

# Support to the implementation of an integrated Water-Energy-Livestock project for the Dairy Value Chain in the municipalities of Petté and Wina in North Cameroon. Inception Report.

UNIDO

Climate Technology Center Network (CTCN)

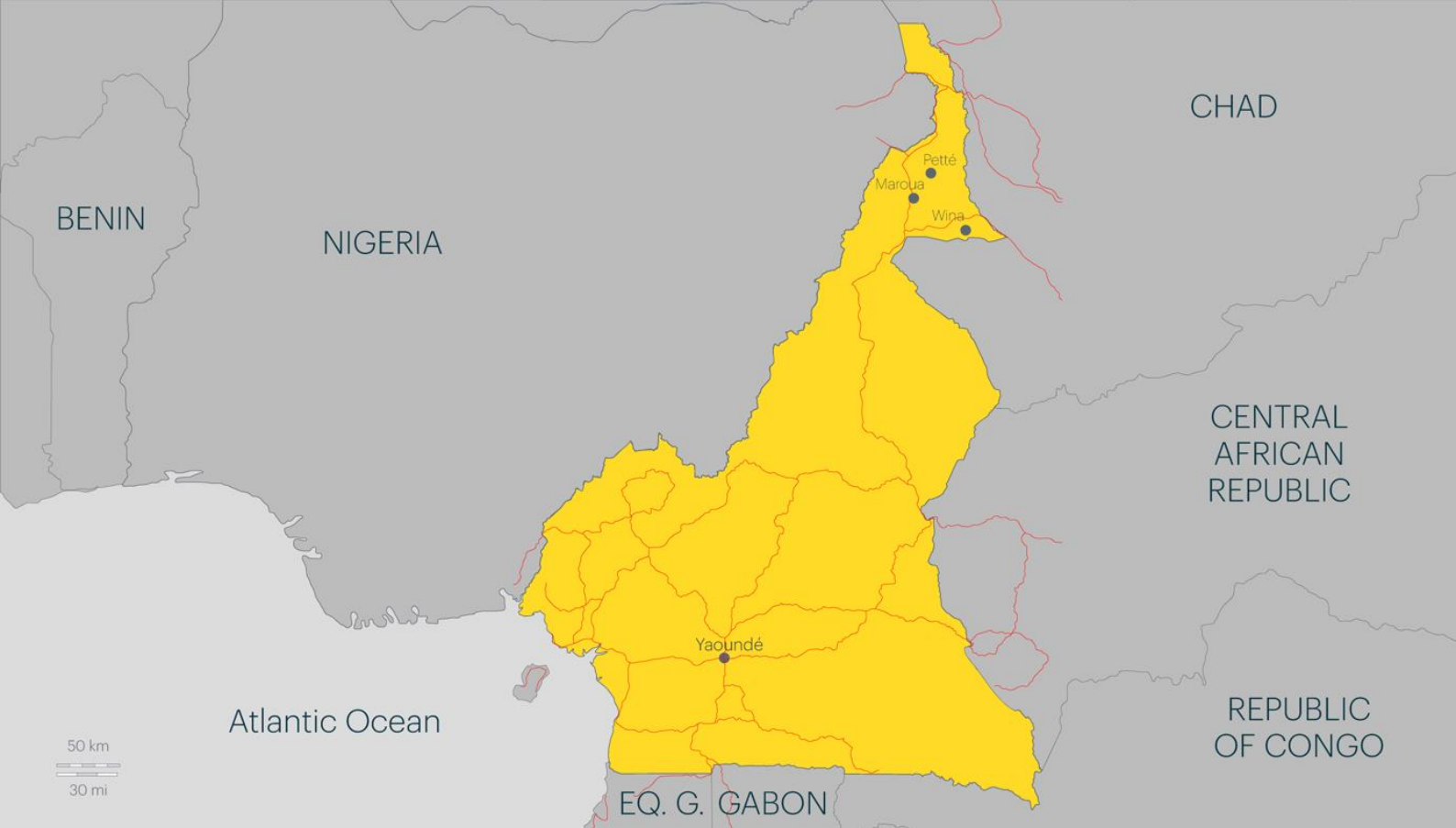
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# Chapter 1. Inception Component.



