

Final Report

Piloting REDD+ Monitoring and Non-Wood Forest Product Value Chains to Mitigate Green House Gas Emissions in the Rural Communities of Bandafassi, Senegal

Grantee: Arbonaut Ltd

***Local Partners: Agence Nationale des Ecovillages (ANEV),
AGRO ECO Services, Centre national de Recherches
Forestières (CNRF), Groupe d'Intérêt Economique GIE
Wakilaaré I and Groupement de Promotion féminine (GPF)
Foussatawu***

Grantee: Arbonaut Ltd

Project start date: 1/11/2014

Project end date: 30/11/2017

12 February 2018

jarno.hamalainen@arbonaut.com **JARNO HÄMÄLÄINEN**
+358 45 279 29 69 **Head of REDD+ and Sustainable Forestry Unit**

TABLE OF CONTENTS

1.	EXECUTIVE SUMMARY	4
2.	ASSESSMENT OF IMPLEMENTATION OF THE PROJECT	5
2.1	Implementation of Activities	5
2.2	Deviations from the Planned Activities	13
2.3	Achievement of Outputs and Objectives	13
3.	CLIMATE CHANGE	14
4.	DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES	15
5.	ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT	16
5.1	Relevance	16
5.2	Effectiveness.....	17
5.3	Efficiency	17
5.4	Impact.....	18
5.5	Innovativeness and learning.....	18
6.	SUSTAINABILITY AND POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS.....	19
7.	FINANCIAL REPORTING	20
8.	CONCLUSIONS AND RECOMMENDATIONS	20

ANNEXES

Annex 1	Updated Logical Framework Matrix
Annex 2	Pictures
Annex 3	Other supplementary documentation

ABBREVIATIONS

ANEV	Agence Nationale des Ecovillages
COMNACC	Comité National sur le Changement Climatique
CSE	Centre de Suivi Écologique
CST	Comité Scientifique et Technique
DEFCCS	Division des Eaux, Forêts, Chasse et Conservation des Sols
EIG	Economic Interest Group
FFD	Finnish Agri-Agency for Food and Forest Development
FREL/FRL	Forest Reference Emissions Levels / Forest Reference Levels
GIS	Geographical information system
INP	Institut National de Pédologie
IPCC	Intergovernmental Panel on Climate Change
ISRA	Institut Sénégalais de Recherche Agricole
IRD	Institut de recherche pour le développement
MFA	Ministry for Foreign Affairs
MRV	Measuring, Reporting and Verification
NASA	National Aeronautics and Space Administration
NFMS	National Forest Monitoring System
NWFP	Non-wood Forest Product
PROGEBE	Projet de gestion durable du bétail ruminant endémique
REDD+	Reducing emissions from deforestation and forest degradation
UNDP	The United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USGS	United States Geological Survey

1. EXECUTIVE SUMMARY

Arbonaut and Senegalese partners Agence Nationale des Ecovillages (ANEV), AGRO ECO Services, Centre National de Recherches Forestières (CNRF), Groupe d'Intérêt Economique GIE Wakilaaré I and the Groupement de Promotion féminine (GPF) Foussatawu have implemented the Nordic Climate Facility granted project "Piloting REDD+ Monitoring and Non-Wood Forest Product Value Chains to Mitigate Green House Gas Emissions in the Rural Communities of Bandafassi" between January 2015 and November 2017.

The overall project objective was to increase the capacity of rural people to adapt to the adverse effects of climate hazards by promoting alternative means of subsistence for rainfed agriculture. The purpose was to enhance sustainable income sources based on value-added NWFP products in the Bandafassi Rural Community, including future carbon trade possibilities on reduced GHG emissions from forests. In the long term, the project is expected to have an impact through reduction of emissions from deforestation, land degradation and forest fires. The long-term intended objectives also include limiting the impact of degradation factors on Niokolo Koba National Park, a UNESCO World Heritage Site, and to ensure the regulation of the flows of the major rivers Niger, Senegal and Gambia. The project area is consisted of total 33 villages and about 2,300 households.

