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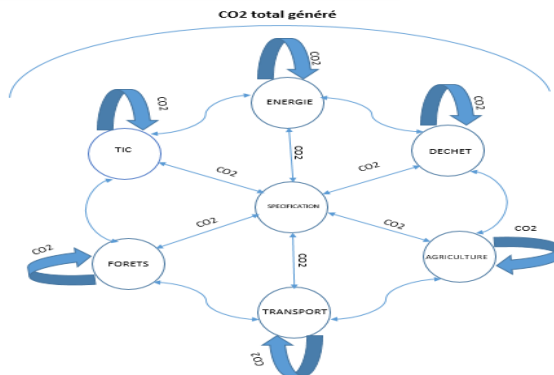
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Africa LEDS Reporting back CAMEROON



ICT - SAPGA



$$I = \alpha P^\beta A^\gamma T^\delta e$$



ICT - AFROSHOP

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A) SUMMARY

Cameroon, like most countries in the world, takes an active part in the fight against climate change; To this end, it regularly participates in major global climate events such as the "Millennium Goals", the Kyoto Protocol, and recently made at COP21 in Paris, quantified commitments for the reduction of its GHG Emissions. It has initiated the implementation of these commitments with the identification and programming of greening projects, but poorly controls their impacts, particularly on the aspects of job creation or allative costs. Thus, the proposal of the UNEP, to set up in Cameroon a model LEDS, able to take into account in its predictions at the same time the level of emissions, and the impacts on the creation of jobs, cost and GDP, was warmly welcomed by the country's authorities.

A LEDS CAMEROON team was immediately formed and, with the support of the UNEP, proceeded to the setting up of a LEDS Model, specifically Cameroonian, integrated and intelligent, taking into account the specificities of the five agro-ecological zones of the National Territory. . The LEDS Model is based on two interdependent components; the first component consists in carrying out a pilot project whose purpose is to identify and characterize one or more activities along the value chain of a given product; Then we must proceed with the greening solutions of these activities and implement them; Throughout this process, lessons or constraints are observed and will make it possible to address the policies in effect according to the objectives. The indicators produced by the experience of component 1 are collected and put together in a database; Component 2 uses the indicators in the Component 1 database to scale up and translate the Component 1 experience across the whole of the agro-ecological zone or at the national level. The model is dynamic, intelligent and integrated and adapts easily to the evolution of data and its environment. Given its weight in terms of economy or employment, the agricultural sector is currently the center of the Model, but this situation may change depending on the importance of other sectors; Model can accept new sectors without major constraint. ; The introduction of ICTs is one of the peculiarities of this model and increases its capacity to reduce GHG emissions. Around the agriculture sector, Transport, Energy, Forestry and Waste sectors gravitate in an interdependent way, with however a minimum of autonomy for each, the system being however strongly integrated, interacting with the policies in force;

In the field of application, the construction of the Model has made it possible to carry out Ngoulmakong and Jakiri pilot projects based on the development of the value chain of "Manioc" speculation. This experience has highlighted a cost-effective option for developing the country's vast potential for renewable energy resources through decentralized systems to value rich farmland in rural areas with a significant impact on income aspects. Sustainable growth, jobs and GDP growth. The multiplication of these cases, which can be rationally visualized by the Model, is an asset of great importance since the State has made it a priority policy with the commitment of the Head of the Department who personally handled the Model and recommended it to the whole Country through the creation and the operationalization of the Task Force; It demonstrates the interest of the Model, which makes it possible to put at the disposal of the policies, not only the parameters of profitability of a given project, but also, its socio-economic impacts, in particular on the employment and the costs.

B) TECHNICAL REPORT

1- CONTEXT: BRIEF BACKGROUND OF THE WORK IN THE COUNTRY – WHAT IT ENTAILS & WHAT IT INTENDS TO

To achieve the implementation of its COP21 commitments in its NDC, which "represents a significant effort for a country whose emissions are insignificant at the international level, and whose Gross Domestic Product (GDP) per capita is ranked 148th in the world, "the Cameroonian government plans to set up a battery of measures, particularly in the fields of Agriculture, forestry, waste management, energy, building, transport and industrial development. Cameroon has set a target of reducing its GHG emissions by 32% by 2035, the base year being 2010. In the baseline scenario, GHG emissions reach 104 MtCO₂-equ by 2035, ie 166% increase compared to 2010. In the INDC scenario, the increase in emissions is contained at 71 MtCO₂-equ in 2035, an increase of 82% compared to 2010. (39MtCO₂-equ). The INDC scenario is constructed by applying to the sector emissions of the baseline scenario an estimate of the reductions resulting from the implementation of the sectorial actions.

This vast greening program has already begun and will continue gradually. The sizing and the programming of the projects are done manually until now and there is no tool to measure their impacts, in particular on the GDP, the employment or on the costs; It is in this context that UNEP, through the "Africa LEDS" network led by Ghana's Nkwame Nkrumah University and its local correspondent ADEID Cameroon, will propose to the Government of Cameroon the design and implementation of the Cameroonian LEDS Model, able not only to calculate the **GHG (Green House Gases)** emissions related to a given project, but also to measure its socio-economic impacts, particularly on employment, costs and GDP. The LEDS Model was developed by the Cameroon LEDS team; The arrival of this powerful tool coupled with digital tools has provided National Decision Makers at all levels with visibility and controlled mastering in the design and monitoring of the greening activities implementation in the country's economy:

- At the decision makers level

The Model has been handed over by the Government of Cameroon. A Task Force was set up under the supervision of the Ministry in charge of the environment to coordinate the implementation of the greening program of the national economy with the use of the Cameroon Model LEDS. This tool makes it possible to oversee the design, implementation and exploitation of the greening projects and programs of the selected sectors of activity, and to address the policies implemented when major constraints are observed in the development of the greening projects activities; The Model operates initially with five sectors of activity (Agriculture, Energy, Forestry, Waste, Transport), and will open gradually, thanks to its intelligent character, to all other sectors. The ICTs sector is for the moment transversal to other sectors of activity. The tool allows Decision-makers, in addition to sizing the project according to the objectives of greening, to measure the socio-economic impacts so the level of jobs and businesses created the investments to be made, the impact on GDP. This is a novelty that gives a great flexibility of choice to decision-makers, who can now in a very short time, for a goal of reducing GHG emissions, objectively choose the size of the projects, the level of investment or the sector of activity to be operated according to the targeted socio-economic impacts and vice-versa. This is a powerful and instantaneous tool for investment decision and policy address, and a great support for objective choice of option, procuring additional income by its rationality and efficiency. The Cameroonian Government, through the Task Force has begun to review the sizing and the programming of its COP21, 2015 Paris agreement Commitments

for projects and programs better selection, Taking into account socio-economic impacts, which was not possible before. This will lead to a rational programming while selecting projects, sectors and measuring impacts, involves the financial costs compared to what the Country can mobilize, and what could be expected from the international cooperation.

- At the sectoral level

The Model also makes it possible to monitor the implementation and exploitation of projects at the sectoral level, to exploit the constraints to address the policies in force. Each selected activity sector is represented by a member at the level of the TaskForce. It is this member who liaises between the field and the Task Force, and thus goes up the field reports as well as the problems that may require adjustment in the improvement of current political arrangements.

- In the private sector

The private sector, as part of the overall greening of the country's economy, also benefits from access to the Model LEDS Cameroon, which is made available to it, for the optimal greening of its activities to align to the national policy.

- At the policy level

The policies in force are not fixed. When the implementation of greening projects and programs encounters significant obstacles, policies are readjusted accordingly to streamline activity. The information is reported to the Task Force which makes proposals to amend the policy framework; The sectoral members of the Task Force serve as relays. Decisions are taken by the Minister in charge of the Environment in relation with the other sectoral Ministers involved.

2- ACHIEVEMENTS / ACCOMPLISHMENTS

i) COMPONENT 1 – GROUND DEMONSTRATION PILOT ACTIONS

a- what practically has been achieved.

1. SITE VISITS

As part of the development of Component 1 pilot projects, several champions established in some of the five agro ecological zones in Cameroon were explored, including:

- the NGOULEMAKONG and MFOU sites in the agro ecological zone of the Forests;
- the YOKO and Nyambaka sites in the High Guinean savana;
- Koussiri and Yagoua in Sahelian zone
- the sites of JAKIRI, Mbouda and DSCHANG in the Grass Field;

Given the means available, actions were conducted in the whole selected sites, but we concentrated the major part of our activities in the NGOULMEKONG and JAKIRI champion's sites. In these two sites, the technical characteristics of the existing champions were analyzed. In some cases, some activity data exist, but are of poor quality because they did not follow a precise model of collection; In general, these data do not exist. By reconstructing a more reliable database, although limited through more elaborate feasibility studies, we have identified sectoral greening posts focused on agriculture as central sector, making it possible to quantify greening measures; sectorial activity data matrices have by such been created.

YOKO/Mekoissim, meeting with the community and council



EU- UNEP AFRICA LOW EMISSIONS
DEVELOPMENT STRATEGIES
AFRICA-LEDS

JAKIRI, site visit with the community and council



NGOULEMAKONG, MOU between ADEID/LEDS and Ngoulmakong Council.



2.1 ACHIEVEMENTS IN THE JAKIRI SITE

Activity 1: Feasibility studies to establish optimal ongoing actions to build on in conducting ground demonstration

Five feasibility studies in total were conducted in Jakiri. The aim of these studies was to determine if Jakiri could host the different agro-value chain greening strategies that were to be implemented in the course of this project. The studies showed that;

- **Clean energy feasibility studies:** With the presence of a 30kW micro hydro power plant built by the council, Jakiri hosted a source of renewable energy. Unfortunately, this source wasn't connected to an existing processing unit. Processing was made with the help of fuel-driven individual or collective mills. The study was to determine whether LEDS contribution would consist in finalizing the transmission /distribution line to connect the processing Unit, or in constructing a bio digester to supply the processing unit for both heat and electricity required for the drying and grinding of cassava. The evaluation criteria here was the cost of rehabilitation of the site or implementation cost for the bio digester, its output power plus its volume in the case of the biogas, the distance from the processing unit, and finally, the engagement or concern of the local population. The study concluded that with the presence of the 30kW, micro hydro plant in Jakiri, 1.5 km away from the processing unit site, with a very dynamic population, it was not necessary for LEDS to implement a bio digester, and thus, more realistic and feasible, to work on the linking of the hydro power plant with a processing unit as clean energy scenarios for the Jakiri council.
- **Cassava growing feasibility studies:** Traditional cassava growing method is mostly practiced in Jakiri, with an average yield of 9-11 tons /ha with a relatively high loss rate of 30%. This average is very low given that Jakiri used local species of cassava, practiced little agroforestry techniques in the farms, with analytical or random follow ups of farms, not really optimal with the seasonal variations faced by the people. The study was to determine the feasibility of introducing improved and adapted cassava plants with an average yield of 20 tons/ha offering greater resistance to climatic variations than the local plants reducing the loss rate, introducing line agroforestry with the safou (plum) tree for its abundant leaves with a land coverage of 25m², an average yield of 100-150 kg per tree, apiculture for pollination of plum tree which would theoretically impact positively on the yield of plums by 50% and yield annually 30 liters of honey per hive, together with the introduction of ICT for a smart and adapted follow up of the local farms. The evaluation criteria here were the plum tree needs, its impact on the cassava farming, the impact either positive or negative impact of its soil on the leaves, its growing period, its size when fully grown, the economic nature of its fruit highly consumed on a national basis. The study concluded that LEDS project could go up to as 50 ha of existing agroforestry farms with the introduction of 100 hives (2 hive per hectare), for the realization of the LEDS greening objective. This was due to the fact that local farmers needed short and long-term returns. Short term returns were guaranteed by apiculture while long-term returns were realized with the safou fruit (Takes five years to grow and has a 1 year production cycle). It also concluded that given the relatively low yield of the region and the relatively high losses in the order of 30% due to traditional analytical follow up, LEDS project would extend its greening to the introduction of a smart ecosystem-based climate management solution for cassava farmers, named SAPGA, developed by the students of the University of Yaoundé I, which would reduce their on farm losses down by 50-80% (source:

SMARTER 2020 ICT MODEL) in combination with the improved yield and adapted cassava plants. The cooperative JAKIRI COOP CA was selected to partner.

- **Cassava processing feasibility studies:** As mentioned earlier, there were no cassava processing unit in Jakiri. Processing was made thanks to fuel-driven individual/collective mills, with a poor energy efficiency, since powered by very old engines. The study conducted was to evaluate the feasibility of upgrading flour milling machines to enable cassava milling, and connection of these to the micro-hydro plant. The evaluation criteria here were the cost of partial upgrading, the cost of full upgrading, the power output potential of the micro-hydro plant, the processing needs of the council with its corresponding input needs, and the actual processing capacity of the council. This study concluded that, Jakiri with an annual processing capacity of 150 tons of cassava flour, an annual 9000 kWh (1,125 liters of fuel in the BAU) equivalent energy need (18kWh x 5 hours x 100 days), having at its disposal a 30kW micro-hydro plant, and a good quality-to-price ratio for upgrades, was suitable for a full upgrade. In other words, the creation of a processing unit with upgraded mills, powered by the micro-hydro plant.
- **Digital marketing systems feasibility studies:** It has been demonstrated that the use of ICT tools in linking producers to consumers either final or not (retailers, wholesalers) which is relatively costless, would boost sales by 20-30% in the short run and 30-50% in the long run. The aim of the studies we conducted were to identify the different existing tools, their proximity with local councils, their ease of use, their cost, their customer database, their transaction history, and finally the affinity of these solutions with the local producers. On this behalf, the study identified Afroshop, a mobile app being developed by the private sector enterprise TKSwift, as being the best cost-effective marketing system for the producers.
- **Cassava consumer market analysis:** The aim of this study was to identify the different existing cassava end products, their respective market shares, and finally, which range of products will be best suited for the Jakiri producers to add more value. The evaluation criteria here was the Investment Return Ratio (IRR). The study showed that cassava could be sold in different forms; garry (most common and fair production cost), flour (very common, low production cost), starch (relatively high cost of production). Some of the forms were not considered due to their short conservation time / lifespan. This study concluded in the adoption of flour as our principal market for LEDS given its relatively high IRR.

