrepreneurs to participate in the coffee value chain. Fifty four (54) Training events in the different empowerment disciplines were undertaken.*
Output 4.4 & 4.5: Implement 3 additional measures at the NUCAFE factory that will be both demonstration projects for the potential climate adaptation, as some smart green solutions for utilising resources at the factory.	*-Three (3) adaptation measures to include shade trees, swales and rain stormy water harvesting are implemented at NUCAFE factory.*	-Successfully, the three adaptation measures at the NUCAFE factory with the shade trees, swales and rain stormy water harvesting were implemented at the NUCAFE factory along the big milestone of procuring and installing the first of the kind industrial solar power plant.
Output 5.1: Eco-friendly terroir coffee product development and brand improvement	Eco-friendly terroir coffee product developed and NUCAFE coffee brands improved.	*Overall, efforts undertaken towards greening the coffee value chain facilitated development of eco-friendly coffees and the 2 NUCAFE brands one Omukago and other NUCAFE have been developed both utilizing Robusta coffee which is commonly grown and indigenous to the project area.*
Output 5.2: Participation in promotion fares and exhibitions.	Participate in at least 5 fares / exhibitions	*To promote increased sales of eco-friendly coffees, we have had a participation in different international exhibition and fares to include France exposure on marketing Geographically Indicated products, Netherlands World of Coffee, Seoul Int'l Café Show and the African Fine Coffees Conference (AFCA) held in Kigali Rwanda. There was also participation in the COP 23 and 24 to further enhance project partnership and visibility.*
Output 5.3 & 5.4: Direct contact to potential buyers/markets.	-Establish contact with at least 5 specialty coffee buyers.	*- Direct contact with 8 new buyers for the eco-friendly coffees in Europe particularly Scandinavian region, Germany, Spain, Poland and Italy, South Korea, United Kingdom and South Africa were established. These markets*

[6] Climate Smart Agriculture

Expected outcomes and Outputs	Indicator(s):	Achievement of the outcome and outputs:
		have guaranteed farmers' possibility to sell eco-friendly carbon neutral Robusta coffee earning atleast 250% per kg of coffee sold.
Output 6.1: Develop model for upscaling the business model nationally and internationally that is aligned with Uganda NAPA and NAMA activities.	-A business model report developed	- A scaleout business model for building smallholder farmers' resilient and sustainable value chains was developed and shared with NDF in January 2020.
Output 6.2: Prepare and disseminate technical report for upscaling business model, which is built on the success indicators within the project, and will include the reporting on project OVIs.	- Technical upscale report developed and shared with stakeholders.	-An upscale green energy solutions report for resilient and sustainable value chains in Uganda was developed and shared with NDF and stakeholders during the stakeholders workshop in Kampala, Uganda. The successful undertaking of a national lessons and experience workshop was also part of dissemination.
Output 6.3: Participating at international events like COP	-Participation in international events	NIRAS represented by Morten Pedersen and Emelie *Öhlander* participated in COP 23 held in Bonn, Germany from 10th – 15th November 2017 attending the UNFCCC and COP24 held in Katowice, Poland.

2.2 Deviations from the planned Outputs and Activities

There were some activities that did not get implemented and or were partly undertaken as listed below;

Activities / Outputs not undertaken	***Explanation***
Output 4.3: Develop and implement two learning modules for practical entrepreneurship	*The improvement of the farmer ownership model and Climate Smart Agriculture guide book very well covered the necessary content.*
Output 4.5: 3km developed community road network around the factory	*During the baseline study assessment on potential adaptation and mitigation measures around the factory, this was considered a little more costly to undertake. It was thus replaced with the implementation (4.5) of the 3 additional three measures (shade trees, swales and rain stormy water harvesting) at the factory that demonstrate projects for potential climate change adaptation as some smart green solutions for utilising resources at the factory.*
Potential complement to Environmental Impact Assessment	*This was sufficiently covered during the baseline assessment and development of output 1 under the baseline report where the recommendations complemented the environmental impact assessment that initially undertaken for the factory.*