## 1. Introduction

In June 2015 Cameroon validated the Plan National d'Adaptation aux Changements Climatiques du Cameroun (PNACC) which includes, inter alia, an assessment of climate change in each of the five agro-ecological zones, an assessment of the sensitivity, vulnerability and sectoral and geographic resilience, a 2016-2025 intervention strategy, an assessment of losses, risks and gaps, and a five-year action plan for 2016-2020 broken down into 20 detailed project files.

The PNACC's vision is that by 2035, "Climate change is fully integrated in Cameroon's five agro-ecological zones and the country's sustainable development, thus reducing its vulnerability, and even turning the climate change problem into a development solution / opportunity. Thus, Cameroonians - especially women, children and vulnerable people - and the country's economic sectors are gaining greater resilience and greater capacity to adapt to the negative impacts of climate change.

One of the five agro-ecological zones is the Sudano-sahelian, located in the North of the country. The Far North region of the Republic of Cameroon have a strong similarity with the other Sahel countries, where lack of economic growth, environmental degradation and instability are the main features. In order to combat this regional challenges, the United Nations launched in 2018 the UN Support Plan for the Sahel (2018-2030) to promote sustainable peace and inclusive growth in the region, through the pursuing of the following main priorities:

1. Promoting cross-border cooperation for stability and development
2. Preventing and resolving conflicts; violent extremism and crime; and promoting access to justice and human rights
3. Promoting inclusive and equitable growth and increasing access to basic quality services
4. Building **resilience to climate change, and decreasing natural resource scarcity, malnutrition and food insecurity**
5. **Promoting access to renewable energy**
6. Empowering women and youth for peace and development in the Sahel

Taking into account the importance of technology and development in the climate change field, the UN created the Climate Technology Centre and Network (CTCN) through the UNFCCC Technology Mechanism. The CTCN has the

goal of promoting accelerated deployment and transfer of climate technologies to developing countries, for the purpose of energy efficient, low carbon and climate-resilient development. The CTCN provides this services through the Technical Assistances (TA) requested by the National Designated Entities (NDE) of the respective countries.

Within this context, in 2018, the CTCN in collaboration with the United Nations Industrial Development Organization (UNIDO) accepted a Technical Assistance requested by the national NDE based on the appeal made by the organization Help Community, to implement an integrated project in Water, Energy and Livestock for the dairy value chain in the Far-North Province of Cameroon.

Despite having the suitable geographic features and the possibility of being consolidated as a main economic sector, the dairy value chain in Northern Cameroon is decimated due to several climatic, social, energy and contextual particularities. Taking into account the goals of the UN Support Plan for the Sahel mentioned above, and the particularities that hold local development, the CTCN is proposing the development of an integrated plan that will consolidate and strengthen the dairy sector of the region through the use of green technologies, such as solar panels. Taking into account the isolation of Pette and Wina communes, solar energy presents as a suitable tool which can deliver the desired electric autonomy and bring the capacity to operate the whole dairy sector (specially storage and manufacturing) with the suitable conditions.

## 2. Situational Analysis

### 2.1. The Dairy Sector in the Sudano-Sahelian Region.

Cameroon, despite having agriculture and animal husbandry as leading sectors in its economy, is one of the countries in the world where the production and consumption of **milk per capita is the lowest**. Milk is only collected to a very limited extent, as it is estimated that milk production represents only 45% of its potential production. Moreover, due to low yields and the isolation of the main production basins, Cameroon has an average production deficit of more than 170,000 tons of milk per year.

Livestock in Cameroon has the potential to contribute significantly to economic growth, which should help to reduce food insecurity, malnutrition and unemployment. Moving from a predominantly subsistence-oriented livestock sector to more commercial practices offer opportunities to better integrate livestock farmers into the value chains. This will require, among other things, improved species, grading, storage, auction sales, popularize, verbalization of information on prices, transport and logistics services.