Activity 2: Training actors on climate action enterprise opportunities in greening agro-value chains using nature-based on farm approaches (agro-forestry), clean energy and ICT / digital marketing tools.

- **Mobilizing and training cassava farmers on climate resilient approaches, specifically, agro-forestry:** A lobbying was conducted together with the Jakiri council in order to mobilize and train farmers on eco-friendly approaches to farming, with a particular focus on agro-forestry given its potential in the region. This training lasted five (05) days, from January 10 to 14 2017. As a result, 120 farmers including 50 women were mobilized at Jakiri, trained on the eco-friendly best practices; the role of agro-forestry in cassava production (farming), apiculture's impact on agro-forestry and vice-versa, the usage of ICT driven management solutions (SAPGA) for a smarter resilient production, and finally how all these would impact on their earnings. Of these 120 farmers, 70 members of the JAKIRI COOP CA today including 40 women are using SAPGA to follow their farms, practice smarter agro-forestry (driven by both the benefits to the plant and environment, and those linked to their purses). 20 other farmers who attended the workshop

while not being members of the cooperative after their training, joined the ecosystem-based approach of farming. This made a total of 90 successful trainees.

- **Mobilizing and training ICT partners from University of Yaoundé I and the private sector, TKSift on how to target opportunities in green agro-value chains:** A 2 day workshop was held from January 20 to 21 2017 at Yaoundé, on opportunities linked to greening the agro-value chain in line with the government strategic consideration of the Agricultural sector; opportunities at the production phase given the present seasonal variations, opportunities at the post-harvesting level with inadequate storing systems vs. smart and auto-managed ICT-driven storage units, opportunities at the processing phase given the variety of cassava output forms (access to information on market behavior and future tendencies in order to optimize production), the processing opportunities also considered the opportunities linked to digitizing processing units in order to predict market needs and thus produce accordingly (not too much nor too less) thus optimizing the IRR, and finally the marketing opportunities in linking producers to consumers. This workshop successfully gathered and trained 40 youths and 20 professionals from the private sector, with 25% and 50% of women respectively, some (students) of which created AgriTech businesses following these.
- **Mobilizing and training cassava farming cooperative members on enterprise opportunities in clean energy powered value addition of cassava:** The Jakiri council though having a 30 kW micro-hydro power plant was fully dependent on fuel-powered flour mills for cassava processing. Since having no alternative, the cooperatives didn't really realize the cost savings they could make since having no choice. The mobilization helped identify 3 cooperatives. Amongst these, 200 members, including 70 women and 32 executives attended and were successfully trained. The training entailed proposed a shift from fuel-driven individual / collective mills to mills powered by the micro-hydro plant. This shift would help the farmers save 25-45% of their budget in processing, while considerably reducing their carbon footprint. The training lasted a day, and as a result, 2 out of the 3 cooperatives conducted feasibility studies on this shift.
- **Mobilizing and training clean energy enterprises on income opportunities in powering agro-value addition:** The observations made at Jakiri helped realize the importance of clean energy actors in the greening process. A workshop was conducted at Douala which gathered 7 solar energy enterprises, 3 biogas enterprises, 1 micro-hydro specialized enterprise and 20 freelancers, on the business opportunities and strategic implication of the government in their sector. The workshop showed the clean energy world tendency, the opportunities for Africa and Cameroon in particular, opportunities in rural areas, and Jakiri as fertile investment opportunity for the future (after LEDS project). At the end of this 1 day workshop, a clear clean energy trajectory was retained with 35 professional trained on maximizing on local investment opportunities, especially those in line with government policies.

Activity 3: Greening up-stream cassava production

For the ground demonstration of LEDS project, 50ha of farm were used as case study for the introduction of plum trees, improved and climate resilient plants, apiculture and the use of SAPGA.

- **Clearing 50ha of existing agro-forestry farms in Jakiri:** Traditional agro-forestry techniques were practiced on this farm (characterized by a sparse/random distribution of trees). For precision agro-forestry, each ha (100m x 100m) of land was divided into 3 equal parcels of 3000m² (30m x 100m) on the length, with 500m² (5m x 100m) reserved for the plum tree. The first step thus

consisted in clearing the 50ha farm, while maintaining the trees present in the 500m² swap zone. For this task, 100 direct short term jobs were created, with an average of 2 jobs per ha. The wage rate for the job was USD \$100 per person, thus a total of USD \$10 000 for this activity.

- **Acquisition of cassava cuttings:** The next step was to acquire the cuttings required for the planting activity. A cutting of a local cassava plant costs USD \$0.01 while a cutting of the improved and adapted plant would cost USD \$0.02. For the planting activity, 10 000 cuttings would be required per ha, giving a total of 500 000 cuttings for the farm. The total cost for these cuttings was USD \$10 000.
- **Cultivating & watering 50 ha of cassava:** After planting, the cassava cuttings needed to be fed and watered. Traditionally, this follow up was made analytically, that is, based on the normal flow or variation of seasons. This analytical method rapidly became inadequate early 2016 due to the abnormal seasonal variations caused by climate change. The annual precipitations dropped from 134 mm that year to 125 mm. The cassava plants thus needed appropriate management, integrating precision precipitation forecasting & cultivation techniques of the area. This work was precisely made by SAPGA, an automated management tool for cassava farming made by University of Yaoundé I students. The feeding aspects were handled as were traditionally, with the use of pork manure (organic fertilizer) which is very rich (contains potassium, nitrates, Magnesium, calcium, and other mineral elements) and adapted for cassava farming. 50 jobs were created in total. The expenditures for this activity summed up to USD \$28 000.
- **Integrating agro-forestry and apiculture into cassava farms for increased carbon sinks:** Conducted in parallel with the previous task was the integration of agro-forestry and apiculture in the cassava farms. An average of 20 plum tree per ha were introduced with a plum tree plant priced at USD \$3 per plant, thus a total of USD \$3000. Additionally, 2 hives were implanted per ha, each hive priced at USD \$150, thus USD \$15 000 were invested on these. The planting of the 1000 plum trees generated 20 jobs, with a total cost of USD \$200. 10 new jobs were created for the follow-up of the plum trees, for a total of USD \$1000. Finally, 5 bee hive keepers were recruited, each at USD \$100, thus a total of USD \$500. A total of 35 jobs were created. The total investments made here summed up to a total cost of USD \$19,700.
- **Harvesting & transportation of 50ha of cassava farm, agroforestry and apiculture yields:** The previous activities led downstream to the final production activity which was harvesting and transportation. The harvesting period was quite satisfactory! In effect, with an average yield of 25 tons per ha (25% increase in yield, thanks to apiculture), a total of 1 013 tons of cassava were harvested on the 50ha (accounting 10% losses). This yield could not reach as high 1 125 tons given the area covered by the trees. Moreover, 2125 liters of honey were successfully harvested (15% losses), giving an average yield of 21.25 liters of honey per hive. This harvest generated a total of 50 jobs for cassava harvesting and transportation, for a total of USD \$2500, 20 jobs for the harvesting and transporting of honey, for a total of USD \$1200. The total expenditures for this task are USD \$3700.

Activity 4 (Jakiri ONLY): Consolidating ground demonstration site for micro-hydro powered processing
The 50ha farm land cultivated in the course of the LEDS project were not meant for direct consumption. In the agro-value chain in Jakiri, cassava production is meant for transformation into flour. In order to obtain this flour, a series of steps were followed. The cassava harvested has its skin removed, the roots

washed and then peeled, 100% of the labor force here are women. The peeled cassava is then chopped into small pieces about 5 x 0.5 x 0.2 cm, and sun-dried for three to five days (or dried in a hot air oven at 55°C), time for the moisture content of the cassava to be less than 8% (this is a necessary condition for quality flour production). The chips are then milled (through fuel-driven flour mills), and the flour sieved through a 60 mesh sieve. It should be noted here that, these fuel-driven mills were in fact made for maize flour and then adapted for cassava flour. Once transformed, the cassava flour is then picketed in units of 25 kg in plastic bags, and as such, can be conserved for twelve (12) months. The cooperative possessed 6 mills. Each mill produced 250 kg of flour per day (five working hours), consuming an average of 2.1 liters of diesel per ton. The yield recovery in Jakiri's BAU was about 20-22% depending on the mill used. As such, in order to produce 100kg of flour the processing unit needed 455-500kg of cassava. The average flour yield was 21.46%. Thus for 50ha of farm, not only was the actual yield low as 500 tons, but the total flour produced was only about 108 tons. In order to remedy this situation, LEDS project not only did upgrade the cassava flour mills, but in order to make the council benefit from LEDS project, put in place a centralized processing unit with these upgraded machines. But first and foremost, the rehabilitation of the micro-hydro plant and extending the wiring of the plant to the cassava mills were to be done. The tasks carried out in this activity were as follows;

- **Rehabilitation of micro-hydro plant & upgrading micro-hydro power control unit to enable supply to the cassava milling plant:** The preliminary feasibility studies carried out revealed some defects of the micro-hydro plants. The power plant had two major defects, the water intake system and the transformer. The water system intake consists of a single 0.6m inner diameter and 5cm thick pipe which channels water from a height of xm downstream to the turbines in the power house with an average water flow of 40.6 liters/s. The defect came from the fact that the pipe had a total of 22 perforations with the largest covering an area of 38 cm², causing the water intake volume as low as 12 liters/s. As for the transformer, the throughput of the 30kW micro-hydro dropped to 12kW thanks to the underperforming water-intake system. This caused a gradual degradation of the transformer. The repairs of the water intake pipe consisted in replacing a total length of 12m of pipe of same cross-sectional area, which increased the input volume to about 31 liters/s. This increase was to be supported by the transformer, whose principal role was to elevate the potential difference for transport loss reduction (increasing voltage and reducing current, thus reducing current losses). Hopefully, the transformer could be repaired by a technical team from Douala. These repairs made the output power rise back to 22kW.
- **Extending wiring of the Jakiri site to power cassava flour mills:** The chosen site for the processing unit was 1.5 km away from the power plant. In order to supply the processing unit with electricity, 1.5km of cabling were needed to extend the high tension cables to the spot. We did have access to the transformer formerly used by the cooperative to bring down the voltage to the normal 220V value.
- **Upgrading flour milling machines to enable cassava milling:** As cited previously, the JAKIRI COOP CA did use a 60 mesh sieve to produce fine cassava flour. This sieve was built in the mills. Unfortunately, finest quality cassava flour is only obtained with an 80 mesh sieve. The existing 6 machines' sieves were then upgraded to the requirements. 5 jobs were created here for a USD \$100 total investment.
- **Upgrading flour milling machines to enable connection to the micro-hydro plant:** The upgraded flour machines still possessed their classical fuel-driven engines. The engines were upgraded to electrical driven ones with better efficiency. The mills prior to their upgrades required 1.875 liters of diesel per functioning day each, a total of 11.25 liters per day. Each liter of diesel would cost USD \$1.23 per liter, equating to USD \$13.79 per day, thus USD \$1 379 per annum. With the

upgrades, the first benefit was in terms of working capacity. Each machine could now process with a brand new 4 HP (2.98kW) electric motor, 600 kg of flour per day. The total processing capacity of the processing unit thus rose to 3.6 tons per day, thus 360 tons per annum. 1kWh at Jakiri cost USD \$0.12. Thus, the 9000kWh processing need would cost USD \$1 080 vs. USD \$1 379 in the BAU. This represented USD \$299 saved, thus 21.28% of savings, with a net zero (0) processing impact on the environment. Furthermore, everything being equal, a 360 ton flour production in the BAU would require USD \$3309.6. This represented USD \$2 229.6(67.34%) savings in the long term on the BAU scenario, with a net zero (0) processing impact on the environment.

Once the mills upgraded, the 1013 tons of cassava furnished yielded 405.2 tons of cassava flour after the process (described earlier). This represented a throughput of 40%, which represents a 93.2% throughput increase from the old fuel-driven mills. This processing activity generated 100 jobs for the preprocessing phase (all women), 25 jobs at the processing phase and 25 jobs at the packaging phase for a supplementary investment of USD \$5000. Thus, the processing phase generated a total of 150 jobs, vs. 60 jobs in the BAU, equivalent to USD \$1800.

Activity 6: Market linkages through expanding Afroshop mobile application to cover cassava produce marketing.

This activity was carried out in two phases. Prior to the processing activity was a first market linkage activity. This activity consisted in the linking of the processing unit with the farm products. The second phase was then carried out after the processing, linking the flour producers to local and distant consumers.