2.3 Achievement of NCF indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
1. Number of beneficiaries reached (women/men)	Women		3,384	Beneficiaries Database and Attendance list
	Men		4,778	
	Total		8,162	
2. Number of people with increased resilience to climate change (women/men)	Women		3,215	Marketing records for some the farmers that participated in marketing
	Men		4,539	
	Total		7,754	
3. Number of people with improved livelihoods/income-generating possibilities (women/men)	Women		3,215	Reports prepared by NIRAS and NUCAFE
	Men		4,539	
	Total		7,759	
4. Number of new decent jobs created (disaggregated by number of permanent (women/men) and seasonal (women and men))	full-time	women	24	NUCAFE HR records and a rapid farm and hub evaluation
		men	33	
		total	57	
	part-time	women	450	
		men	635	
		total	1,086	
5. CO2e emissions reductions (actual at project completion and expected during the lifetime of the project's mitigation investments)	At project completion, 649.3[7] tons per annum of tCO_2 emissions reductions are expected with 10,777[8] tons of tCO_2 emissions reductions expected in the 20 years as expected lifetime period.			Installed digital home monitoring system on solar plant
6. Number of green business concepts tested	At least 8 green businesses have been tested out during the project implementation to include undertaking industrial solar power plant, solar power irrigation and flex pump, improved soil fertility management, shade trees, Biochar, bee-keeping and drought index insurance.			Adaptation and mitigation report

[7] Of which 83.0 tons from avoided emissions due to solar PV's, and 566.3 from carbon sequestration due to shade trees

[8] Of which 1,717 tons from avoided emissions due to solar PV, and 9,060 from carbon sequestration due to shade trees

7. Number of multi-stakeholder partnerships developed	5 Multi-stakeholder partnerships were established during the implementation of the project.	Progress reports
8. Amount of funds leveraged (actual project co-financing and possible secured future investments for scaling-up/replication)	The actual project co-financing is Euro 751,164 and Euro 1,019,969 is being sought for future investments upscale.	Developed leveraged partnerships

3. CLIMATE CHANGE

The project implementation has facilitated development of a combination of both adaptation and mitigation potential measures at farm and NUCAFE factory levels. In contribution to fulfilment of Sustainable Development Goals 7, 9 and 13, the project facilitated procurement, installation and commissioning of the first of the kind industrial solar power plant with peak production of 172.38 kWp for emission tCO_2 reduction of 113.6 tons per annum during the first 10 years, and with cumulative potential of saving the environment 1,717 tons of tCO_2 emissions over a 20 year life period of the investment. Several adaptation and mitigation measures at both the farm and NUCAFE factory levels such as shade trees, improved soil fertility management, Biochar application and solar irrigation were undertaken demonstrating coffee smart practices in building eco-friendly coffee products for Uganda's coffee value chain.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

Successful implementation of this project has been of significant importance to the farmers in the project area around Lake Victoria in Uganda that installation of the first of kind industrial solar power plant enables farmers reduce 60% of processing costs per kg and NUCAFE factory is directly reducing 40% of factory power requirements during processing. This is a direct economic empowerment of the farmers. The improved farmer ownership model enabled beneficiary farmers market eco-friendly carbon neutral coffees mainly in the European markets attracting 250% increased income per kg of coffee marketed through NUCAFE. Using the model, farmers have been empowered socially to own their coffee and determine their destiny upon which they are able contribute directly to environmental sustainability. As part of the holistic capacity building programme for the farmers, enhancing their gender equity responsiveness was part of the resilience strengthening in the coffee value chain, at least 41% of the project beneficiaries were female. Successful best practices in strengthening the resilience capacity of coffee value chain in view of both climate change adaptation and mitigation measures at both the farm and factory levels were developed and tested for replication in the upscale phase with alignment to Uganda NAMA and NAPA in sync to the government of Uganda's National Development Plan III.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

Implementation of the project in the agricultural sector particularly the coffee sector sub-sector is directly aligned to the government of Uganda's five prioritised growth opportunities and development fundamentals identified within Uganda's Vision 2040. As declared in "the National Coffee Policy", the vision of coffee industry in Uganda is to have, "a competitive, equitable, commercialised and sustainable coffee sub-sector" to which the industry's current target goal is to produce 20 million 60kg-bags by 2030. The country level National Development Plan III is focused on agro-industrialisation to which implementation of this project put importance to pilot industrial solar power along other adaptation sustainable measures in demonstrating greening the coffee value chain.