A Measuring, Reporting and Verification (MRV) system allows detecting emission reductions and the level of sequestration achieved through implementing strategic interventions and actions to address drivers of deforestation and degradation. The activity on designing and piloting a MRV methodology and system in the sub-national scale is the first step towards systematic monitoring of changes in terrestrial carbon stocks. The national MRV system is a key requirement enabling countries to access the potential future REDD+ carbon markets, establishing fair benefit-sharing mechanisms and long-term incentives for sustainable management of dryland forest landscapes in Senegal. The achieved benefits can be attributed to carbon and non-carbon ecosystem services. Fair benefit-sharing promotes equal livelihood opportunities countrywide, which may require prioritising development interventions and supporting them with monetary and/or non-monetary resources.

Local entrepreneurship and reduce deforestation and forest degradation were aimed to be enhanced by promoting non-wood forest products (NWFP) agriculture being the main livelihood activity in the rural community of Bandafassi.

The project achieved the following outputs:

(i) REDD+ Measuring, Reporting and Verification (MRV) methodology and system developed and piloted

The pilot MRV methodology and system have been designed by following the UNFCCC/IPCC good practice guidelines and with the interactive contributions of the identified host institution *Direction des Eaux et Forêts, Chasses et de la Conservation*

des sols (DEFCCS) and relevant MRV stakeholder organisations that have participated in the national level workshops and training events. The sub-national forest reference level study was conducted including activity data monitoring in 2003-2015, the average annual non-carbon dioxide emission estimation based on wildfire activity mapping and a field campaign for emission and removal factor development. The deployed MRV system has the potential to be upscaled to cover new regions. The MRV system process has introduced a design of the institutional framework, procedures and a bundle of geographical information system tools with mobile app, desktop and web-based interfaces.

(ii) Local entrepreneurship based on sustainable use of value-added NFWPs enhanced and (iii) Reduced volume of firewood through promotion of improved stoves

The non-wood forest products (NWFP) and improved cookstove activities have been warmly welcomed by the local Bandafassi community members that have been trained and equipped to ensure sustainability of the activities after the project life span. These activities have had a direct impact on the local economy, especially women's elevated incomes, which have improved food security through new nutrition items and funding schooling opportunities of the community members, mostly children. The activities have had direct impacts in the livelihood with impacts also in gender aspects, since the mainly participated in the organised training sessions.

2. ASSESSMENT OF IMPLEMENTATION OF THE PROJECT

2.1 Implementation of Activities

Activity 1.1 Design REDD+ MRV system

In the context of REDD+ implementation, a MRV System is a sub-component of the National Forest Monitoring System (NFMS) to enable tracking carbon emissions and removals regards to forests. The carbon emissions and removals take place due to permanent land use and cover changes, forest degradation, growth (enhancement) and regeneration processes.

The national REDD+ MRV institutional concept involving the focal point, host and key institutional stakeholders had been prepared as the outcome of the national level MRV workshop in May 2016. The institutions identified as key stakeholders and data sources were provided with a training session held between 22nd and 26th May 2017. There were 20 participants attending the event and training topics included the forest reference level and pilot MRV system technical design considerations. The local level DEFCCS has been equipped with inventory material and their staff members have gained capacities through training on forest and carbon field inventories. The

ecological perimeter and its water supply contribute to the achievement of biomass reinforcement, one of the duty of DEFCCS.

A desktop and web-based GIS component of the MRV as well as mobile application have been developed to assist activity data monitoring, emission factor development and dissemination of the results. The MRV system tools and documentations have been delivered to DEFCCS. The MRV tools work as a stand-alone system and necessary resources have been committed for the system hosting, maintenance and user-support until the end of 2020. The complete integration with NFMS (SIGCOD) to the extent needed is envisaged to take place outside the scope of this pilot project.

Activity 1.2 Assess land cover changes 1990-2000-2014 from satellite imagery

In the national MRV workshop (May 31st, 2016), the reference period was confirmed as 2002-2015 based on the satellite data and historical reference data availability.

Four sets of the reference maps within this period (year 2003, 2007, 2010, 2015) were produced using Landsat imagery for land use, cover and fire scar information. These work phases were conducted in compliance with the IPCC main land use and land cover categories (forestland, cropland, grassland, settlement, wetland, other land) and three forest canopy classes (open, medium dense and dense forest) for the land areas with higher than 10% canopy cover. The accuracy assessment of each land use and cover product was assessed through visual assessment of the historical Google Earth imagery following a systematic sampling approach in Open Foris Collect. The time series analysis was carried out for detecting the land cover changes between the reference years.

The land change maps over the period of 2003-2015 are found in the WebGIS portal (<https://proms.arbonaut.com/senegal/>) and a change matrix is presented in the produced forest reference level technical report, presented in annex 3.