- **Cassava growing:** In the BAU, the JAKIRI COOP CA after harvesting their 420 tons of cassava bought an extra 80 tons in order to process successfully 150 tons of flour. Studies were still conducted to determine the possible revenue of the cooperative if they did end their activities at the production phase. The studies concluded that, for 1 ton of cassava being sold out at USD \$70, the cooperative could realize sales in the order of USD \$29 400, which would imply negative returns for the BAU investments of USD \$52 000. This showed why the JAKIRI COOP CA couldn't end just at production and continued their activities till cassava flour processing. But what was the LEDS project impact on this matter? In effect, thanks to the introduction of improved cassava plants, the JAKIRI COOP CA would harvest 1125 tons of cassava (Improved yield plants, SAPGA for precision follow up, and Afroshop for maximum/total sales), the cooperative would realize USD \$78 750, corresponding to USD \$58 700 investments everything being equal (USD \$76 700 with apiculture and agro-forestry). Still, the cassava growing activity didn't end here with the LEDS project. The apiculture yields, 2125 liters of honey could be totally sold thanks to Afroshop, yielded USD \$12 750. This thus gave a total of USD \$91 500 sales for an initial investment of USD \$76 700. Far more profitable than the BAU.

A special note has to be made here since the IRR in the LEDS project will witness three major changes with time. The first major change here arose the second year of investment by the JAKIRI COOP CA. In effect, the investment dropped from USD \$76 700 to USD \$58 700 since no further investments were required for agroforestry and apiculture, with the same level of returns, USD \$91 500. The second major change has not yet occurred and is programmed to two years from the writing of this report. The arrival of the first plums, about 70kg per tree (70 tons in total), they are expected to raise the sales further by USD \$28 000, to USD \$119 500. The yield of the plum trees will increase within 5 years until reach their normal output of 120 kg. At this time, the IRR will witness its final change, with total sales this time rising by USD

\$48 000, to a final and quasi-stable USD \$139 500 with the same level of investment, USD \$58 700.

Though this wasn't what was practiced by JAKIRI COOP CA, this study was made in order for this activity to be replicable elsewhere, and would help decision makers while using the model developed in component 2, to have tangible data in the case of cassava growing projects, for efficient decision making.

- **Processing:** The 405.2 tons of cassava flour obtained at the end of the processing step were solely sold through the ICT mobile application, Afroshop. This new channel changed marketing at Jakiri in numerous aspects. From the sales point of view, prior to Afroshop, 2-10% of the production was not sold. That year, a noticeable percent of the production finished unsold, 4%. It should be noted that these 4% do not remain in stock neither. Instead, JAKIRI COOP CA decided to redistribute these between the members of the cooperative (this though can't be accounted as sales). This implied that out of the 150 tons produced, only 144 tons could be sold (comparing though the BAU situation with the LEDS greening alternative will consider the initial 150 tons produced, since losses will always depend on the farmer, his produce and the channel used. Also, some cooperatives intentionally decide to share a fraction of the produce obtained after processing with the members, this produce can be before or after sales and thus can always be accounted as losses). 1kg of cassava flour costs USD \$0.6, thus in the BAU, the total sales realized were USD \$86 400 for an investment of USD \$61 179 ($IRR_{BAU} = 1.412$). Given the cooperative's tradition of not being able to sell all produce, the cooperative decided to deliberately share (redistribute) 4% of the 405.2 tons, i.e. 16.2 tons between its members. The remaining 389 tons though representing 259.3% of the already impossible past sales could be totally channeled with the help of Afroshop. This made a sales record of USD \$233 400 for the JAKIRI COOP CA. thus for a total investment of USD \$82 940, JAKIRI COOP CA made a total of USD \$246 150 ($IRR_{LEDS Project} = 2.968$) with a net reduction in the carbon footprint, from 3.27 CO₂ tons to 0 CO₂ ton. This not only demonstrated that greening the agro-value chain was possible, but also very profitable than the actual BAU with the right tools at hand.
- **Transport:** Furthermore, the LEDS project while greening the agro-value chain was also concerned with greening the transport sector concerned with the transport of agricultural produce to and from the processing units. Prior to Afroshop was what was Cameroon's global baseline situation. There were four (4) principal means of transport; motorcycles (27%), old cars (35%), clandestine buses commonly called "opep" (24%) and finally heavy trucks (14%). This discrepancy came from the fact that the quality of roads linking the farms to the processing units was pretty bad. These roads, being unable to support the weight of heavy trucks were not fully exploited. Additionally, the Cameroon government had till today, the will to reduce the amount of clandestine transport means in the territory. This implies old cars, motorcycles and opeps (in fact, even the motorcycles and cars are clandestine). Afroshop played a crucial role in this. The fact is, this sector, particularly in rural areas has majority of its jobs being informal ones. In order to avoid clandestine transport means, Afroshop uses registered transporters for the produce from the processing unit (this measure could not really apply to the produce from the farms since these were those passing through the worst roads. Thus, could not be definitely removed in this sense but reduced). This shift from the linking of transporters to producers, primary or secondary, had three major impacts. The first noticeable impact was the optimization of the extra distance to sale ratio. This ratio, used by the local farmers determined the average useless extra distance effort a product covers before it is sold per unit produce. This ratio dropped from 22km per ton to 4km per ton. This was as a result of the full removal or reduction of useless displacement, since these will be

conditioned by a delivery/command in Afroshop. Afroshop thus modified the transport structure at Jakiri drastically (no clandestine transporter could register). This accounted to the second noticeable impact, the transport structure. Motorcycles thus came down to 10% of the total traffic, old cars came down to 25% of the traffic (since mostly used for transporting produce from farms to processing units), opeps when down to 10% (though having a greater carrying capacity, opeps are interested in transporting produce from the processing units to the consumers, final or not. Their weak participation amounts to their conversion from “*transporting from the processing units*” to “*transporting to the processing units*”. And finally, trucks, accounting 55% of the traffic (100% of the traffic from the processing unit). It should be noted that this traffic concerns the transport of the 50 ha produce to the processing unit and the resulting 402 ton of flour to the market. This shift was only possible thanks to Afroshop. This change in the transport structure had a direct final impact, i.e. impact on the cost of transport. From motorcycles with a very low carrying capacity (200kg) to a relatively high load to transport cost ratio (USD \$28 per ton) with the highest carbon footprint (1.5 ton CO₂ per ton transported) to trucks, having a comparatively high load capacity (50 tons), a relatively low load to transport cost (USD \$6 per ton) with the smallest of all carbon footprint (0.25 ton CO₂ per ton of produce transported on average). The transport cost fell from USD \$18.76 to USD \$12.5, i.e. USD \$6.26 were saved for every ton transported (USD \$8 857.9). The carbon footprint was lowered from 1268.88 ton CO₂ in the BAU to 821.41 ton CO₂ (35.01% CO₂ emissions mitigated) after LEDS project. No jobs were created here. In the contrary, clandestine jobs were destroyed (1 truck = 5 opeps for example), and replaced by yet few but formal jobs.

Activity 7: Development of case studies based on demonstration actions

The activities carried out in the ground demonstrations and results obtained helped develop 4 cassava case studies or scenarios.

- **Case study 1: Replacement of local cassava plants with improved yield and climate resilient ones, using SAPGA to follow up cassava farms:**
 - o **CHALLENGE:** Help farmers develop LEDS vision in the cassava growing activity, while improving their financial balance
 - o **SOLUTION & OUTCOME:** Shift from local cassava plants yielding 10 tons of cassava / ha and traditional analytical follow up resulting in 25% losses, to improved yield cassava plants producing 25 (locally, only 20 tons are harvested, but thanks to apiculture there is a noticeable 25% increase yield) tons per ha, with the use of SAPGA, a cassava-based smart management tool for cassava growing follow up, reducing on farm losses to 10%.
 - o **IMPACTS:** 200 jobs in total were created versus 80 in the BAU, 1013 tons were harvested vs 415 tons in the BAU, a total of 144.1% CO₂ mitigated on the possible emissions vs BAU (based on the surface activity needed to yield the 1013 tons in the BAU), for a total investment of USD \$58 700 versus USD \$52 000 in the BAU, with sales as high as USD \$78 750 in the LEDS case study versus USD \$29 400 in the BAU.

- **Case study 2: Introduction of agro-forestry and apiculture in cassava growing:**
 - o **CHALLENGE:** Improve cassava growing yield and carbon sinks
 - o **SOLUTION & OUTCOME:** Practice of agro-forestry techniques through the introduction of 20 plum trees per hectare and apiculture, consisting of 2 hives/ha for an overall improve

of 25% yield and diversification of revenue. Negative returns were encountered in the first year. As from the second year, the IRR just kept increasing, with an estimated major rise every 5 years for 10 years, and then remain constant).

- **IMPACTS:** 55 new jobs were created, 7.2 tons of CO₂ were sunk as a result (7.2Kg of CO₂ per tree), this required a total investment of USD \$20 900 corresponding a level of revenue of USD \$12 750 the first five years (with a constant USD \$8 400 investment as from the second year), USD \$40 750 the five year set and finally USD \$60 750.
- **Case study 3: Moving from fuel-driven cassava processing to clean cassava processing into cassava flour:**
 - **CHALLENGE:** Reduce the carbon footprint of the cassava processing activity while improving the efficiency and profitability of this.
 - **SOLUTION & OUTCOME:** An upgrade of the usual fuel-driven maize flour milling machines into electrical cassava flour machines. Sieves were upgraded from 60 mesh to 80 mesh. The engines were upgraded and funnels replaced to attain a processing capacity from 1.5 ton per day to 3.6 ton per day, with a 93.2% throughput increase (from 21.46% to 40%), this with a constant kWh equivalent energy need.
 - **IMPACTS:** 155 jobs were created versus 60 in the BAU scenario. There were a total of 0 CO₂ emissions versus 3.27 tons in the BAU. Energy processing cost dropped by 21.28%, from USD \$1 379 to USD \$1 080. The total investments needed to process the BAU 500 tons of cassava into flour versus the 1 013 tons of the LEDS project rose from USD \$61 179 to USD \$
- **Case study 4: Using Afroshop to boost cassava flour marketing:**
 - **CHALLENGE:** Provide best sales opportunity to farmers while reducing the carbon footprint linked to their marketing activity.
 - **SOLUTION & OUTCOME:** The android application Afroshop was used for linking the producers (JAKIRI COOP CA in our study) to the consumers. This permitted them to realize 96% sales of their stock of cassava flour and 100% of their honey sales. The consideration of transporters by Afroshop made possible a change in the transport means BAU, from 27% motorcycles – 55% old cars – 24% opep and 15% trucks, to 10% motorcycles – 25% old cars – 10% opep and 55% trucks.
 - **IMPACTS:** 447.47 tons of CO₂ were mitigated (35.01%) compared to the BAU. A drop in the average transport cost by USD \$6.26 (33.37% savings on the BAU).

2.2 ACHIEVEMENTS NGOULEMAKONG

Activity 1: Feasibility studies to define ongoing optimal actions on which to base a ground demonstration

A total of five feasibility studies were conducted in NGOULEMAKONG. With the objective of determining if NGOULEMAKONG is a favourable site for hosting/developing greening projects along the agri-food product value chain to be implemented as part of the LEDS. The studies concluded that:

Renewable energies: the NGOULEMAKONG plant, in accordance with the local context, had two sources of energy for the supply of machine motors (diesel and electric fossil fuel), however, as energy cuts are very recurrent, 90% of the machinery fleet is composed of diesel engines (Photos of the plant's diesel machines). With a processing capacity of 6 tonnes of cassava days, the plant consumes an average of 100 litres of fuel on average days to run these machines, representing an estimated emission potential of 95 tonnes of CO₂. As part of the project, we migrated from a 100% electricity source by connecting the plant to the national electricity grid which is composed of 60% hydro and 40% fossil (heavy fuel oil), or 45KW of total energy in which there is a 15Kw cassava flour production mill.

The Ngoulmakong unit is sized to produce 1600 tons of flour annually through its 15 Kw mill. 5 161 tonnes of cossette tubers must be dried at 20° before going to the mill. The statistical data collected indicate that the corresponding total wood consumption is 674 Kg. It requires a thermal energy production of about 574,000 KJ to obtain 1000 Kg at 20° of dried product, corresponding to 221 KWH, and for 1,600 tonnes of dry flour, the total drying energy corresponds to 353,600 KWh; the treatment of 1600 tonnes of cassava chips causes GHG emissions of about 354 tonnes annually. As part of the project, we replaced the wood dryer by a totally autonomous mixed solar dryer (direct and indirect) with a high efficiency; this made it possible to reduce the 2 missions generated by the drying process

Feasibility studies on cassava cultivation: The traditional cassava cultivation method is mainly used in NGOULEMAKONG, with an average yield of 15 to 17 tonnes/ha. This average is very low, since NGOULEMAKONG used local cassava species with an improved species mix, agroforestry techniques on farms are non-existent, with analytical or random farm monitoring, which was not really optimal given the seasonal variations faced by populations, an average consumption of 1 ton of nitrogen fertilizer per hectare (NPK photos of fertilizer bags) and an abusive use of herbicides and phyto generally not registered with strong side effects (negative impact on soils in the long term, carcinogenic diseases and water pollution). The feasibility study aims to validate the introduction of improved cassava plants with an average yield of 20-25 tons/ha (higher yields are generally not for flour production and food), the introduction of Agroforestry lines with safou tree (plum) for its abundant foliage with an average yield of 100-150 kg safou per tree, beekeeping for plum pollination, which would have a positive impact on plum yield of 25% and an average yield of 30 litres of honey per hive, as well as the introduction of ICT for intelligent monitoring (soil mapping, personalised agricultural calendars, automatic irrigation, disease prevention, etc.) and raising awareness among producers on the use of organic herbicides and phyto plus insertion and promotion of organic herbicides and phytos such as Anti-H and Proca diatrine. The evaluation criteria were the need for plum trees, their impact on cassava production, the positive or negative impact of its leaves on the soil, its growth, its size at maturity, the economic nature of its highly consumed fruits. The study concluded that the LEDS project could benefit from an area of 50 Ha for the pilot project.