The implementation of the project was relevant in creating and building increased adaptation and mitigation capacity to climate change among smallholder farmers in Uganda. Specifically, there was;

- *Enhanced and improved capacity in soil fertility management at farm level.*
- *Testing adaptation measures such as shade trees, solar water irrigation and Biochar application.*
- *Installation industrial solar power plant for reduced CO_2 emissions and costs of production.*
- *Building farmers' capacity using the farmer ownership model.*
- *Created increased employment opportunities and incomes.*

5.2 Effectiveness

Overall, the project objectives were achieved successfully with great attribution to the strong partnership composition and technical assistance from NIRAS and local stakeholder support from Agribusiness Development Ltd, Agribusiness finance Ltd and Mercantile that financially and technically supported NUCAFE to deliver on the project objectives. There was a slight delay in installing the solar panels on the new factory warehouse extension which was due to limited local knowledge and skills on integrating factory design and calculations for such investment projects involving solar as well as at the later time that we were faced by COVID 19 Pandemic. Technical capacity has been developed to service and operate solar power at an industrial scale, adapt coffee smart practices at farm level while our local staff and consultants have been working with NIRAS.

The project was delivered with the overall budget cost of Euro 1,246,480. It is also critical to note that there were some unforeseeable expenses especially in relation to new warehouse extension for solar installation that led to increased cost of establishing the structure as well as project delays due to COVID 19 pandemic.

5.3 Efficiency

Despite the unanticipated project completion delays due to the unforeseen project timelines to accomplish support studies for the warehouse extension, the five main project milestones were

successfully accomplished during the project extension period. Some unforeseen costs increased total project implementation cost. Overall, all agreed outputs with NCF as per the updated logoframe were achieved.

5.4 Impact

The successful implementation of this project has had far reaching social, economic and environmental impact. Socially, the project attained a 36% above the target and enabled 8,162 farmers (3,637 male, 2,471 female, 1,141 male youth and 913 female youth) enhance capacity in coffee smart practices building robust resilient capacity in coffee adaptation and mitigation measures for sustainable value chain. At least 8 green businesses were tested during the project implementation period with great potential for scaleup. Both at the farms and NUCAFE factory level, a total of 1,143 (669 male and 474 female) decent jobs were created with 57 (33 male and 24 female) being permanent and 1,086 (635 male and 450 female) are temporary jobs. Appropriate capacity in gender equity was enhanced with at least 41% of the beneficiary farmers being female. In the economic dimension, the project with installation of first of the kind grid tied industrial solar power plant of 172.38 kWp power capacity at NUCAFE factory, smallholder farmers are enabled to reduce processing costs by 60% while NUCAFEE factory reduces processing costs by 40% with overall contribution to saving the environment with tCO_2 emission reduction of 113.6 tons per annum with cumulative anticipated potential of reducing 1,717 tons of tCO_2 emissions reductions expected in the 20 years as lifetime period. Through a holistic strategic long term upscale of both bottom up adaptation and mitigation measures a unique eco-friendly coffee brand has been brought to the Ugandan coffee value chain with high financial and ecological value guaranteeing at least 250% increased income per kg marketed for the farmers.

5.5 Sustainability

The project has been implemented with success registered and premised on the successful business model, the farmer ownership that empowers and creates shared value through building robust resilience for increased participation in the coffee value chain. Based on the upscale business model, development of eco-friendly carbon neutral coffees that directly link smallholder farmers to economic opportunities and low-carbon technologies / pathways (win-win gains) while employing a Farmer Ownership Model for increased smallholder farmers' market rewards in parallel with key sustainability components of social, economic and environmental dimensions, presents a very innovative, strong and farmer centred sustainability approach in which domesticating the Farmer Ownership Model guarantees a continued sustainable development of the coffee value chain. A market driven orientation towards a sustainable business case for scaling up solar irrigation pumps replacing diesel pumps and industrial solar power to save the environment of CO_2 emissions were outstanding components to scaleup. Overall, this gives substantial rewards to the smallholder farmers socially, economically and environmentally in a win-win manner.

5.6 Coherence

The overall implementation of the project is consistent with the Sustainable Development Goals (SDGs) particularly SDG 7 and 13. This is coherent with the government of Uganda's

commitment to the Paris Agreement article 6.2 to reduce carbon emissions in which the plans to execute the country level NAPA and NAMA for the sector are a big contribution. The project actions were focussed to promoting use of clean energy innovations in which solar energy at industrial level and farm through solar irrigation solutions were piloted. This is coherent with UGGDS goal and Uganda NDC 2015 that aims at low emissions economic growth process that emphasizes effective and efficient use of the country's natural, human, and physical capital while ensuring that natural assets continue to provide for present and future generations. The project priorities are aligned to the government of Uganda's target to produce 20 million 60-kg bags by 2030 as well as the national development agenda, National Development Plan III focussed on agro-industrialisation.