In order to pilot radargrammetry to study for improving land use classifications five Stripmap images of the space borne TerraSAR-X sensor were acquired from Airbus in May 2016. The study involved some technical process supervision from Finnish Geospatial Research Institute (FGI) of the National Land Survey of Finland. However, the results were not that promising so that the approach could be recommended to be adopted in the context of Senegal for forest monitoring purposes.

Activity 1.3 Carry out biomass and tree resource inventory

The biomass and tree resource inventory activity has been completed during the milestone period 3. The emission and removal factors including above-ground, below-

ground and deadwood pools have been calculated for conversion between each land cover and forest type.

The inventory had to be implemented in two seasons (2016, 2017) due to delay in the implementation of local co-financing.

Local DEFCCS has been equipped for the biomass inventory and a forest inventory manual developed based on previous inventories conducted in Senegal, with some additional measurement to satisfy carbon inventory need. Two inventory teams has been trained to use PDA to collect field data in a digital form. One hundred plots have been measured, from which were 16 permanent plots to feed the historical DEFCCS national inventory database.

Activity 1.4 Pilot a low-cost system to monitor land use/land cover changes and changes in carbon stocks

The pilot MRV system is based on mobile, desktop and web-based GIS software tools, which is currently also operated independently from the NFMS system under development since the beginning of the project to date. The system does not demand any commercial license for its components and it relies on freely available satellite data and field data measurement data.

The piloted MRV system and methodologies are compliant with the UNFCCC and IPCC recommendation and guidelines. The web-based GIS system hosts data on a server accessible through the Internet. A 3-year maintenance commitment has been made by Arbonaut to ensure sustaining the system functionalities for the future and the potential to integrate the pilot system functionalities with NFMS to be deployed.

Activity 1.5 Develop a bankable project for Payment for Ecosystem Services (PES)

ANEV has contracted AgroEcoServices to prepare a project document to be submitted to donors. This assignment is expected to be completed after the project reporting has been completed. The bankable project is targeting the scaling up of piloted activities in a larger region.

Activity 1.6. Bring the project for PES to the market

The process related to this activity has been initiated by conducting various donor and stakeholder events and meetings to tell about the foreseen project thematic topics, as examples wild fire management, sustainable/community forest management, valorisation of NWFP, improved cookstoves. The support and engagement of the donors and stakeholders will be finalised when the bankable project scope is finalised through the bankable project document process. The project and its scaling up possibilities have been presented to the UNDP, FFD and Finnish Ministry of Foreign Affairs and mentioned to NDF. The project experiences have been

also shared with the stakeholders and development organisations in the neighbouring countries with similar conditions to Senegal.

Activity 2.1 Conduct a marketing study on value-added NWFPs

The market study has been conducted at the early stage of the project in addition to a baseline study on the Bandafassi commune. They show how large is the potential for targeted NWFP (Tamarind, Baobab, Mad, Shea Butter and Honey)on the market, demanding more products with better quality. These studies have also been useful for the local authorities that had not up to date data on the population.

Activity 2.2 Organize a study tour to visit best experiences NWFPs productions and treatments to Burkina Faso

The original Burkina Faso plan had to be abandoned since instability appeared in the country. Besides there had been some challenges to implement this activity, since availability of the local co-financing appeared during the rainy season, when the target people were mostly working with food production and did not have time to travel.

At the end the president of the two partner Economic Interest Groups EIGs and the mayor of Bandafassi commune, who also participated in the final workshop held in Dakar in November 21st, 2017, had a study tour to “La Maison de la Femme” (Women’s House), in the commune of Djida Thiaroye Kao, near Dakar. This house is a production centre where is active 66 groups of women, mainly in cereals and vegetables production.

La Maison de la Femme has Auchan supermarket and several restaurants as customers. Especially the level of organization to manage this large number of groups, has been important to observe. The main topics in the intensive discussion have been how to share the premises and equipment, how to involve all groups equally in workload, how to increase production, how to ensure the quality of the product and how to work sustainably.

In addition, La Maison de la Femme showed interest to buy baobab fruit powder from Bandafassi, when the sufficient quality standards and the production amount are ensured.

Activity 2.3 Organise youth and women in Economic Interest Groups (EIG)

In total, 24 EIGs have been touched by the project activities, including 553 members from which 503 are women. Nine of those groups are new and some old groups have been reactivated with new activities or got they legal status.