- **Feasibility studies on cassava processing:** As mentioned above, there is a cassava processing unit in NGOULEMAKONG. The transformation is carried out using machines powered by diesel (100%) and electric (0%) engines. The objective of the study was to evaluate the electrical empowerment of the 45KW national electric power plant and the substitution of diesel engines by electric motors. The evaluation criteria here were the cost of a partial upgrade, the cost of a complete upgrade, the energy production

potential of the micro solar power plant, the processing needs of the board with the corresponding input needs and the actual processing capacity of the board. This study concluded that NGOULEMAKONG with an annual production capacity of 1,600 tonnes of cassava, an equivalent processing capacity of 30 kW, a micro power plant of 100KW, with plans to increase its production and processing capacity to 10,000 tonnes by 2035, and a relatively reasonable cost for upgrades, was suitable for full substitution

Feasibility studies of digital marketing systems: It has been shown that the use of ICT tools to link producers to consumers, whether final or not (retailers, wholesalers), which is relatively cost-free, would increase sales by 20 to 30% in the short term and by 30 to 50% in the long term. Our objective is to identify the various existing tools, their proximity to local populations and producers, their ease of use, their cost, their customer database, their transaction history and finally the affinity of these solutions with local producers. To do this, the study identified Afroshop, a mobile application developed by the private company TKSwift, as the best cost-effective marketing system for producers.

Analysis of the cassava consumer market: The purpose of this study was to identify the different existing end products of cassava, their respective market shares and, finally, which range of products would be most appropriate for NGOULEMAKONG producers to bring more value to their agriculture. The evaluation criterion here was the return on investment (ROI) ratio. The study showed that cassava could be sold in different forms. garry (most common and fairest cost of production, TRI = 1.301), flour (very common, low cost of production, TRI = 1.42), starch (relatively high cost of production, TRI = 1.476) Some of the forms were not considered due to their short shelf life / shelf life. This study concluded that flour was adopted as the main market for LEDS due to its relatively high IRR.

Activity 2: Train stakeholders on climate action opportunities in ecological agri-food value chains using nature-based agricultural approaches (agroforestry), clean energy and ICT/digital marketing tools.

- Mobilize and train cassava producers in the application of soils and crops, in particular organic fertilizers, organic phyto and organic herbicides:

Farmers from selected champion cooperatives as well as other stakeholders along the cassava value chain in the locality of NGOULEMAKONG were trained on the impacts of nitrogen fertilizers on climate and soils, herbicides and phyto-chemicals on health during training workshops held in yaoundé at Tsinga local police academy. Local producers have also been trained in the use of low-carbon production methods and green production techniques have been proposed and adopted, such as:

- Substitution of 50% synthetic nitrogen fertilizer for organic fertilizer (animal excrement, compost, etc.);
- Use of biochar to reduce leaching during spreading;
- The use of organic herbicides such as Anti-H;
- The use of procadiatine as an organic phyto-sanitary product;
- The use of legumes and CIPAN crops.

During this multi-stakeholder cohort, the invited young students were trained on agritech and digital marketing as major assets for the development of the agricultural sector and the growth of the national economy. Energy production companies were invited and built on the importance of renewable energies in the cassava value chain (opportunity, market axes, job and wealth creation, etc.) and finally cooperative members were trained and built on the importance of renewable energies in energy empowerment and their added value (implementation cost, benefit, impact, etc.)

In short, at the end of these training sessions, where 24 women, 11 young people and 37 men were invited, it emerged that 21 women, 8 young people and 32 men had been trained and 21 of them are now using the methods learned, and 3 hen farmers were presented and instructed on how to use excrement to supply the cooperative with organic fertilizer. The Afroshop platform has been adopted for the marketing of agricultural products and inputs along the value chain, the use of electric sprayers for optimizing yields and lowering the investment rate has been demonstrated and adopted.

Activity 3: greening up-stream cassava production

Cassava cultivation in ngoulemakong was carried out as follows over a total area of 50 ha: in accordance with the established specifications, we introduced fruit trees (Safoutiers) to promote agroforestry, i.e. 25 plants per hectare with spacing of 10 M between the plants. Thanks to the latter we have increased the CO₂ sequestration rate of the plantation and consequently increase the producers' income (at the fruit sale: 63\$ US for 50 Kg). We made a nitrogen fertilizer substitute in biochar and organic fertilizer of 50% for an equivalent yield rate, i.e. a reduction of 200 KG per hectare of NPK (40\$ US for 50 KG). We used improved seeds that give 25 to 30 tons per hectare and cost 25F per cuttings as a substitute for local seeds that gave 11 to 15 tons per hectare and also cost 25F per cut. Workers for the per-hectare clearing were paid US\$65 per hectare and those who planted the trees and cuttings US\$0.2 per plant and US\$0.02 per cuttings. Workers for the harvest were paid 0.2 per foot of cassava extracted and the total yield was 28 tonnes per hectare compared to 17 tonnes at BAU for an investment of US\$1200 compared to US\$1350 in greening.

The watering system used here was of a traditional nature called "bottle watering" which consists in attaching bottles to the feet of the crops on bottle spikes which, in case of rain, store water and channel the watering directly to the feet of the plant. With an estimated average impact on production of 2%.

Freight transport is done with motorcycles, everything doors and small cars/taxis for the factory and is generally paid at US\$2 per 50 Kg bag when the road is good and US\$3 when it has rained and the latter is impassable. We recommended the use of heavy machinery such as the Dyna 300/ cargo to facilitate pick-up and mass transport, which will result in fewer trips, lower fuel consumption and lower costs.

In short, at the end of our activities to green the cassava production chain, it appears that the results were quite positive. Among other things, we have increased producers' incomes by US\$73 per bag of safou and increased the sequestration rate of the plantation by 10% through agroforestry, optimized production through improved seedlings/seeds and the substitution of 50% nitrogen fertilizer for biochar and organic fertilizer, which has allowed us to have an average yield of 28 tonnes per hectare and a reduction in production costs of US\$156 per hectare and cultivated land of 6.5%. We also note a significant improvement in employment with the increase in production, which increased the number of harvesters by 2 additional people per hectare.

Research on dryers in Cameroon has expanded significantly over the past decade. It is recognized in the international community, but there is a gap between the variety of dryers offered and those used in the field, although this observation is not quantified. Many solar dryers are available with a wide variety of solar air collectors to use this free energy. However, its developments are affected by irregular solar radiation and unfavourable conditions during the rainy season. These types of dryers are rarely used. The modern dryer developed as part of the NGOULEMAKONG project is a mixed dryer (direct and indirect solar coupling) with high efficiency designed to withstand a number of climatic conditions (rain, heavy rain, heavy rain, etc.) making it a robust, expandable and efficient tool.

As a replacement for the wood dryers that produced 98 tons of CO₂ per year, and a drying capacity of 950 tons of cassava per year, a consumption of 14 tons of wood for 750 tons of cassava is 2700 USD and costs 1550 USD for 5 average jobs generated. The solar dryer does not produce CO₂ because it is totally autonomous with an average capacity of 750 tons of cassava per year, a relatively low electricity consumption of 1 KW and a manufacturing cost of 2110\$ USD for 9 jobs created.

**EU- UNEP AFRICAN LOW EMISSIONS
DEVELOPMENT STRATEGIES
AFRICA-LEDS**

Data	BAU	Project
Area cultivated	50 ha	50 ha
Natural and improved seed quantity	10,000 feet per hectare	10,000 feet per hectare
yield per hectare	10 t – 20 t maximum	25t – 35 t maximum
synthetic fertilizer	200g per foot	100g per foot
Quantity of organic fertilizer	0	100g per foot
Nitrogen content	20% of the total quantity	20% of the total quantity
Impact on performance	15%	20%
Irrigation system	artisanal bottle	artisanal bottle
Percentage of export	40%	65%
Cost of plant	0,05\$ USD	0,1\$ USD
synthetic fertilizer cost	40\$ for 50 kg	40\$ for 50 kg
Manure cost	8\$ USD	8\$ USD
Herbicide	3l of Glycot per hectare	13l of Anti H per hectare
Phyto	5L per hectare	8L proca per hectare
Herbicide cost	3\$ USD per liter	0.1\$ USD
Phyto cost	5\$ USD per liter	2\$ USD per liter
Staff per hectare	2	2
Cost of cultivation	1400\$ USD and 1800\$ USD with tractors	1550\$ USD and 2100\$ USD with tractors
Cost of maintenance staff	70\$ USD	70\$ USD
Cost of the harvest	200\$ USD	300\$ USD
Cost of sale	70\$ USD per tons	70\$ USD per tons
Quantity of organic waste	250 Kg	500 Kg
Percentage of waste recovery	5%	20%
An increase of	200 ha per years	200 ha per years
mill power	15 Kw	15 Kw
plant capacity	45 Kw	45 KW
engine type	Gazole	electric
work days	300	300
type of dryer	Wood	Solar
drying capacity	950 tons per	750 tons
dryer price	4250\$ USD per Years	2110\$ USD per years
Transport type	Bike and small car	mass transport by truck
Cost of transport	2\$ per 50Kg	1,4\$ per 50Kg

b- Contribution to the information on investment policy decisions and implementation of the NDCs.

At the national level, we have the establishment of the Task Force by MINEPDED with representatives of the various ministerial departments and the presence of the private sector and civil society.

Options of greening activities implementation lead to identify obstacles, worries and impacts relate to their development; Some impacts are conjectural, other are structural; Solutions to impacts lead to address the investment Policy as to take them into account when orienting and sizing investments Along the way of the NDCs implementation, problems identified to implement greening projects will be structural or conjectural; when they are heavy like financing worries, they will mostly find solutions through policy adjustments.

At the local level, In terms of investment policy, we have each time worked with the municipal institution responsible for the territory's economy. This has allowed local decision-makers to work closely with local investors and gradually develop a strategy to attract external companies. However, the slow acceleration of the decentralization policy does not really leave municipalities free to make strategic and political choices. Sectoral ministries still control many sectors. But there are mechanisms that can allow local entities to engage in a multi-stakeholder business partnership. The role of the project was to show local elected officials these paths and to engage with them in the support and supervision of local actors in the agricultural and agri-food product value chain.

We have also initiated discussions on the concept of an archipelago economy, by proposing to neighbouring and complementary municipalities to work together to develop large-scale projects with a more visible effect on the reduction of greenhouse gases. Their contribution to the implementation of the CDN and the MDGs would be more visible, and their local climate governance better structured.

However, the aspects related to the financing of these projects are still being fine-tuned at the level of the State, which is deploying large resources without much success.

We expect the various funding windows to integrate the greening aspect of the value chain into their project selection criteria as well as the data collection system. This will make it possible to move from Business-As-Usual to the reduction of the carbon footprint of companies and the paradigm shift in local development strategy.

The appropriation of ICTs by climate and financial authorities would facilitate transactions and their security while reducing GHG emissions.

CASAE STUDY: IMPACT OF THE PROJECT ON LOCAL ECONOMY

The case study helps to identify worries of all types which can occur due to the project implementation and to identify related solutions; this is a way to identify policies which are to be addressed and notably, in the case of Investments policies which is concerned here.

The case study helps to generate activity data which can be modulated according to the decision makers objectives; It presents different options to the decision makers who can modulate them for an affordable adaptation to the State capacities or objectives through policies adjustments.

IMPACT OF THE PROJECT ON LOCAL ECONOMY

The Project of Ngoulmakon has actually 1000 hectares of cassava, with option of extension. The greening of its production machine will enable the municipality to make a significant contribution to reduce the production of greenhouse gases, to create more wealth and sustainable jobs for young people and women according to its objectives and capacities.