6. INNOVATION

The project facilitated improvement of the Farmer Ownership Model with integration of an ecological civilization module for increased shared value creation in a win-win manner in the coffee value and as well piloted innovative technologies that included; establishment of the first of the kind grid tied industrial solar power plant with capacity production of 172.38 kWp. Secondly it demonstrated use of solar powered irrigation technologies for increased coffee production in Uganda. Strategically enabling improvement of branding eco-friendly carbon neutral Ugandan coffees for the sustainable niche global markets.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

Developing and accelerating NUCAFE's renewable energy transition through the upscale of industrial solar PV power and solar irrigation technologies to effectively reduce CO_2 emissions in coffee production while boosting sustainable agriculture productivity is critical. The upscale of green investment opportunities create economic benefits for farms, smallholders and underserved communities; circular solutions that emphasize reusability across the coffee value chain; and serving as a model for commitment to—and achievement of—Uganda's NDC. The development of the upscale business model that is centered on a choice of interventions which is committed to boosting industrial level efficiency and cost effectiveness while building farmers' resilience with actions focused to use of clean energy innovations such as solar energy for industries which is in line with the government of Uganda's NDP III strategy on Agro-industrialisation and farm irrigation rather than use of diesel generators provides a wide range of opportunities. To leverage scale up of pilot activities atleast Euro 1 million as a grant is sought to facilitate scaleup activities. This will enhance establishment of green financing facility for uptake of industrial solar, solar irrigation solutions and advancing capacity development for green entrepreneurship through accreditation of the Farmer Ownership Model Attestation scheme and Coffee Career and Entrepreneurship Skills Development Centre.

8. RISKS

Type of risk	Date Identified	Description	Management Response
Health	5/02/2020	The unexpected occurrence of COVID 19 caused unexpected delays for the completion of the project.	A project extension was sought and granted by NDF.

Type of risk	Date Identified	Description	Management Response
Financial	10/08/2018	Lack of affordable patient financing limits green investment and projects.	Building a green fund is essential to upscale climate change resilience.
Programme	28/04/2019	Limited local knowledge and skills in infrastructure designs and calculations for solar pv panel hosting.	Build local content capacity to support solar pv systems design, installation and maintenance
		Weather variability that initially delayed establishment of demonstration plots.	Adjustments to equipment some of the demonstration farms were considered.
Marketing	4/06/2019	Fluctuating low global prices that affected business turnover	Strategic increase to market eco-friendly carbon neutral coffees offers better value to the farmers for resilient and sustainable livelihoods.

9. MONITORING AND EVALUATION

In addition to both the internal monitoring by NIRAS and NUCAFE, active involvement of farmer leaders, stakeholders, partners and the relevant Ministry especially of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) was considered. The project results were shared at National stakeholders' workshop as well as the steering committee bringing together key players in the coffee sub-sector. To enhance improvements and monitoring of progress, a joint visit with NCF was held during the project implementation in which recommendations of some changes were considered especially in relation to the demonstration farms that were to be established. Timely reports of each activity completed were also prepared and shared.

10. LESSONS LEARNED

Implementation of project draws a number of lessons that are critical for similar investment projects of this nature. These include;

- *A consideration of sufficient preparatory time during the phase of project implementation is essential.*
- *Undertaking a technical assistance for the smooth implementation of green based investment projects is fundamental. This initiative drew on NIRAS expertise to support the local team to deliver on project especially facilitating the necessary feasibility studies for solar panels procurement, design, installation and warehouse extension calculations.*
- *Integrating a detailed assessment of buildings where there is a combination of solar panels installation on building roofs is paramount to have a proper*

quantification for buildings strengthens and integrity. During the project implementation, establishing the underlying factors of the warehouse extension to support solar panels required investigating soil bearing capacity, wind, earthquakes as well as extra load. This consequently project cost and caused delays to finalisation of the project due to unforeseeable factors of aspect.*

- *Unexpected occurrences such as COVID 19 need to be considered in view of the contingency plan both in time and financing to enable the project facilitate implementation of such projects smoothly where project extensions are considered.*
- *Availability of blended financing. Securing financing for projects of this nature requires availability of affordable patient financing to support green investments that take time to be accomplished. Establishing green financial facility to support upscale of green investments is paramount. This will fasten and upscale best green practices in the value chain.*

11. OUTREACH

The project outreach / visibility has been ensured with inclusion of NCF/NDF logo on most of the publications in media and presentations as well as through National workshop and steering committee organized to share results and project outcomes especially relating to the NUCAFE industrial solar power plant. Social media has been used, NDF has been mentioned. Some of the visibility messages in the different channels and social media are as below;

1. https://youtu.be/fiRyaO1QIcA
2. https://youtu.be/iQ0OEDiGsyU

LESS CARBON EMISSION

By installing solar, Nkandu said, Nucafe has been able to avoid over 1.2 metric tonnes of carbon emissions from being emitted into the atmosphere in just over six days.