Additionally, a federation of EIGs have been created to allow a joined management of the investments like the transformation centre.

Activity 2.4 Establish centre for treatment of honey and other NWFPs

A transformation centre, including two rooms for production and a warehouse, powered by solar energy, has been built and equipped in the village of Bandafassi.

The investments have known delays due to the timely availability of the local contributions. Some activities had to be started before the centre was ready and its equipment arrived late in the project, with impact in to the level of production that stay lower than expected especially regarding some specific products.

The project partner ANEV has implemented new activities to offer some trainings and possibility to the EIG to get incomes, even the investments were not effective. by the time.

The transformation centre and equipment have been transferred to the federation of EIGs for continuing the activity.

The following production levels (2016-2017) had been achieved by the 15th November 2017¹:

Production 2016-2017					
	Quantity	Unit	Price (FCFA)	Turn over FCFA	Turn Over Euro
Sirup Tamarin	64.0	Liter	1500	96 000	146.35
Juice Tamarin	74.0	Liter	500	37 000	56.41
Powder Bouye	11 364.0	Kg	2000	22 728 000	34 648.62
Sirup Bouye	111.0	Liter	1500	166 500	253.83
Juice Bouye	221.5	Liter	500	110 750	168.84
Sirup Maad	5.0	Liter	1500	7 500	11.43
Juice Maad	10.0	Liter	500	5 000	7.62
Shea butter	712.0	Kg	2000	1 424 000	2 170.87
Honey	606.0	Liter	2000	1 212 000	1 847.68
Soap	698.0	Items	500	349 000	532.05
TOTAL				26 135 750	39 843.70

In addition to the transformation Centre, an enclosed ecological perimeter of 2 ha has been set in Bandafassi. It is equipped with a water tower powered by solar

¹ The unit price for Bouye for is higher than originally assessed due to improved quality

energy. The purpose of the perimeter is to enable the sapling production for plantation activity. In the same time, the EIGs benefit from remaining space to produce vegetables and cereals depending on the season.

The EIGs are committed to maintain the perimeter and the DEFCCS local office to continue sapling production after the project period. Reinforcement of the biomass by additional planting as well as fighting forest fires by planting green belts is a duty of the DEFCCS, that benefit from the perimeter.

The project produced saplings equivalent to 270 ha: species for planting in hedges to protect the perimeter and stop erosion, species for forest to enhance carbon stocks, support biodiversity and the NWFP production in the future and wild fire-resistant species to create natural fire breaks. In addition, some fruit trees like orange, lemon and mango trees have been produced to be planted in the villages, improving food security and providing new incomes in the future. 10 000 plants are still in the perimeter to be planted later, covering about 25 hectares. Material for 15 000 more plants and seeds is remaining for next sapling production. A survival rate of 85 % is expected, but its confirmation will require further monitoring.

Activity 2.5 Train EIG members on improved sustainable production techniques, processing and marketing of NWFPs

Twelve training sessions have been held for 296 participants. Some changes appeared in the topics. Less training sessions on NWFP transformation have been held, but soap production based on shea butter was included in the topics. Women also got interested in tree plantation activity and so sapling production courses have been organised.

Activity 2.6 Develop micro-credit system for financing future inputs and renewal of technology

During the project implementation it was identified that the microcredit which EIGs were already using was quite advantageous. It was decided to inject cash in the system to provide leverage effect and allow women to access raw material and to better organize production. Unfortunately, this activity has been implemented very late in the project and the effects cannot be yet measured at the end of the project.

Activity 3.1 Introduce firewood saving stoves in key sites such as schools and health centres

There is no large-scale stove in the region and the construction will be the innovation that EIGs are waiting to see. The knowledgeable person to build them was not easy to find, until a new staff member of the DEFCCS in Kédougou was employed. To build this stove special construction material (mold) had to be prepared and a suitable provider was found in Tambacounda.

Due to delay, the stoves were possible to be built only in end of the year 2017, but it is not possible to build them during the rainy season (May-September). A community size demonstration stove is under construction in the yard of the transformation centre. It will be mainly used for the production of shea butter, and probably in some occasions when large amounts of food are to be prepared. The hut is under construction, the building material for the stove were ready. This activity will be achieved when the material for the roof will be dry, probably after the submission of the final report as a normal activity of ANEV, which is expected to continue working in Bandafassi after the pilot project.