Activity data are as followed:

- Area cultivated: 1000 Ha
- Natural and improved seed quantity: 10,000 feet per hectare
- Local yield per hectare: 10 t – 20 t maximum
- Improved yield per hectare: 25t – 35 t maximum
- Quantity of organic fertilizer: 100g per foot 1 ton per hectare
- Nitrogen content: 20% of the total quantity
- Impact on performance: 20%
- Irrigation system: artisanal bottle
- Quantity of organic fertilizer: 50g per foot
- Nitrogen content: 20%
- Impact on performance: 30%
- Cost of natural plant 25F
- Cost of improved plants 50F
- Manure cost 4000F 50kg
- Herbicide: 3l of Glycot per hectare
- Phyto: 5L per hectare
- Herbicide cost: 1500F per liter
- Phyto cost: 2500F per liter
- Staff per hectare: 5 people
- Cost of cultivation: 700000 and 900000 with tractors
- Cost of maintenance staff: 35000
- Cost of the harvest: 100000F per hectare
- Cost of sale: 35000F / tons
- Quantity of organic waste: 250 kg
- Percentage of waste recovery: 5%
- Percentage of export: 65%
- An increase of 200 Ha each year

After processing, the main activity data are described in the table below:

**EU- UNEP AFRICA LOW EMISSIONS
DEVELOPMENT STRATEGIES
AFRICA-LEDS**

2019	1 000	17 000	600 000 000	765 000 000	1 000	310 003 897	5 000
2020	1 200	20 400	720 000 000	918 000 000	1 200	372 004 676	6 000
2021	1 400	23 800	840 000 000	1 071 000 000	1 400	434 005 456	7 000
2022	1 600	27 200	960 000 000	1 224 000 000	1 600	496 006 235	8 000
2023	1 800	30 600	1 080 000 000	1 377 000 000	1 800	558 007 015	9 000
2024	2 000	34 000	1 200 000 000	1 530 000 000	2 000	620 007 794	10 000
2025	2 200	37 400	1 320 000 000	1 683 000 000	2 200	682 008 573	11 000
2026	2 400	40 800	1 440 000 000	1 836 000 000	2 400	744 009 353	12 000
2027	2 600	44 200	1 560 000 000	1 989 000 000	2 600	806 010 132	13 000
2028	2 800	47 600	1 680 000 000	2 142 000 000	2 800	868 010 912	14 000
2029	3 000	51 000	1 800 000 000	2 295 000 000	3 000	930 011 691	15 000
2030	3 200	54 400	1 920 000 000	2 448 000 000	3 200	992 012 470	16 000
2031	3 400	57 800	2 040 000 000	2 601 000 000	3 400	1 054 013 250	17 000
2032	3 600	61 200	2 160 000 000	2 754 000 000	3 600	1 116 014 029	18 000
2033	3 800	64 600	2 280 000 000	2 907 000 000	3 800	1 178 014 809	19 000
2034	4 000	68 000	2 400 000 000	3 060 000 000	4 000	1 240 015 588	20 000
2035	4 200	71 400	2 520 000 000	3 213 000 000	4 200	1 302 016 367	21 000

BAU balance sheet

Here we have an area of 1000 hectares

Yield of 17 tons per Ha

A loss due to poor management and misinformation of 40%

Losses of CHF 8,000,000

Mismanagement of waste resulting in a relative loss of relative earnings estimated at 1,500,000 per year

A relatively high pollution rate

Low production rate

Low employment rate

A static economy

Low youth integration rate in the agricultural sector

An unstable cassava price

An inefficient data collection system

Greening Scenario

How will the implementation of this strategy allow us to reach our goal?

Hypothesis

We make a migration of 50% towards bio-fertilizer including organic waste

We integrate to boost production biochar

We use phyto bio

Cultivation is done with improved cuttings and tractors

Bio fertilizer and organic phyto

Use 50% synthetic and 50% organic, or 50g each per foot for a 50% reduction in fertilizer emissions.

Using compost

Household Organic Waste Management Project

Use of manure

Hatchery project

Fertilizers and organic phyto

- Use of legumes, Cijan etc. for an additional gain in green manure
- Use of phyto such as
- Proca-diatrine which is both a fungicide and an insecticide
- Anti-H which is a non-toxic and 100% organic herbicide
- Cost proca 1000F the Liter
- Cost anti-H 1000F 5 liter

Balance sheet

- Net increase in production rate of 35% or 8000 tonnes on average

- A remarkable reduction in emissions of 20% or 105 000 000 tonnes CO₂eq tonnes over 100 years
- A net increase of t he GDP is 360 000 000 FCFA
- Effective data management
- Low rate of carcinogenic diseases (carbon and toxin related)
- Growth of the rural and national economy
- A 290 000 000 F fertilizer gain averages corresponding to 17 000 bags not imported

Use of ICT

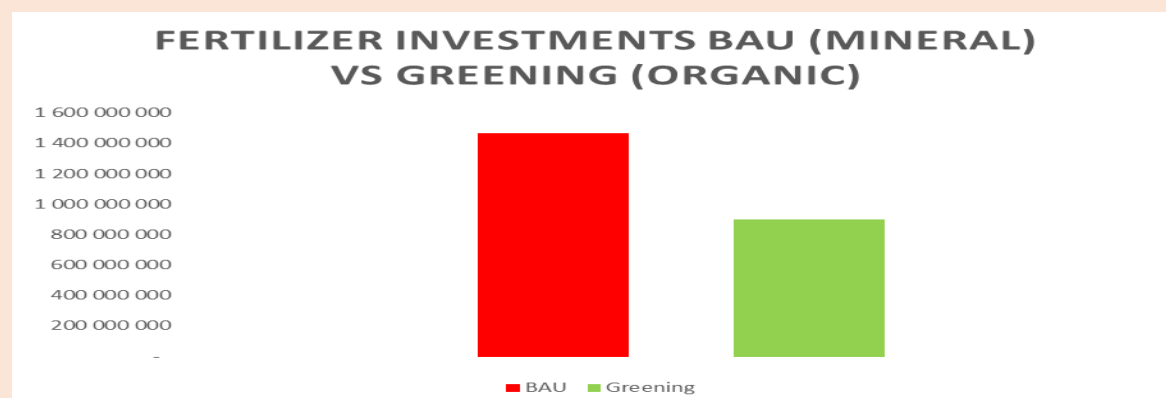
ICT integration remains a major asset

- Using drones
- Automatic irrigation systems
- Meteorological notification system
- Commercialization, procurement, training, and financing applications like AFROSHOP
- ERP integrated management
- The use of michorized fertilizers

GRAPHIC REPRESENTATION OF THE NGOULMAKONG RESULTS FOR THE GREENING REPLACEMENT OF CHEMICAL FERTILIZERS BY ORGANIC FERTILIZERS OPERATING ON INITIAL 1000 HA OF CASSAVA CULTIVATION

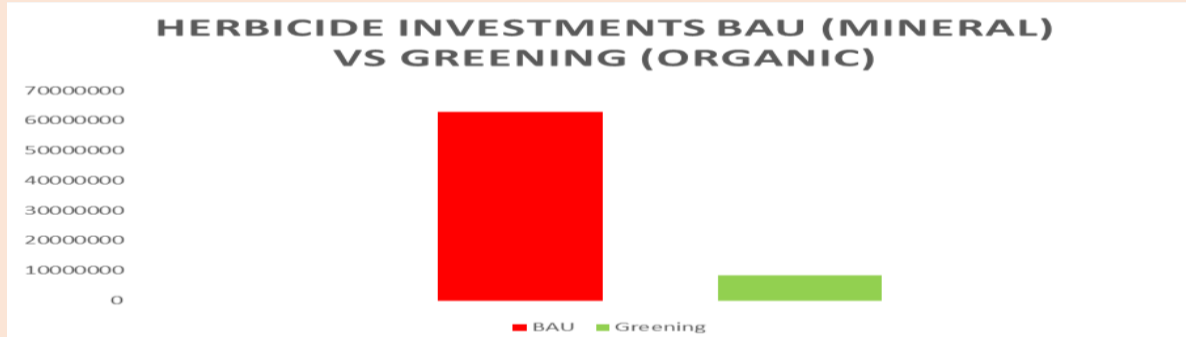
These graphics give a large visibility of different options in the hands of Decision Makers, allowing them to modulate objectively and rapidly their choices of investment considering the level of GHG emissions and impacts on jobs creation, capacity of investment, and the corresponding choice of the investment sector. The impact on the GDP is easily identified. The area will evolve from 1000 hectares in 2019 to 4 200 hectares in 2035. ITSs impacts will be also taken into account.

- Fertilizers Investments

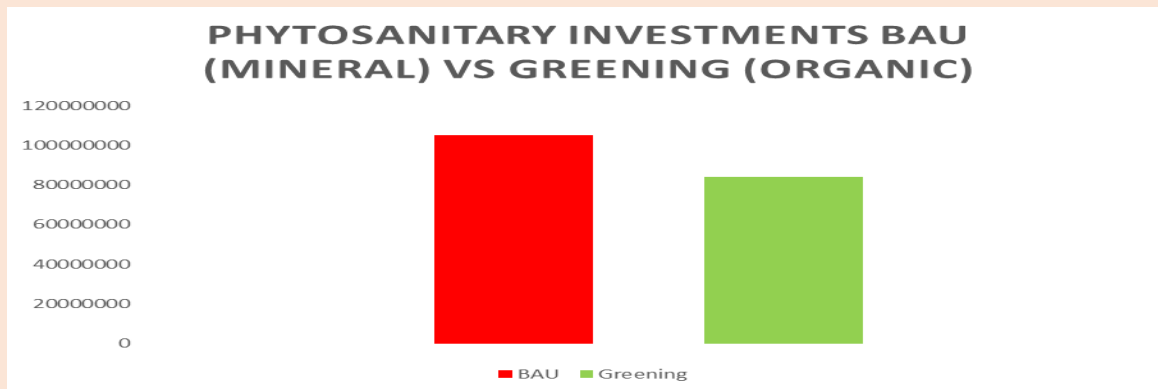


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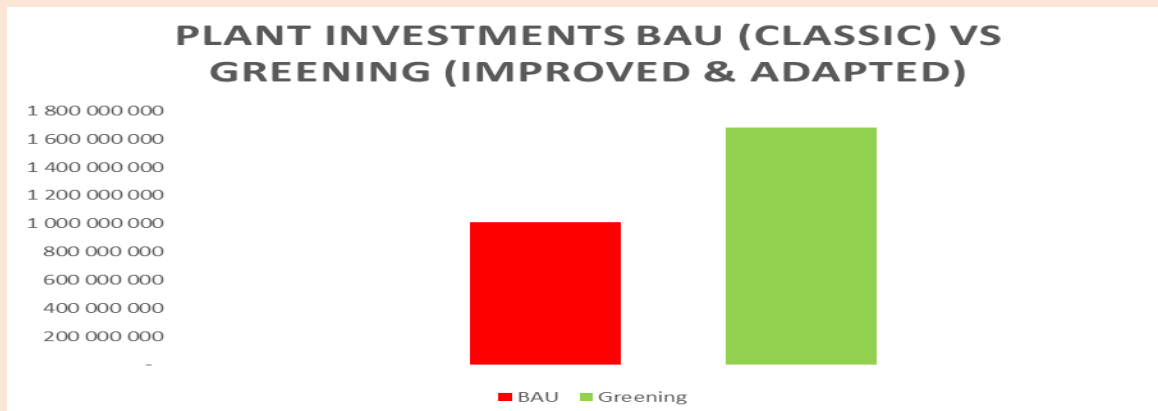
▪ Herbic ide Investments



▪ Phytosanitary Investments



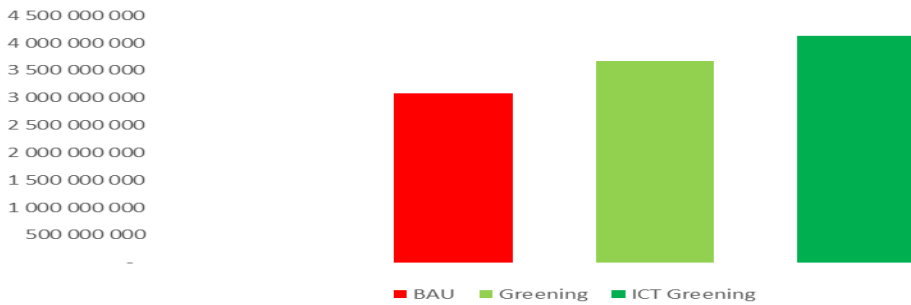
▪ Fertilizers Plant Investments



▪ Income (total)

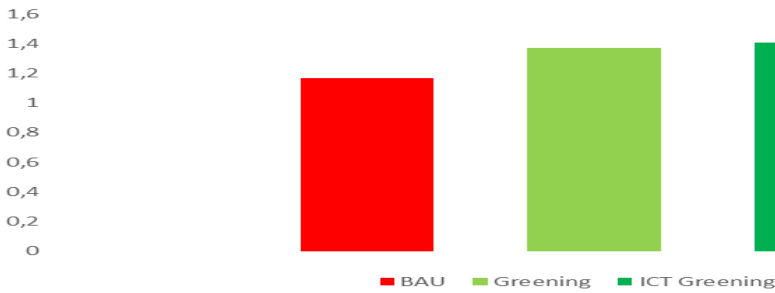
EU- UNEP AFRICALOW EMMISIONS
DEVELOPMENT STRATEGIES
AFRICA-LEDS

**INCOME BAU VS GRENNING VS FURTHER
ICT GREENING**



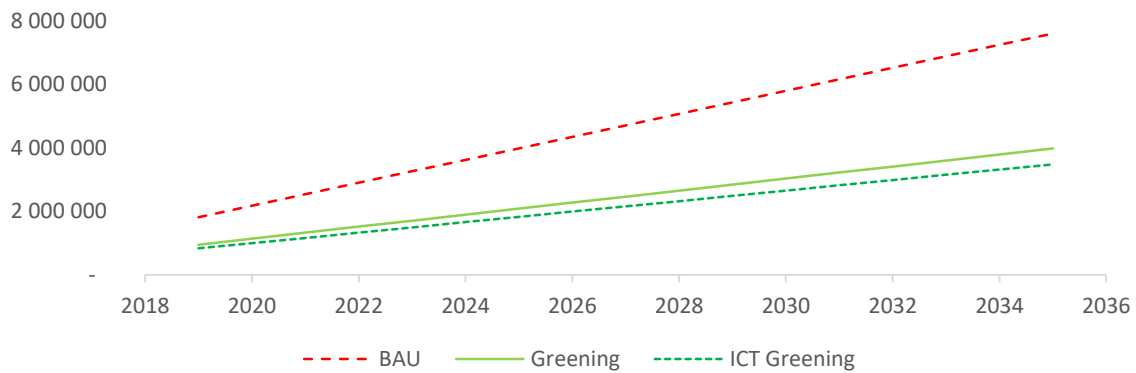
▪ IRR

**IRR BAU VS GREENING VS FURTHER ICT
GREENING**



▪ GHG emissions

GHG EMISSIONS



s

IMPACT ON THE POLICY

Above demonstration and comments show that greening is of great importance for the creation of jobs, increase wealth and the reduction of greenhouse gases in Ngoulmakong commune. At the level of Decision makers, it appears clear that the operation can be carried on. The gap is positive.