BUSINESS

Friday, August 28, 2020

COFFEE FARMERS EYE BIG CASH WITH SOLAR-POWERED PLANT

By Faridah Kulabako

Coffee farmers under the National Union of Coffee Agribusiness and Farm Enterprise (NUCAFE) are set to earn more from the sale of carbon-neutral coffee and reduction in coffee processing expenses.

This follows the installation of a 172KW industrial solar energy at their Namanve-based NUCAFE factory.

The first of its kind in Uganda, the rooftop industrial solar is expected to cut farmers' electricity costs by 60% while that of the plant (NUCAFE) will decline by 40%, according to the NUCAFE executive director, Joseph Nkandu.

"Electricity is expensive; it touches deeper into the pockets of farmers, but solar will reduce the coffee processing expenses related to electricity for our farmers," he said. He made the remarks during the commissioning in Namanve recently.

Nkandu said farmers have been on average paying sh4m monthly for electricity, eating into their profitability.

He said the 40% cost that farmers will continue paying is to enable them recover the investment made.

As a membership organisation, NUCAFE has about 1.5 million smallholder farmers, organised in 200 farmer co-operatives and associations, representing over 250,000 families.

Additionally, Nkandu said the industrial solar energy will also ...

Antony Welishe a coffee farmer from Mbale. NUCAFE solar project is expected to reduce the coffee processing expenses

... Development Goals. This will be specially Goal 7, which aims at ensuring access to affordable, reliable, sustainable and modern energy for all and Goal 13, which talks about taking urgent action to combat climate change and its impacts, as it will curb carbon emissions.

By installing solar, Nkandu said, NUCAFE has been able to avoid over 1.2 metric tonnes ... emitted into the atmosphere in just over six days.

"This is a great milestone that will benefit coffee farmers, who will sell ecologically friendly coffee," he said, adding that NUCAFE is committed to using green energy.

The project was implemented with financial support from aBi and the Nordic Climate Facility Initiative of the Nordic Development Fund. They also had technical support from Niras International, Astonfield and Makerere University's technical team and the installation was by Village Energy Ltd. The Village Energy Systems engineer, Sammy Ssenyonga, said the plant has a payback period of between four to five years, after which NUCAFE will start enjoying free power for the next 25 years. He said the 442 solar panel plant is currently generating almost 100% of the capacity required.

BETWEEN THE LINES

- Mukumbya called for increased value addition to prolong products' shelf-life, saying the COVID-19 crisis has proved price resilience for valued added products.

Enhance value addition

The aBi Group chief executive officer, Josephine Mukumbya, also commended NUCAFE for the achievement, saying it will enable smallholder farmers to be traced back and earn a premium for their carbon-free coffee.

She added that the innovation will make a lot of change in the region and pledged continued support to NUCAFE.

Mukumbya, however, called for increased value addition to prolong products' shelf-life, saying the COVID-19 crisis has proved price resilience for valued added products, whose price never collapsed as much as that for unprocessed products, such as ...

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

Expenditures, EUR			Financing, EUR					
Grantee	**Amount**		**NCF**	**NIRAS**	**NUCAFE**	**RAN**	**Revenues from the project**	**Total**
NIRAS	255,360		255,360				-	255,360
NUCAFE	995,190		244,526		750,664			995,190
RAN	500					500		500
Total	**1,251,050**		**499,886**	**-**	**750,664**	**500**	**-**	**1,251,050**

13. CONCLUSIONS AND RECOMMENDATIONS

Successfully, the project has been undertaken with the completion of the 5 milestones that sustainably demonstrate a combination of both adaptation and mitigation

measures in building a resilient coffee value chain with development of unique eco-friendly carbon neutral coffee brand during project implementation. This project report presents opportunities and recommendations for upscale of best practices in adaptation and mitigation measures critical in enhancing a resilient climate change responsive coffee value chain. The following recommendations are proposed;