Not other large scale stove will be constructed by the project.

Activity 3.2 Train and support local craftsmen for the manufacturing and broadcasting of improved stoves

This activity has been divided in to two components.

First, women from 10 villages have been trained to build fix improved stoves from local raw materials. They have started production, selling service for 2,000 XOF (= EUR 3.05), what seems to be a suitable price in the market for both crafter and buyer. According to improved stove crafter of Habibou village, to earn the same amount she would need to sew up to four days, instead of six hours spent to build one stove.

Secondly, the project acquired mobile improved cookstove with metal and clay. Those stoves have been provided to the EIG that sold a part of them and rent second part for example to families having a periodic need for making biggest amount of food for weddings etc.

Both cookstove types have been very welcomed and easily find customers, creating a market for that. In total 30 training sessions have been held for 130 participants.

The following table provides the statistics for the improved stoves.

	Amount	Price FCFA	Turn over FCFA	Turn over EUR
fix	68	2000	136 000	207.33
mobiles first delivery	75	4000	300 000	457.35
mobiles second delivery	150	4000	600 000	914.69
TOTAL	293		1 036 000	1 579.37

Activity 3.3 Train people to use improved stoves

Ten sessions on rising awareness of population to the use of improved stoves have been organised in the same villages concerned in to the Activity 3.2. 150 people have participated in those sessions.

Improved stoves users have been very satisfied with them. They mentioned 3 major advantages: 1) 2-3 times less work to collect fire wood, that is mainly the task of children and women; 2) cooking time divided by two; and 3) exposure to smoke drastically reduced with a positive influence an eyes and throat irritation.

Activity 3.4 Disseminate the results

Five radio programs have been broadcasted on a local radio from the Bandafassi cultural center on the topic of this project. The program “*Yentéré rembé*” or Women’s discussion in Poular language is diffused once a week, mostly in Poular language, but also in Wolof, French and Bassari. It is audible from almost all villages in Kédougou province.

Ms. Adama Sidibé, the ANEV worker in the village of Bandafassi, has participated to this program. She mentioned that women form different villages have called the radio station to get more information, some came to Bandafassi to see the activities. Its shows high interest to the project activities, since to call radio station need to use own money, and for transportation until Bandafassi even more.

The final workshop has been organised in November 21st, 2017 to disseminate the project results. The local radio broadcast companies conducted interviews and recordings in the workshop. Also internet and printed press published articles (<http://www.lesoleil.sn/actualites/item/72532-projet-pilote-redd-vers-l-elaboration-d-un-document-de-projet-pour-accéder-au-marche-carbone.html>)

A web page of the project is open at the address www.arbonaut.com/mrv-senegal, which provides an access to webGIS containing the MRV and project activity public data.

A master thesis has been conducted in Arbonaut on the topic *Satellite imagery based canopy cover estimation in tropical dryland forest of Senegal* by Valeriya Serbina, at the University of Eastern Finland, Faculty of Science and Forestry, School of Forest Sciences, and the results are expected to be published in early-2018.

2.2 Deviations from the Planned Activities

2.2.1 Activities that have not taken place

All the planned activities have taken place.

2.2.2 Unforeseen activities that have taken place

Some of the NWFP training topics were changed from the original plans. A national study tour with 3 participants was organised instead of visiting Burkina Faso.

2.3 Achievement of Outputs and Objectives

In total, 553 persons have been directly impacted by the project, from which 503 women at the Bandafassi level. At the national level, 71 people have been directly impacted, mostly men from the administration.

13 green business concepts have been tested (10 NWFP value chains, 3 based on improved stoves). 49 women have earned more with NWFP production than one traditional year of incomes, even the production is limited in time and no full-time work is possible for the women. Those women have increased the resilience of their families to climate change, estimated to 294 persons. Other beneficiaries – 502 remaining - had earned mean 14 euros, that are significant incomes but not decent job. The potential of seasonal job creation is very large and depend of the organisation level of EIGs, not on the resource or the market demand. Around twenty women will get very significant incomes from improved stoves making. Some women are seeing this activity as they family main incomes source in the future with the target to spread the technology out of they own village.