In case the results are not good, the first thing is to identify the reason and then inform and restructure policies the way to solve the identified problem.

Graphics confirm visibly that Fertilizers greening using organic to replace Mineral is a very high cost effective operation; Policy should be informed in the way to promote massive investments in that sector for increasing income, creating new green jobs and highly reduce the GHG emissions.. It becomes easy to size greening projects according not only to the level of GHG emissions, but also to the socio-economic impacts which can be clearly defined. The options will also be chosen in accordance with State or any Investor capacity, so that policy in place can be modulated taking into account any constraint or opportunity to develop green projects.

By doing so, the component 1 has helped to inform investment policy decisions and contributed to implementing the NDCs since the selected project is an NDCs one contributing to the activity greening. Investment policy can benefit from better appreciation of financings needs or other facilities enabling the easy development of such projects on the national territory. By adapting selected projects and sectors to State capacities and objectives.

c- Some site pictures (see Annex2)

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2. NEEDS OF GOULEMAKONG AND JAKIRI SITES TO BE EXTENDED AND BECOME GLOBAL GREEN REFERENCE VILLAGES

- Model of the green village hosting the site for the operation of the Jakiri cooperative. Sustainable and circular agriculture is the model reproduced by ADEID/LEDS in the country. This Model has been adopted by JAKIRI and NGOUKLEMAKONG Councils as the Objective of their activities greening. 10 Councils of ADAMAOUA region also accept this LEDES model and are working on a conception of a project called "Dilitized gree village Cameroon".



3. **videos of actors**
In Annex

ii) COMPONENT 2 – MODELLING ACTIONS

a- Capture the sectors shortlisted from the NDCs as most representatives of the country's climate

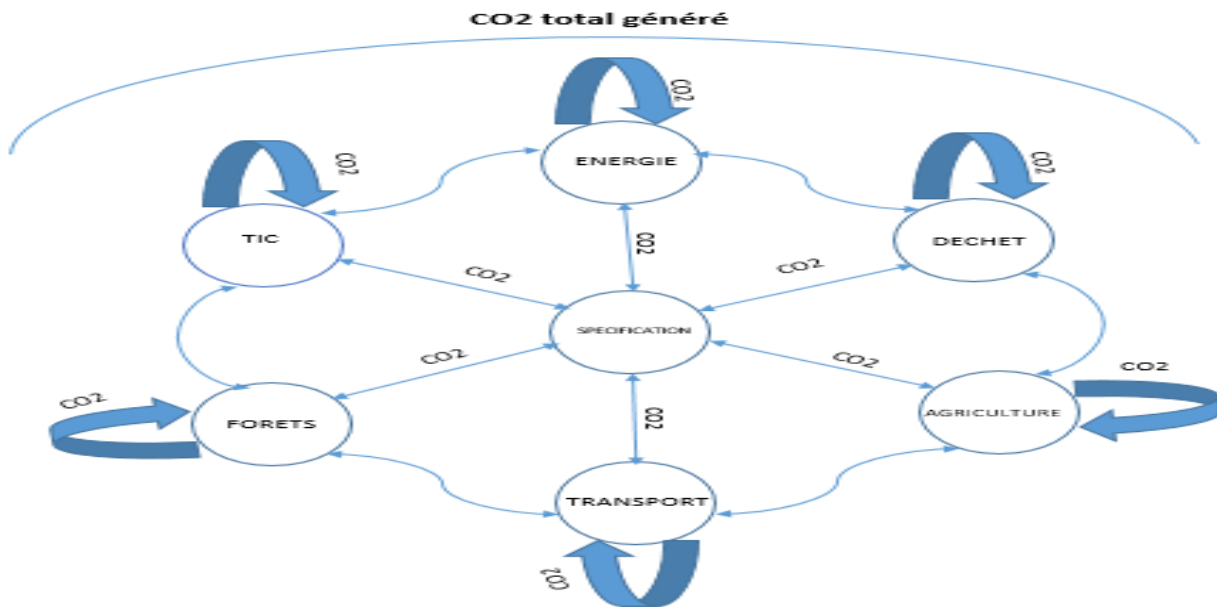


Fig 1 : LEADS Model Representation in nodes

Description

To measure greenhouse gas emissions, particularly CO₂ from the agricultural, forestry, energy, transport and waste sectors and the impact of CO₂ from these different sectors; Cameroon will have to build a model that integrates 5 main components; each component will have to be able to estimate the quantity of CO₂ from the sector of activity it represents through value chains; another will measure the impact of these quantities on GDP, employment, costs, etc. This induces a two-way communication between these models since they are part of the same set.

In this diagram, each satellite node represents a sector of activity. Each satellite node is considered as a potential GHG emitter and integrates within it an impact measurer aimed at reducing the CO₂ rate generated by it through mitigation strategies. The loop represented on each sector of activity reflects the self-regulatory capacity of each sector of activity. The special node at the centre of the model represents a value chain chosen according to the objectives to be achieved by a development project. The links between satellite nodes materialized in this graph mean the existence of a certain synergy between the different sectors of activity with or without a specific value chain. The arcs between the satellite nodes

and the central node materialize the contribution of each sector to the development of a specified value chain on the one hand but also the action of a value chain for the development of a business sector. The specification appears when the number of business sectors is greater than or equal to 2. The intelligent character of the model will come from the orientation of the existing arcs between the different nodes according to the problem to be solved and the national development objectives.

Equation setting

The model must be able to integrate all sectors, so it is an aggregation of the models of the study sectors.

$$E = \sum_{m=1}^q \sum_{j=1}^p \sum_{i=1}^n e * DA_{ijmt} * FE_{ijmt}$$

With:

- i: index of an activity in a sector of activity
- j: index of a sector of activity at a level in the value chain
- m: value chain level
- t: study period

Five main sectors have been selected in the Cameroonian LEDS Model: Agriculture; transport; Energy; Forest; Waste. To improve the GHG emissions reduction rate, a sixth sector has been added: the ITCs which act primarily as a tool and will become a full sector by the time. In this Model, each Sector can be the central sector, depending on its importance or objectives. In the Cameroonian LEDS Model, AGRICULTURE is the Central sector; But, this can evolve, without major modifications, since it is an intelligent Model. While being integrated in the whole system, each sector can grow individually in an open system before the final integration:

- Each satellite node in the Model representation above represents a business line;
- The loop represented in each business sector reflects the self-regulatory capacity of each business sector;
- The special node located at the center of the model represents a value chain chosen according to the objectives to be reached; The center can mutate, and in the case of Cameroon, given its importance, it will be taken by the agricultural sector which is the basis of the approach;
- The links between satellite nodes shown in this graph signify the existence of a certain synergy between the different sectors of activity;
- The arcs between the satellite nodes and the central node materialize the contribution of each sector for the development of a specified value chain on the one hand but also the action of a value chain for the development of a sector of activity;

b- Integration of sectorial models to forecast the amalgamated trajectory of complementary sectors

To measure the emissions of greenhouse gas CO₂ in particular from agriculture, forestry, energy, transportation, waste, and socio economics impact associated to climate impact relate to emissions reduction from these sectors, Cameroon, has built a model that incorporates five main components; each component should be able to estimate the amount of CO₂ along the value chain from its development model; It will be through the values of chains that Impact will be measured on GDP, employment, cost, etc. ICTs as tools will be emphasized. Those two models are connected since belonging to the same system as opposed to BAU where sectors are modelled in sectorial silos.

As agriculture is considered as a lift for development in Africa by the African Union, this will justify the privileged position of the component that it represents in the final model as central sector. That sector represents almost 70% of employment in Cameroon

The assessment of the emissions and the impacts of greening the economy on the GDP through the investment costs of the related green projects, the green jobs created, is translated by mathematical equations reflecting the sectoral realities that will decline on the practical plan in

"Digital Cameroon LEDS" that allows to exploit the model LEDS thus developed, to identify and size LEDS projects according to GHG emission reduction targets set for a given horizon, and to measure impacts on green jobs, specific costs and GDP.

ICTs, which are a major component of the model, are integrated into the activity data, as ICT waste nuisances are taken into account in the Waste sector, but could evolve to express themselves in terms of **'impact of ICTs on GHG emissions "**or simply in terms of full **"business sector"** in their own right based on the significance of their effects on GHG emissions; the intelligence and dynamism of the model allow these evolutions.

Other impacts, not yet sufficiently taken into account, will gradually be integrated on the same principle

This model allows sectorial estimates of emissions of greenhouse gases by enriching itself with its artificial intelligence module which capitalizes all the optimal solutions verified by the scenarios and the concrete simulations allowing projections on the targeted and controlled development of Cameroon while keeping a possibility of adjustment that allows its great flexibility and adaptability according to the stakes and the evolutions of the world, while also privileging the higher interest of the Cameroonian State and its development. While predicting the GHG emissions, the Model predicts at the same time the socio-economic relate impacts. Our model is a safe and reliable tool for decision making for our authorities.

As any human work is imperfect, our model is a case study which will have to continue its development for the establishment of a great school of modeling. Our model poses the fundamental on which a modeling university must be built for the development of the Cameroon in particular and Africa in general.

The densification of data collection will continue for better calibration in the five major ecological zones of the country, with export options in similar ecological zones in Africa or elsewhere. This can be done with the development of specific control projects in these large areas and their close monitoring in relation with other projects in these areas to take into account the parameters of usual behaviors to better characterize the specifically local aspects involved in the consolidation of the area.

The model being essentially dynamic and intelligent, its framework remains applicable to all the speculations produced in Cameroon, as well as to the various priority activity sectors. Whatever the sector of application, the main parameters required are the data that must be rationally processed; treated, reliable and formatted for a certain compatibility with the model

The lack of data being the major problem encountered during the development of the modeling phase, the following resolutions were taken for the future in order to take into account other crops exploited in Cameroon:

- Global Greening activities identified should be supported and reinforced in the NGOULEMAKONG and JAKIRI champions to enable better and intensive activity data collection;
- Three other champion or specific pilot projects should identified in the three remaining agro ecological zones for activity data collection;

- Financing of those projects should be found among the UNEP connections;

c- Simultaneous forecasting of both climate & socioeconomic priorities

Following the 21st Conference of Parties of the United Nations Framework Convention on Climate Change, scheduled for November 30 to December 11, 2015 in Paris, France, Cameroon pledges to work for "a reduction of 32% of its greenhouse gas (GHG) emissions by 2035, the deadline for its projected emergence.

Existing Model in the BAU Model scenario consisted on linear planning without specific integrating tool, aiming to forecast only GHG emissions reduction in separated sectors without any rational synergy; Socio-economic impacts are not evaluated. **Business as Usual (BAU) scenario modelling was focused on silo climate impacts only.**

As part of the accelerated implementation of its commitments, Cameroon, in cooperation with UNEP, has proposed to develop the LEDS Cameroon process, which is a low-emission model, a tool for sizing and programming projects and programs. Low emission in the priority sectors defined by the Government of Cameroon in order to facilitate the achievement of its greenhouse gas emission reduction targets.

The model developed by the Cameroon's modelling team mainly allows for projects or programs to be developed, the evaluation of GHG emissions, the measurement of their impact on costs and green jobs creation, the impact on GDP, It allows also to make predictions according to the defined objectives; Its implementation is proving to be a powerful tool for addressing government in the rational orientation of its socio-economic (economic) greening policies. And investments.

The initial concept is circular, open, and put at the service of the activities to be developed, but depending on its importance, a given sector can become the main sector and occupy the center of the model: this is the case with agriculture in the Cameroon LEDS model: The other sectors, while being self-regulated, put themselves at his service mainly. The model is intelligent and can therefore mutate without inconvenience. Its dynamic nature allows it to also integrate new sectors that have become significant in terms of greenhouse gas (GHG) emissions;

▪ THE CHARACTERISTICS OF THE MODEL AND ITS FUNCTIONING

The model developed was inspired by numerous international and proven sources, among which the IPCC approach, and other experiences operating in the similar environment, and relied mainly on theoretical concepts readily adaptable to the context of Cameroon. The main features of the designed model meet the following principles:

- Stochastic model

The model admits Laws of probability, especially when activities develop over time.

- Smart model

The reference model is designed in an integrated form with agriculture as the main sector; the model being intelligent, mutations can take place, and, for example, each sector can become the main sector according to its evolution.

- Dynamic model

The model is not fixed; it can evolve by integrating new innovations to justify its dynamic character.

The assessment of the emissions and the impacts of greening the economy on the GDP through the investment costs of the related green projects, the green jobs created is translated by mathematical equations reflecting the sectoral realities that will decline on the practical plan in "**Digital Cameroon LEDS**" that allows to exploit the model LEDS thus developed, to identify and size LEDS projects according to GHG emission reduction targets set for a given horizon, and to measure impacts on green jobs, specific costs and GDP.

ICTs, which are a major component of the model, are integrated into the activity data, as ICT waste nuisances are taken into account in the Waste sector, but could evolve to express themselves in terms of '**impact of ICTs on GHG emissions**' or simply in terms of full "**business sector**" in their own right based on the significance of their effects on GHG emissions; the intelligence and dynamism of the model allow these evolutions.