i. *Upscale industrial solar power technologies in Uganda as it has a high potential in contributing to reduction of CO_2 emissions which is directly in line with Government of Uganda's aspirations of producing 20 million 60kg bags and NDP III that is aligned to Agro-industrialization.*
ii. *Promote uptake of farm level adaptation and mitigation measures particularly relating to sustainable and efficient utilisation of soil fertility management measures, solar irrigation, Biochar application and shade trees. This directly supports establishment of resilient farms and landscapes around factories thus minimising the dry island nature of most buildup areas associated with factories, cities and peri-urban places.*
iii. *Enhance branding, promoting and marketing of eco-friendly carbon neutral Ugandan coffees globally.*
iv. *Develop the Farmer Ownership Model Attestation scheme to upscale the wider opportunities in other value chains and countries.*
v. *Facilitate development of blended green financing mechanisms for innovative green initiatives with long term returns as is the case for green initiatives.*
vi. *Facilitate capacity development in green entrepreneurship for promotion of climate smart innovations and technologies through the NUCAFE Coffee Career and Entrepreneurship Enhancement Centre.*

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Annex 1 Project completion fact sheet

Project Name:	***Improving climate resilience for small scale coffee farming systems in Uganda, through modelling of adaptation and mitigation potential in the coffee value chain*, Uganda**		
Country/ Region:	Uganda	**Financing:**	
		EUR	**%**
Nordic Partner:	NIRAS		**0**
Local Partner:	NUCAFE + Agribusiness Development Ltd + Mercantile Credit Bank Ltd + RAN	750,664	**60.00**
Other Partner:	RAN	500	0.04
	NCF grant disbursed	499,886	**39,96**
	Total	**1,251,050**	**100**
Classification:	Mitigation/ adaptation/ combination		
Project cycle:	Contracted: 01/01/2017 Original Closing Date: 31st May 2019 Actual Closing Date: 30/11/2020		
Project description:	Overall, the successful implementation of the project has delivered all the 5 milestones with the key purpose of creating a resilient coffee value chain in Uganda through a bottom up perspective, on improving the market based approach so that environmental services are accounted for in the value chain. Adaptation and mitigation opportunities at both the farm and NUCAFE factory levels were identified and have been piloted with exciting results registered. The project investment has facilitated procurement and installation of the first of the kind industrial solar power plant of 172.38 kW power capacity that enables farmers reduce their processing income by 60% per kg of coffee produced, NUCAFE factory reducing 40% of processing charges while saving the environment of tCO_2 reduction of 113,6 tons per annum cumulatively guaranteeing reduction of 1,717 tons of tCO_2 emissions that is expected in the 20 years as lifetime period of investment. The unique project innovativeness combined bottom-up adaptation and mitigation opportunities that facilitated building resilience capacity against climate change socially, economically and environmentally with improving and deploying NUCAFE's Farmer Ownership Model among 8,162 farmers (3,637 male, 2,471 female, 1,141 male youth and 913 female youth) which was 36% above the target number of farmers around Lake Victoria crescent in Uganda. Mutually undertaking the combination of interventions has facilitated the development of the eco-friendly carbon neutral Ugandan coffee brand guaranteeing at least 250% increased household income per kg marketed for the farmers to the specialty segment globally. Sustaining the demonstrated resilient capacity against climate change in the coffee value		

	chain requires upscaling the key innovative technologies such as industrial solar power, solar irrigation, developing the Farmer Ownership Model Attestation scheme with enhancing green entrepreneurship capacity through facilitating deployment of green entrepreneurship courses through development of green financial fund and the NUCAFE Coffee Career and Entrepreneurship Enhancement Center as central.				
Key results:	**NCF indicators**	**Results**			**Clarifications/Means of verification**
	Number of beneficiaries reached (women/men)	women		3,384	Beneficiaries Database and Attendance list
		men		4,778	
		total		8,162	
	Number of people with increased resilience to climate change (women/men)	women		3,215	Marketing records for some the farmers that participated in marketing
		men		4,539	
		total		7,754	
	Number of people with improved livelihoods/income-generating	women		3,215	Reports prepared by NIRAS and NUCAFE
		men		4,539	
		total		7,759	
	Number of new decent jobs created (disaggregated by number of permanent (women/men) and seasonal (women and men))	full-time	women	24	NUCAFE HR records and a rapid farm and hub evaluation
			men	33	
			total	57	
		part-time	women	450	
			Men	635	
			Total	1,086	
	CO2e emissions reductions (actual at project completion and expected during the lifetime of the project's mitigation investments)	-At project completion, 649.3[9] tons per annum of CO_2 emissions reductions are expected with 10,777[10] tons of CO_2 emissions reductions expected in the 20 years as expected lifetime period			Installed digital home monitoring system on solar plant
	Number of green business concepts tested	8 green businesses tested			Adaptation and mitigation report
	Number of multi-stakeholder partnerships developed	5 Multi-stakeholder partnerships were established during the implementation of the			Progress reports