Planned Objectives and Outputs	Indicator(s):	Achievement of the objectives and outputs:
Output 1: 1 REDD+ MRV methodology and system developed and piloted	<i>Sub-national Reference Levels / Reference Emissions Levels (RL/REL)</i>	100 %
	Activity data monitoring system	100 %
	<i>Emission factors based on the field measurements and analysis of the relevant IPCC carbon pools</i>	100 %
	<i>50 officials trained to sustain REDD+ MRV system</i>	100 %: 54 technical people participating in 4 trainings, 58 people participating in national workshops.
Output 2: Local entrepreneurship based on sustainable use of value-added NWFPs enhanced	<i>1 site for improved NWF production in use included solar power and water procurement</i>	100 %
	<i>100 improved hives in use</i>	110 provided, 74 in use. Micro credit funding for support local market development and filling the gap
Output 3: Reduced volume of firewood through promotion of improved stoves	staff of 5 workshops in improved stoves are trained, supervised equipped	40 women trained to build improved stoves

3. CLIMATE CHANGE

The designed pilot MRV system comes with the first set of tools and technical manuals introduced in the stakeholder training sessions to monitor activity data related to land use and cover changes. Reliable assessment of the long-term permanent mitigation impact of interventions on forests, such as NWF and cookstove activities, is expected to require a monitoring period of 4-5 years.

The sub-national forest reference level including above-ground and belowground biomass accounts for 313,701 tons of CO₂ eq. as the average annual net emissions over the period 2003-2015. The average annual burnt area within the study region amounts to 105 000 hectares, which is about 27 per cents of the pilot area. The areas affected by fire are mainly grasslands (52 %), forests (44 %) and croplands only to a smaller extent. The average annual emissions are 346,044 - 445,356 tons of CO₂eq. in case of methane and 204,237-265,967 tons of CO₂eq. in case of nitrous oxide.²

² CO₂ emissions are not counted in case of forest fires to avoid double counting. CO₂ emissions due to fires are counted in land use changes and degradation

Use of the improved stoves decreases firewood needs with an estimated reduction 3 kg dry biomass/day/stove. 68 stoves have been in utilisation about 6 months, saving 37 tons of biomass, representing CO₂ reduction of 68 tons CO₂-eq. Thus, the achieved reduction 136 tons CO₂-eq. per year. The expected minimum life-time for the improved stoves is 3 years. The upscaling potential in the 10 project villages is up to 480 stoves.

Total 270 hectares have been planted with forest trees, fruit and ornamental trees from milestone period 3 to milestone period 5. The IPCC GHG Good Practice Guidance 2003 refers to the biomass accumulation rate values derived from the literature survey and synthesis published by Schroeder (1994) in cropping systems containing perennial species. In the context of the dry tropical forest context the reference accumulation rate provided is 1.8 tonnes C/ha/year corresponding to 6.6 tons CO₂/ha/year. Assuming the overall mortality of 15 per cents, the planted tree coverage sequestrates 267 tons CO₂ per year in average.

The objective was to increase the capacity of rural people to adapt to the adverse effects of climate hazards by promoting alternative means of subsistence such as NWFP production. The project has provide additional income through NWFP and improved stove activities for at least 49 women to be able to make their 6-person household members to survive in case of the complete loss of their annual crop production.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

The establishment of an MRV system was expected to open an opportunity for Payment of Ecosystem Services, in particular facilitating access to the compliance and voluntary markets to compensate forest protection efforts by the people. Moreover, this system was foreseen the first in Senegal and provide a replicable model for the rest of the country. There are already some carbon project initiatives om-going or under development in the country, but Senegal is still building the required readiness for realising the full opportunities. There are also local tourism initiatives getting income by preserving ecosystem services by preserving natural and cultural environments, including wildlife (chimpanzees), for getting income from eco-tourism in Kedougou.

The project was expected provide additional revenue opportunities and create many local green jobs to reduce emigration. In terms of gender, the project was to contribute to the advancement of women and young people who are the two segments most involved in commercialization activities of NWFP. Strengthening the organizational dynamics was expected to have a positive effect on the capacity of rural populations to develop other private income generation initiatives and to participate more actively in the development and implementation of development

policies of their lands, in accordance with the guidelines of the Government to promote decentralization.

The trained 24 EIG members have been receiving in total 41 430 € as additional revenues with a direct impact on their household livelihoods since the beginning of the project activities. The project has been improving the financial independence of women and has been training women to specific works that men are not carrying out. The additional revenues have benefited women, which are traditionally in charge of schooling. The project income has helped them to buy schoolbooks and snacks for the children. The value chain of NWFP has a direct impact of Bedick ethnical minority living in the mountains around Bandafassi as they collect and sell fruits for the transformation unit. They have been also participating in some training and created an EIG.