Other impacts, not yet sufficiently taken into account, will gradually be integrated on the same principle. Globally, the Model help to evaluate the GHG emissions and the impact of the development of a given project on the new green jobs and green activities created, the impact on the cost and the impact on the GDP.

d- Model and its integration to inform NDCs implementation policy decisions

Our Model is an intelligent model that can forecast long term impacts (both climate & socioeconomic) to inform optimal policy decisions with the aim of replicating the above in all the 5 agro-ecological zones of Cameroon:

The sectorial models have been integrated the way to inform NDCs implementation policy decisions, making the agricultural sector, the center of the system and the other sectors its satellites; but, those satellites have a certain level of autonomy and can become at their turn, the center of the model, depending on the importance and governmental objectives; all the sectorial models are dependent, one to another, working in the same and whole system; The models integrate different system for the creation of synergies necessary to power and inform NDCs implementation policy decisions which approach is holistic. Significant Progress has been made in:

- Policy decisions are implemented in different sectors; and each sector is specific with its priorities which should be taken into account when taking decisions; worries of each sector should be considered by policy decisions; worries of each sector are transferred to the decision makers by its representative at the Task Force. This lead to the integration of sectorial models which together and harmoniously will inform the NDCs implementation decisions which actions will be solutions for the whole system and each sector.
- The coordination lead by the Task Force reinforce the integration of the Models since it consists in representative of each sector; This reinforce the Models integration and involve each sector in the decisions, making part of NDCs implementation management;
- The National LEDS committee, which is being taking place will strongly harmonize and integrate each sector in the NDCs policy decisions.

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- Working as needed with the Ministry of Environment to transfer and install models into decision structures of the relevant line ministries through the inter-ministerial policy task force.

A National Cameroon LEDS Model Committee (**Task Force**) has been set in place under the lead of the Ministry in charge of Environment.

Through that Committee, national forecast of the GHG emissions reduction and corresponding projects will be planned, involving all the selected sectors, and implemented by the different Administrations. The whole system is integrated. The Evaluation/Monitoring will be conducted also through that Committee, leading to policy amendments to improve the NDCs development in each sector, and by integration, in the whole system.

- LEDs Model Validation

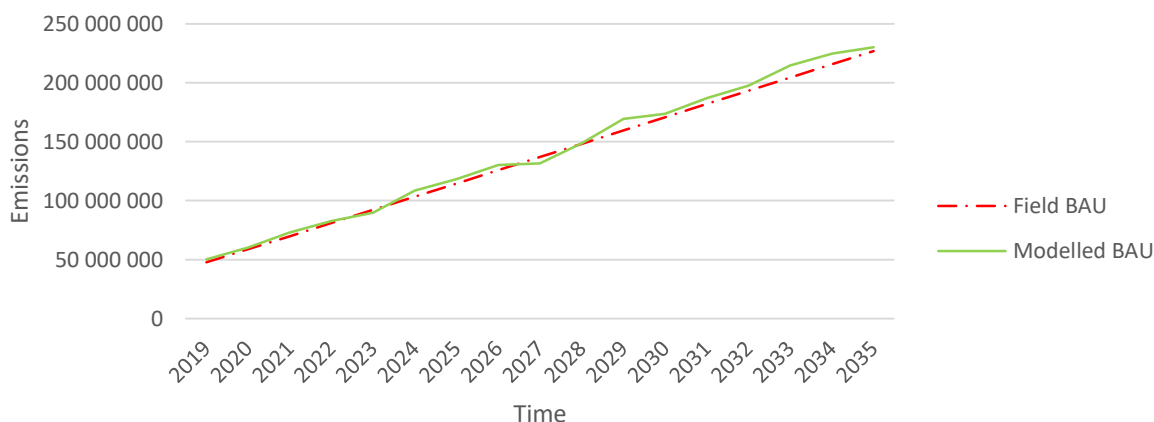
The model was validated using data collected from component 1 pilot actions to forecast their long term socioeconomic & climate impact up to 2035; Using the case of the Transport sector from Farms to the cassava processing unit and using different transport modes, we calculate the forecast parameters manually and then compare them to the evolution driven by the Model; We have the below results on the curves. An example is given below with the local transport GHG emissions.

Local Transport GHG emissions : Ngoulemakong Field BAU (Réal) vs BAU (LEDS Model) for the Model validation

Ngoulemakong



Comparative GHG emissions : Field BAU VS Model BAU



Validation du model (extrapolation des donnés + erreur dans model de +- 5%)

Based on Agricultural sector, the two curves are quite similar, then, the Model is validated.

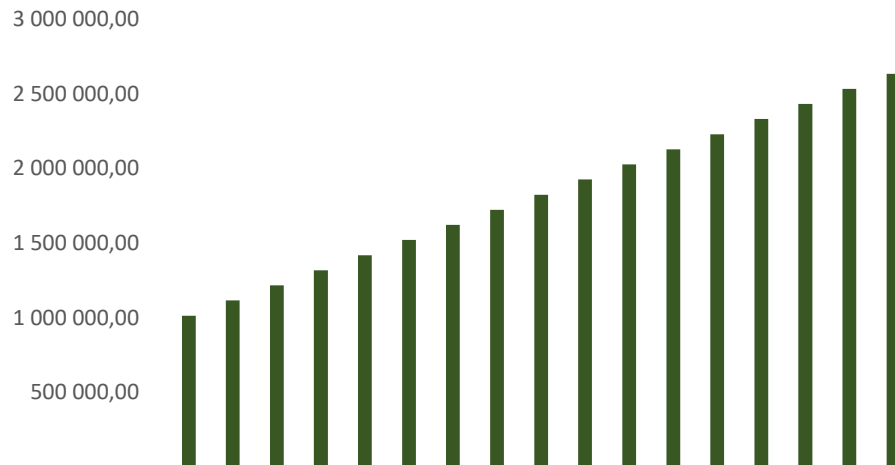
SIMULATION RESULTS FOR GROWING 130,000Ha of CASSAVA

- Cassava being massively consumed. Based on the case studies, the model was run to forecast the impact of increasing the growing land to 130,000 Ha by 2035. It should be noted that, this greening objective was expressed by the government representatives during a meeting with the minister of Environment accompanied by its high staff. The model being a practical decision helping tool, it was run taking into account this development goal. The results were as follows:

CUMULATIVE CO2 EMISSIONS / tCO2



CASSAVA GROWING CAPACITY / TON



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GHG Mitigation forecast / tCO₂

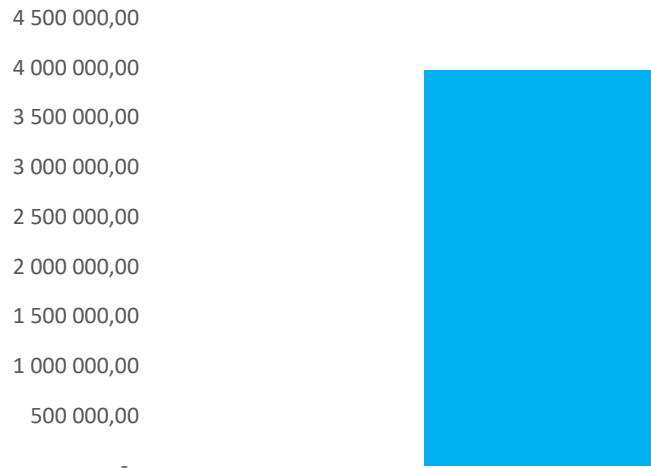


Cost / USD \$

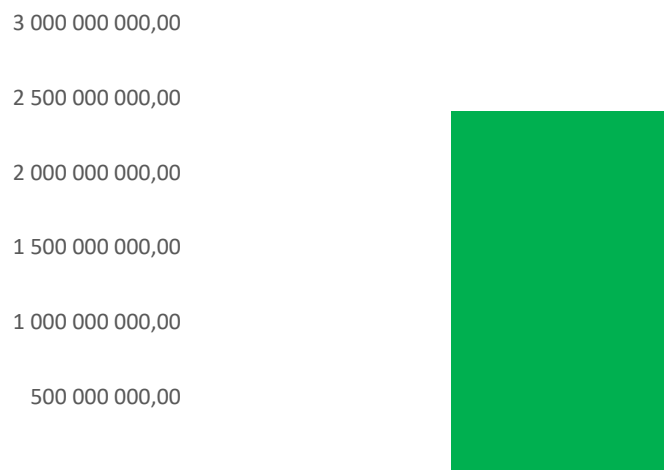


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JOBS



REVENUE / USD \$



SIMULATION RESULTS FOR GREENING THE 130,000Ha THROUGH APICULTURE AND AGROFORESTRY

GHG MITIGATION FORECAST

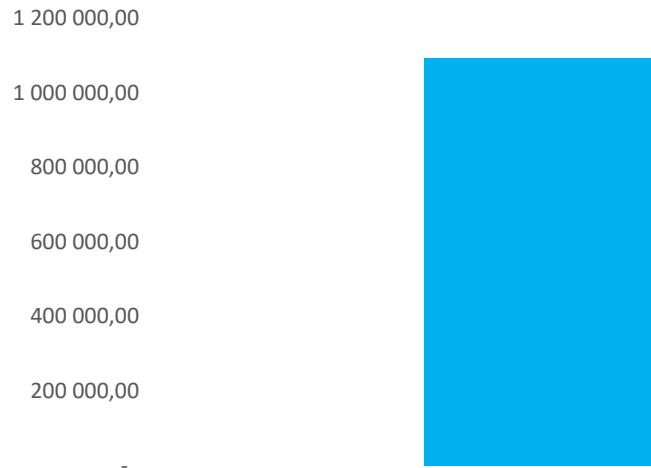


COST /USD \$

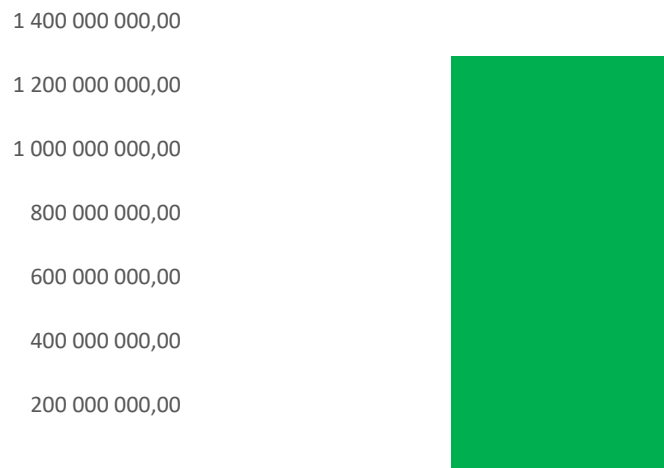


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JOBS

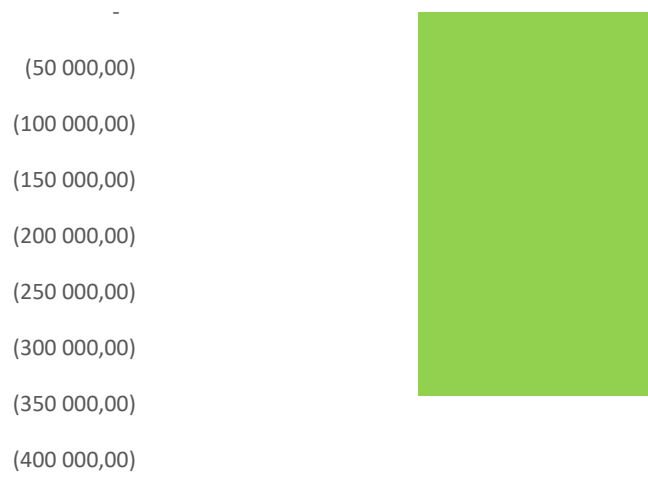


REVENUE /USD \$



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CUMULATIVE CO2 EMISSIONS / tCO2



SIMULATION RESULTS FOR THE PROCESSING OF THE 130,000Ha of CASSAVA INTO FLOUR

CUMULATIVE CO2 EMISSIONS / tCO2



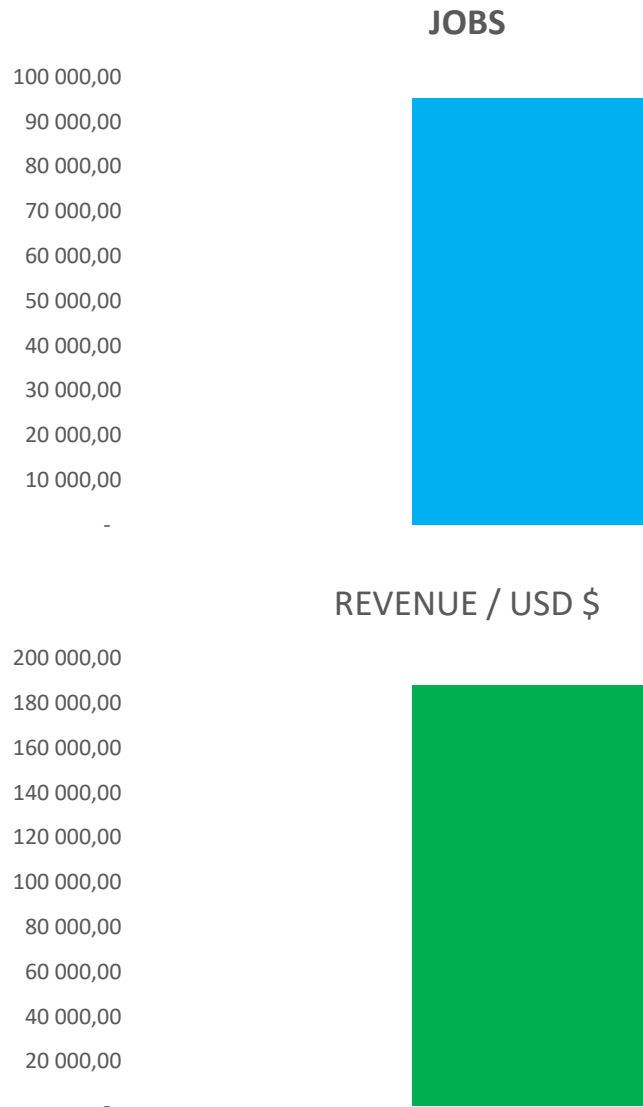
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GHG Mitigation forecast / tCO₂



COST / USD \$





SIMULATION RESULTS FOR GREENING MARKETING STRATEGY AND ACTIONS THROUGH AFROSHOP

The final run of the model was to determine the impacts of linking the different actors of the agrovalue chain through Afroshop would have.