[9] Of which 83.0 tons from avoided emissions due to PV, and 566.3 tons from to carbon sequestration due to shade trees

[10] Of which 1,717 from avoided emissions due to solar PV's and 9,060 from carbon sequestration due to shade trees

		project.	
	Amount of funds leveraged (actual project co-financing and possible secured future investments for scaling-up/replication)	The actual project co-financing is Euro 755,164 and Euro 1,019,969 is being sought for future investments to upscale both adaptation and mitigation	Developed leveraged partnerships
Project performance:	**Main Expected Outcome and Outputs**	**Achieved**	**End-of-project status**
	Output 1. Baseline Report including modelled results of the quantification of potential emission reductions for each mitigation action and adaptation measures potential	Successfully completed	Baseline report shared with NDF and informed implementation of some key adaptation and mitigation measures at farm and NUCAFE Factory levels.
	Output 2. Technical note prepared and submitted to MAAIF, and Ministry of Water and Environment	Completed	This was undertaken as part of technical dissemination report 6.2 with facilitated sharing at the national workshop with the key relevant ministries.
	Output 3. Farmer Ownership Model improved and implemented.	Completed	The Farmer Ownership Model was improved and translated in 5 local languages to include Luganda Runyakitara, Rukonzo, Lumasaaba and Luo
	Output 4. Pilot project implemented demonstrating adaptation and mitigation possibilities at farm and factory levels	Completed	Established 11 demonstration farms in the 6 beneficiary cooperatives piloting adaptation and mitigation measures at farm and NUCAFE factory levels including shade trees, solar irrigation, Biochar application as well as promoting improved soil fertility management practices.
	Output 5. Specialty coffee brand	Successfully improved and	Developed an eco-

	developed and presented to buyers	developed 2 eco-friendly coffee brands including NUCAFE and Omukago.	friendly carbon neutral coffee.
	Output 6. Upscale Report developed for national as well as international climate resilient coffee production value chain	Technical upscale report developed and shared with NDF	The report highlights the key recommendations for upscaling green energy solutions in building resilient and sustainable value chains
Final beneficiaries:	- 8,162 farmers (4,778 Male and 3,384 Female)		
Climate change impacts:	The project has facilitated installation of the first of the kind industrial solar power plant that guarantees reduction of 113,6 tons per annum of tCO_2 emissions with anticipated 1,717 tons of tCO_2 emissions reductions in the 20 years as expected lifetime the solar pv investment.		
Development impacts:	The project has contributed to; - Building capacity of 8,162 farmers (4,778 Male and 3,384 Female) in climate change resilience - Employment of a total of 1,143 (669 male and 474 female) where 57 (33 male and 24 female) are permanent and 1,086 (635 male and 450 female) are temporary jobs. - Development of eco-friendly carbon neutral coffee that guarantees 250% of increased income per kg of coffee marketed. - Facilitating improvement of the Farmer Ownership Model with consideration of ecological civilization as a core module for building resilient climate smart coffee value chain.		
Innovation, technology and learning:	The project has facilitated piloting innovative technologies to include; - Establishment of the first of the kind grid tied industrial solar power plant with capacity production of 172.38 kWp. - Demonstrated use of solar powered irrigation technologies for increased coffee production. - Developed the eco-friendly carbon neutral Ugandan coffees.		
Partnership:	NUCAFE in partnership with NIRAS facilitated local collaboration with; - Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) - Ministry of Water and Environment Climate Change Department - Agribusiness Development Ltd - Agribusiness Finance Ltd - Mercantile Credit Bank Ltd - Resilient Africa Network (RAN)		
Sustainability and replicability:	The successful implementation of the project was premised on sustainable business model, the Farmer Ownership Model that greatly empowers farmers for increased social, economic and environmental sustainability. The adaptation and mitigation opportunities provide avenues for upscaling best practices for sustainable production and consumption of eco-friendly carbon neutral Ugandan coffees globally. Replicating the Farmer Ownership Model presents unique opportunities for upscaling best practices in building climate change		