Planting activities are improving the environmental and economic sustainability of the households as they allow producing NWFP and improving food security, as a part of plantation has been done as orchards. The equipment provided for sapling production and gardening, the equipment of the transformation unit as well as water supply in the ecological perimeter and the transformation unit are contributing to improved labour conditions and enhanced productivity.

Similarly, the energy saved with the promotion of improved stoves was expected in addition to alleviate pressure on wood resources, also alleviate the hardship of cooking meals through timesaving and elimination of noxious fumes for women's health. As the result the improved cookstoves have decreased the needed time to collect firewood by a half, a task mainly carried out by children. Also cooking time is reduced, procuring advantages for women. The users have mentioned direct impact in their wellness with reduced eyes and throat irritation.

This project activities were to contribute to the protection of the near Niokolo Koba National Park, classified as one UNESCO World Heritage, by reducing pressure on natural resources demand and bushfires. The direct impacts cannot be verified in scope of the short project period and relatively small geographical extent, as the project villages are located relatively far from the national park boundary. However, upscaling the project activities in the next phase are likely to increase impacts.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

The national authorities and stakeholder institutions, which are members of CST, have welcomed the pilot MRV system to complement the NFMS system (SIGCOD) under development in the PROBEGE II project supported by the World Bank and Nordic Development Fund. They have gained capacities and tools to use satellite and other imagery to monitor activity data and detect drivers of deforestation and forest

degradation in a spatially explicit manner. The forest reference level study provides the details for the applicable methodologies to estimate the emissions and removals by the sinks and sources. In addition, the project has provided the needed GIS system facility and capacities to DEFCCS to fulfil their national and international greenhouse gas reporting related duties.

For the local community of Bandafassi, including population and local administration, the project has a significant impact on the strategies to improve the livelihood by providing new incomes from new sources and improving food security.

5.2 Effectiveness

The project objectives have been achieved by exceeding the set minimum requirements when assessing against the performance indicators for each main activity (see Section 2.3).

All the MRV pilot activity outputs have been achieved with the stakeholders. DEFCCS, even without being a partner in the project, has showed ownership regarding the system development process and outputs. The pilot MRV system design has been supported by the active national stakeholder contributions in the national workshops and training events.

The local-scale project activities have suffered from some delays, as the local co-financing has not been timely available during the first quarters of the project years. This is because the NWFP collection and improved stove constructions activities are highly seasonal activities. The farming activities engage local population for from the second quarter onwards and rainy season in May-October limits, for example, cookstove construction activities. However, the timely investment availability constraints have been compensated by the great motivation of the EIG partners.

The necessary changes to the order of implemented activities due to project financing availability has affected effectiveness and quality of the outputs negatively concerning the NWFP value chain development. Training topics had to be changed, equipment and micro credit have not been available when needed from the implementation perspective.

5.3 Efficiency

Additional and unforeseen developing efforts had to be devoted as the parallel National Forest Monitoring System (SIGCOD) development process suffered from delays. The pilot MRV system functionalities had to be developed as independent components and the process could not benefit from integrating and harmonizing some of its functionalities with SIGCOD in course of the project period. At the end the grantee also had to contribute with additional investments on developing the web-based GIS and mobile app components of the pilot MRV Senegal system.

Regarding to the local NWFP and improved stove activity resourcing the minimum required targets were achieved with less available local co-financing as planned at the beginning of the project. There were also significant delays for receiving the NCF financing when agreed milestone were not met on time. At the same time the delays in financing availability led to several project operational plan revisions, which engaged more management and coordination resources than originally planned. Finally, an extension of 6 months was granted to complete the delayed project activities.

5.4 Impact

The planned and achieved development impacts haven been already discussion in Section 4.

The CST member institutions, including DEFCCS being the MRV host institution, have gained capacities to produce reference levels and to conduct MRV. DEFCCS has also been provided with tools and methodology to complete activity data production and conduct carbon inventories.

Concerning the local population, especially the 2 partner EIGs and the new EIG impacted by the project, the activities have had a significant impact on their livelihoods by introducing new incomes opportunities for the dry season period, when there is no agricultural work and usually incomes remain extremely low. Also, food security has been improved and new food items have appeared in some villages, such as vegetables and honey. The women gaining some revenues have been able to support schooling of their children.