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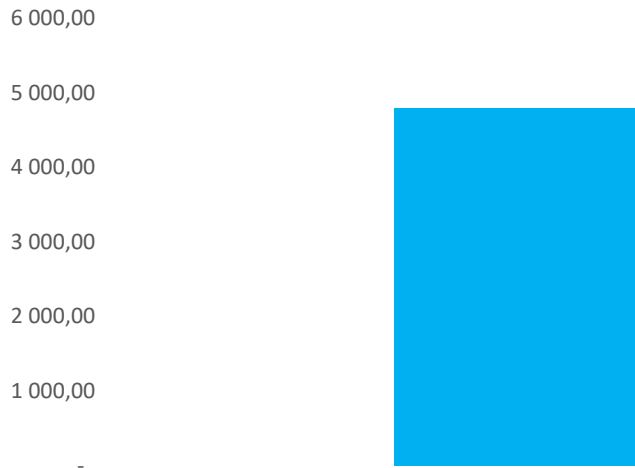
CUMULATIVE CO2 EMISSIONS / tCO2



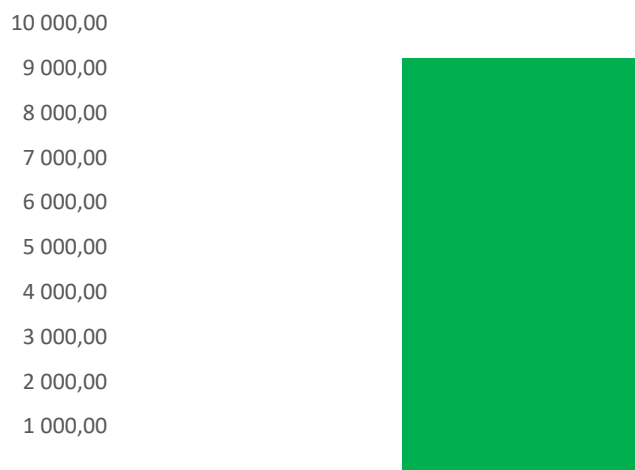
GHG Mitigation forecast



JOBS



REVENUE / USD \$



BALANCE SHEET

The above runs of the model demonstrated the impact of growing and greening the agro-value chain of 130,000Ha of Cassava. The model determined that in order to achieve this growing area, an investment of USD \$2.3 billions were needed. This investment would channel 1.7 Mt CO₂, create 5.2 million jobs with USD \$3.7 billions revenue. This represents a 2.3% mitigation of Cameroon's GHG emissions. The thus model showed that, implementing LEDS in greening the agro-value chains of other agricultural products (cocoa, maize, etc.), Cameroun could implement her 32% mitigation objective.

iii) INTERAGENCY POLICY TASKFORCES

Aims is to show how results of component 1 - the ground actions (through the case studies) and component 2 (through the models) are being integrated across sectors / inter-ministerial departments to inform investment policy decisions.

a) Inter-ministerial policy task force.

The aim is for this policy team to integrate both the case study results and the models into policy decision making structure across government. The results of the model & the component 1 case studies will be handed over to a team of policy makers drawn from a minimum of the following line ministries: environment, agriculture, and energy. This will be expanded when necessary to include transport, trade / industry; The case study will directly be supervised by the corresponding Task Force sectorial representative whom one of the charges is to collect and transmit any vital information from the case study to the Task Force for an eventual policy addressing which maximize both climate & socio-economic benefits of NDCs implementation.

b) Model integration into ministerial policy making and processes

The integration of the two components is progressing and gather actors for a better conception and execution of green projects. This is promoting the projects and programs programing better conception and realization since component can directly address policies through Task Force

- When developing or duplicating the same type of projects with different sizes in an identical agro-ecological zone, the parameters used can be considered as proportional, the basic data being the ones of the case study to be duplicated.
- The previous approach defines the new basic project parameters from which Forecast can be easily emitted, enabling the greening project, the corresponding GHG emissions reduction and the socio-economic parameters to be evaluated.
- The methodology above is applicable to each sector.
- The coordination of all those actions are supervised by the Task Force through Reports and periodical meetings.
- The Task Force analysis of regular feedbacks of strength and weakness conduct when necessary, to adjust and harmonize Policy processes.

3- CONCLUSION & WAY FORWARD

The work was conducted successfully in the component 1 and component 2 : the component allowed the identification of sites in different agroecological zones of the Country and the description of their characteristics, notably the characteristics of the pilot project , describing the development of local product value chain; From this , a project was identified, sized and provided activity data for the product generation, processing and commercialization. At the end, it was possible to make available all the specifications encountered along the development of the whole value chain; The pilot project is so a reference project which can be scaled up proportionally in the same agroecological zone; This reference is defined through the constitution of the programming a data base or activity Matrix which will supply the conception, the sizing and the programming of projects and programs in the component 2.

In the component 2, the projects and programs sizing derive from the reference project of component 1 which is here scaled up.

In the forecast actions, to predict level of GHG emissions, the component 2 is based on data of component 1; The innovation is that, the Model in component 2, while predicting the level of GHG emissions reduction, can characterize at the same time the impacts of projects /programs developed such as new green jobs created; The close connexion between the component 1 and component 2 facilitate the sizing and the implementation of greening projects and program according to the capacity of the Government or the Decision makers at local and national levels, including private sector and civil society.

It will then be easy to develop efficient and affordable green projects/programs of benefit to the country in driving both NDCs implementation and the socioeconomic priorities – food security, income & job opportunities, creation of enterprises – and cumulatively drive realisation of the Sustainable Development Goals (SDGs). When green projects are developed easily all those options are easily fulfilled; this is developed under the supervision of the Task Force which has the capacity of regulation , through informing policy decisions and working with sectorials

The functionality of the model at its current level of evolution, for a GHG emissions reduction target set at a given time horizon and for a selected sector, makes it possible to evaluate in a short time frame:

- The dimensioning of the green project(s) to be developed in the sector
- The identification and sizing of the green technologies to be implemented and the practical calculation of the corresponding level of GHG reduction
- The costs of the project(s) to be developed (impact on GDP)
- The number of green jobs created for the implementation of the identified projects (impact on employment)

This functionality currently applies to priority sectors based on the availability of reliable and actual data, but will gradually be extended to other new sectors...

Cameroon now has a reliable model to be improved to translate its CDN into projects/programmes, defining the respective levels of GHG emission reductions at objectively scheduled horizons, and the impacts of the selected green projects/programmes on Costs, GDP and employment

.The Model, when totally functional will be very helpful for the Country through many ways:

- Accuracy of the forecast

The accuracy of the forecast will help for a better sizing of greening projects and their socio-economic impacts, leading to a better NDCs implementation

- Better greening projects sizing and impacts

The better sizing of greening projects taking into account the socio-economic worries, will be a tremendous tool to evaluate and implement activities, solving by such the local and national development priorities among which food security, income & job opportunities, creation of enterprises

- Greening projects and global impacts.

The implementation of the NDCs through greening and digitalizing projects in the selected sectors and their socio-economic impacts lead to the country Economy clean development and cumulatively drive realisation of the Sustainable Development Goals (SDGs) through most of its 17 main topics:

1. Zero Hunger,
2. Clean Water and Sanitation,
3. Affordable and Clean Energy,
4. Decent Work and Economic Growth,
5. Sustainable Cities and Communities,
6. Responsible Consumption and Production,
7. Climate Action,
8. Partnerships for the Goals.

All the points quoted above when relate to the Cameroon LEDS selected sectors are tackled along the setting up of the project on the GHG emissions reduction aspects and the socio-economic aspects. The LEDS project does not modify, but ameliorate the socio-economic development plan notably through GHG emissions reduction, but also in many cases through socio economic indicators and impacts improvement.

4- ANNEX:

Annex1- list of team members – component 1 team, component 2 modelling team & policy taskforce team

COMPONENT 2: Modeling team

Equipe de modelisation

📍 Mise en place de l'équipe de modélisation



Mise en place de l'équipe de modélisation avec les experts des Universités de Yaoundé 1 et de Dschang ainsi que de L'ONACC, de l'INC et du secteur privé.



4.1. Project Team

- Administrative team

Organization: Name	Availability	Comment
ADEID: Takam Michel	Part time	30H /Week, 300 days
Patrick Chuong	Part time	30H/Week, 250 days

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Organization: Name	Availability	Comment
ADEID: Euloge Feussi	Part time	15H/Week, 100 days
ADEID: Carole Mboubé	Part time	20H/Week, 200 days

- **Expert General technical secretariat component 1 & 2:**
Nguesseu André (general technical secretariat in charge of monitoring and reporting)
- **Expertises Component 1:**
 - Entreprise TKS WIFT (Tsafack Cedrick, Nelino Tami, Tsamo Ulrich), in charge of Afroshop development;
 - Entreprise PWC (Tapbodastephane, Toukap Paulin, Tonsie pierre), in charge of the architectural design of site models by agro-ecological zone.
 - Phillipe Edy mingo (Ingénieur Agronome), in charge of agricultural training and techniques and agri-food technologies; business plan.

4.2. MINEPDED LEDS Modelling Team

- M. Wagnoun Valentin (IGs MINEPDED) – Point focal CC
- KAGONBE Timothée, Point Focal CDN Cameroun, MINEPDED
- Elanga Boris /MINEPDED : Adjoint/ Secrétariat
- Mme Kaano Gisèle / MINEPDED : Membre /Secrétariat

CAMEROON LEDS-AFRICA PROJECT MODELLING TEAM

N°	First & Last names	Organisation & Role	Team
01	WAGNOUN Valentin	I1/MINEPDED (PF CCNUCC)	Coordination
02	AMOUGOU Joseph Armathé	Directeur ONACC	
03	KAGONBE Timothée	SDMESC/MINEPDED (Coord Nat CDN)	
04	TAKAM Michel	Secrétaire exécutif ADEID	Facilitateur
05	HAMAN UNUSA	SDPE/MINEPDED	Secrétariat technique
06	FORGHAB Patrick MBOMBA	Directeur Adjoint ONACC (coordonnateur du Secrétariat Technique)	
07	NGUESSEU André	Consultant ADEID	
08	ELANGA Boris	CA/IG/MINEPDED (assistant Projet)	
09	KAANO Gisèle	CA/IG/MINEPDED (assistante Projet)	
10	BIKONO Pascal Freddy	Stagiaire ONACC	
11	EMBOLO AHANDA B. Xavier	Stagiaire ONACC	
12	TSAMO Ulrich	Dr / TKS WIFT	
13	MESSOMO ONANA Yvana	TKSwift	

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AFRICA-LEDS**

14	Josias TAMI	Dr-Adjoint/TKSWIFT	
15	Prof. MBALLA Fabien	Enseignant Ydé-1	Modélisation
16	BATHA Romain Armand	Doctorant/Ydé 1/ONACC	
17	Prof. NGONGO Isidore	Enseignant/ENS-Ydé 1	
18	KOUMBE MBOCK	Doctorant	
19	Dr. YEPDO DJOMOU Zéphirin	LRCC/INC/MINRESI	
20	Djoro Emmanuel	MINADER	Agriculture
21	Dr. NJILA Roger	Enseignant/univ de Dschang	
22	Dr. AMBANG Zachée	Enseignant/univ ydé 1	
23	Plong Yannik	PNDP	
24	Edimengo Phillipe	Directeur Cooperative SOCOOPROMAN	Forêt
25	NANGMO Yves Nestor	CA/DECP/MINFOF	
26	CHOULA Fridolin	Consultant	
27	BEMBONG Lucas	Doctorant Univ Ydé1/ ONACC	
28	Biteb Stephan	TKSwift	
29	NZANFACK Félix	Enseignant/univ ydé 1	Transport et énergie
30	NANA DJOMO Jules	CEA/CES/MINT	
31	BANGDANG Yolande J.	CEA/MINEE	
32	Prof. MEUKAM Pierre	Enseignant ENS Polytechnique – Ydé 1	
33	Blaise BIGNOM	Expert	
34	PIEDJOU Loïc	TKSwift	
35	TSAFACK Cedrick	TKSwift	
36	NDONFACK Romain	MINT	
37	Prof. TSALEFAK Maurice	Enseignant chercheur/univ de Dschang	Personne ressource

43- Annex2 Photos

44- Annexe3 Expenditure Report