	resilience among farmers in consideration of adaptation and mitigation potential. A market driven orientation towards a sustainable business case for scaling up solar irrigation pumps replacing diesel pumps and industrial solar power to save the environment of CO_2 emissions are outstanding components to scaleup. Strengthening establishment of green finance facility and capacity support enhancement center for green entrepreneurship will play a key role in upscaling climate smart innovations and technologies.
Lessons learned:	A number of lessons are drawn include; - Upscale of industrial solar PV power and solar irrigation technologies can effectively reduce CO_2 emissions in coffee production. - Undertaking investments of this nature involving both adaptation and mitigation measures requires sufficient time investment which needs to be well planned for proper project implementation. - Proper consideration of appropriate calculations and designs are essential especially where the solar panels are to be installed on building roof. The building structural strength has to be assessed before installation is undertaken to bear extra load such as what was considered for NUCAFE warehouse extension to accommodate the 10 Mts. Of solar panels at NUCAFE factory. - Upscale best practices such the NUCAFE Farmer Ownership Model that presents strong opportunities for building resilience through farmers' empowerment. - Developing appropriate blended affordable patient financing is paramount to facilitate upscale of green entrepreneurship in building climate change resilience. - There is need to always contingency plan in undertaking project design for possible time and financing requirements. During project implementation, we experienced COVID 19 in which an extension was granted.

Annex 2 Logical Framework Matrix

Saved as separate document on the web.

Annex 3 Pictures

Saved as separate document on the web.

Annex 4 Other supplementary deliverables/documentation

Deliverables developed during project extension with documents shared include;

1) *4.4. NUCAFE Solar power plant procurement, installation and commissioning report.*
2) *Establishment of water harvesting adaptation measure at NUCAFE factory report.*
3) *6.1 Uganda Scaleout plan for building resilient and sustainable value chains.*
4) *6.2 Technical report for upscale of Business model.*

Other deliverables-Reports

Reports developed during the project implementation are summarized as below;

Material developed	***Number of copies***	***How distributed and to whom?***
Project baseline report	*1*	*Electronically submitted to NDF and stakeholders*
Improved and translated version of the Farmer Ownership Model	*5*	*Disseminated through awareness trainings in 5 local languages, electronically to mainly farmers in different regions, stakeholders and policy makers at country level*
Project financial and technical progress report (milestones 2&3)	*1*	*Shared with NDF as part of formal reporting requirements.*
Climate Smart Coffee Manual	*1*	*Shared electronically with NDF and through presentation with farmers, stakeholders and policy makers relevant ministerial levels especially MAAIF and MWE.*
Test Biochar application factsheet	*1*	*Shared with farmers and stakeholders through presentations*
Shade tree factsheet	*1*	*Shared with farmers and stakeholders through presentations*
Project financial and technical progress report (milestones 4&5)	*1*	*Shared with NDF in fulfilment of reporting requirements*
NUCAFE Solar power plant procurement, installation and commission report	*1*	*Shared with NDF, stakeholders, policy makers and partners as well as through local media networks.*
Establishment of water harvesting adaptation measure at NUCAFE factory report	*1*	*Electronic copy shared with NDF*
Uganda Scaleout plan for building resilient and sustainable value chains	*1*	*Electronic copy shared with NDF, stakeholders and during workshop with relevant ministries especially Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Ministry of Water and*

Material developed	*Number of copies*	*How distributed and to whom?*
		Environment (MWE).
Technical report for upscale of Business model.	*1*	*Electronic copy shared with NDF, stakeholders and during workshop with relevant ministries especially Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Ministry of Water and Environment (MWE).*
Final financial and technical report	*1*	*Electronic copy shared with NDF and stakeholders*

Annex 5 Impact story

The successful implementation of this project has had far reaching social, economic and environmental impact to smallholder farmers in Uganda's coffee value chain. In alignment to the Government of Uganda's National Development Plan (NDP) III aspirations for agro-industrialization, demonstration of installed industrial solar power plant at NUCAFE factory contributing to 60% reduction in processing costs the smallholder farmers while directly reducing 40% processing costs registers a project win in enhancing adaptation and mitigation measures at industrial level while connecting with the farming households to enhance building a resilient coffee chain Uganda. The combination of both adaptation and mitigation measures is a big win to Uganda's coffee sub-sector in which replication of the measures directly contributes to the government of Uganda's targets of producing 20 million 60 kg bags by 2030. The sustainable marketing of eco-friendly carbon neutral coffees is of advantage as it positions farmers uniquely to earn atleast 250% per kg of eco-friendly coffee marketed. To some of the beneficiary farmers, the voices below speak;

"We leant the importance of ownership. We are applying this to our other wine and piggery projects besides the coffee." Immaculate Mayanja

"With the Farmer ownership Model I have improved the quality of coffee and I sell processed coffee which has enabled me to take my children to the best schools."
Richard Ssembusi.