Arbonaut has been able to achieve enhanced knowledge about remote sensing in dryland tropical forests and the experience helps it to provide better services elsewhere where the similar conditions prevail. Radargrammetry was piloted in parallel in this pilot project and in the separate pilot project in Poland, and when compared the results are similar in both cases. This directs Arbonaut's new research and development activities towards exploring other 3D techniques instead of radargrammetry.

5.5 Innovativeness and learning

At national level the CST stakeholders including DEFCCS, CSE, INP, ISRA, CRNF, ISE, ANSD and ANEV have gained capacities in the workshops and trainings. Radargrammetry has been piloted in scope of dryland forest remote sensing and digitals forms are used to assist field inventory data collection. Functional availability of the pilot MRV system components have been ensured with a 3-year maintenance agreement entering into force after the project end. This is an innovative approach as too often the project end means lack of any maintenance due to local resource or capacity constraints.

At the local level, there are many organizational level innovations and lessons learnt emerged regarding how to manage together production and equipment, and ensure collaboration between the EIGs. New kind of production has been welcomed by the population, both producers and consumers. Improved stoves are locally innovation, even this activity has been done in several projects elsewhere in Senegal.

Arbonaut learned on the positives impacts of REDD+ related projects to food security, which can be taken in to account in it other coming projects.

6. SUSTAINABILITY AND POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

ANEV plans to continue activities in Bandafassi in scope of the Ecovillage programme for NWFP production and population accompaniment. Activities piloted in this project will be also replicated in some other existing Ecovillages in Eastern Senegal.

With the new access to microcredit of the EIGs, the level of production and the businesses on NWFP is expected to grow. There is a demand for the product, raw material available sustainably and producers willing to transform NWFP.

Improved stoves crafters will continue they activities independently and they business is sustainable with existing market

The MRV can be sustained by DEFCCS, which has methodology and tools to continue the monitoring. Arbonaut will continue to maintain the web-based and mobile GIS component up to 3 years. The MRV can be extended to other parts of Senegal.

As an output of the project, a bankable project document concept is to be drafted and will be discussed with donors, with the aim to extend the project activities in a larger scope.

The project has a positive impact to environmental sustainability by protecting forest from degradation and by forest enhancement (plantation). Plantation activities are also targeting that the NWFP resources will be sustain in the future.

Institutions in local and national level got from the project valuable new information and reinforcement trough investments, trainings and new knowledges.

Women have been main beneficiaries at local level by the increasing level of incomes directly to themselves. The project helped the families to keep their children at school.

7. FINANCIAL REPORTING

Table 1. Costs and financing.

Organization	Costs, EUR	Financing, EUR									Revenues from the project	Total
		NCF	Grantee		ANEV		Agro Eco Services	EIG Wakilaaré	GPF Foussatawu			
			Cash	In-kind	Cash	In-kind	In-kind	In-kind	In-kind			
Arbonaut Ltd	438 660.55	360 707.46	77 953.10									438 660.55
ANEV	241 234.95				214 234.95	27 000.00						241 234.95
AgroEco Services	147 759.29	89 292.54			32 166.75		26 300.00					147 759.29
GIE Wakilaaré 1	37 174.22							16 462.68			20 711.54	37 174.22
GPF Foussatawu	35 171.01								14 459.47		20 711.54	35 171.01
CNRF	-	-	-	-	-	-	-	-	-	-	-	-
Total	900 000.01	450 000.00	77 953.10	-	246 401.69	27 000.00	26 300.00	16 462.68	14 459.47	41 423.07	900 000.01	

8. CONCLUSIONS AND RECOMMENDATIONS

The relationship with the national authorities and stakeholders, the involvement of the local authorities and population and the general interest regarding the project have been very high. There is a high potential to extend and upscale the project activities.

The future project design processes have to take better in to account the fact that field activities are seasonal and have to be implemented mostly before the rainy season, and thus the funds have to be available in time. The interest by local stakeholders and partners is high to implement the activities, but the budgetary restriction impacted negatively the possibilities to achieve the whole potential success.

There are no constraints to extend the MRV activities and funds for field inventories need to be availed in the national scale. It is important that the institutional anchorage of the MRV can be confirmed when a new administration take place and the National Forest Monitoring System under development in a parallel project will be deployed soon.