Despite the country's obvious potential for the development of the livestock sub-sector, a series of constraints have led to low productivity and production among subsistence livestock farmers in Cameroon. Going by the directives of the 2009 Livestock and the 2012 Pastoral Survey, the following constraints among others affect all value chain

- ▲ Poor education of farmers;
- ▲ Health constraints (prevalence of parasites and infectious diseases affecting 70% of livestock);
- ▲ The low productivity of local species;
- ▲ Poor quality advisory services;
- ▲ Limited access to rural credit/financing and limited access to processing and marketing infrastructure that could maximize added value for livestock farmers.

In addition, following constraints can also be mentioned:

- ▲ Climate change, with negative effects on water and vegetation notably, affects the dairy production
- ▲ Lack of energy. Petté has a limited access to energy and Wina is completely off grid. This situation reduces the storage capacity of the existing production and limits the industrialization of the dairy sector
- ▲ Road network: Both municipalities have poor roads and cannot facilitate the transportation of the dairy production

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#### BOX 1. What is the relationship between milk and climate

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According to a FAO report, between 2005 and 2015, GHG emissions derived from the dairy sector increased by 18 percent. Despite numbers grew, it was also observed that efficiency focused actions were taken in several countries in order to decrease GHG emissions. Nevertheless, the application of that efficiency measures varied according to the region. South Asia, Sub-Saharan Africa, West Asia and North Africa were the regions with higher emission intensities. As this variation evidenced differences in development among regions, it also proved that this problem has a solution which resides in efficiency.

For reducing GHG emissions, the FAO panel proposed the following pathways:

- ▲ Improving efficiencies.
- ▲ Capturing and sequestering carbon.
- ▲ Better linking dairy production to the circular bio-economy.

Nevertheless, the mitigation potential is limited by biological processes which assure that emission will always be generated. Therefore, for these purposes several measures need to be taken in the different stages of dairy production for not just mitigating but also compensating. These solutions go from enhancing carbon capture and storage in soils through improved grass to promoting circular economy opportunities. Furthermore, technologies can be highly useful in different moments of the process and also increase efficiency and reduce GHG emissions.

The increase in efficiency not just affects GHG emissions but also total production, in a way that it correlates food security, development objectives and climate change adaptation and mitigation goals.

Source: <http://www.fao.org/3/CA2929EN/ca2929en.pdf>

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## 2.2. The Sudano-Sahelian Region.

Livestock constitutes an important component of all agricultural production system in the Sudano Sahelian region for farmers. Livestock serves as a cash generator for seasonal requirements of agricultural activity. Pastoralism and mixed-crop livestock farming are two extremes along a continuum of livestock production systems found in the region.

Pastoral production in the southern sub-zone function on the basis of periodic movement in search of natural pastures and water, but production strategies often change in accordance with perception of external condition which may result in occasional journeys of short duration or seasonal transhumance lasting several months<sup>1</sup>. During the rainy season, the most productive strategy is to move animals into the drier areas of arid zone to take advantage of the flush of high-quality forage produced by annual grasses. During the dry season, pastoralists attempt to access enough water, crop residue and natural forages to maintain the productive capacity of their herds (Sandford, 1982). Within each season they take advantage of the patches of pasture that produce more forage either due to higher soil moisture or fertility<sup>2</sup>. This traditional transhumant production system appears to be in a state of transition and is becoming increasingly difficult to sustain. The problem is not simply of too many animals relative to available grazing areas. Long periods of below average rainfall, recurrent severe droughts and sanitary problems, have decreased pastoralists' herds. In addition, in many parts of the region, farmers have taken over the best grazing lands and converted them into cropland. This process has been accompanied by the increasing cultivation of valley bottoms, which has restricted pastoralists movement and prevented them from using these areas as migration routes or pasture during the dry season. This phenomenon is common in all semi-arid region of West Africa. The net effect has been a reduction in total pasture area and seasonal inaccessibility to remaining pastures due to diminution caused by cropping. Due to low pasture availability in most of the zone, there is usually a great demand for animal feed, especially during the dry season. Crop residues are the principal source for this, so that in addition to grain, stover also may bring in cash.

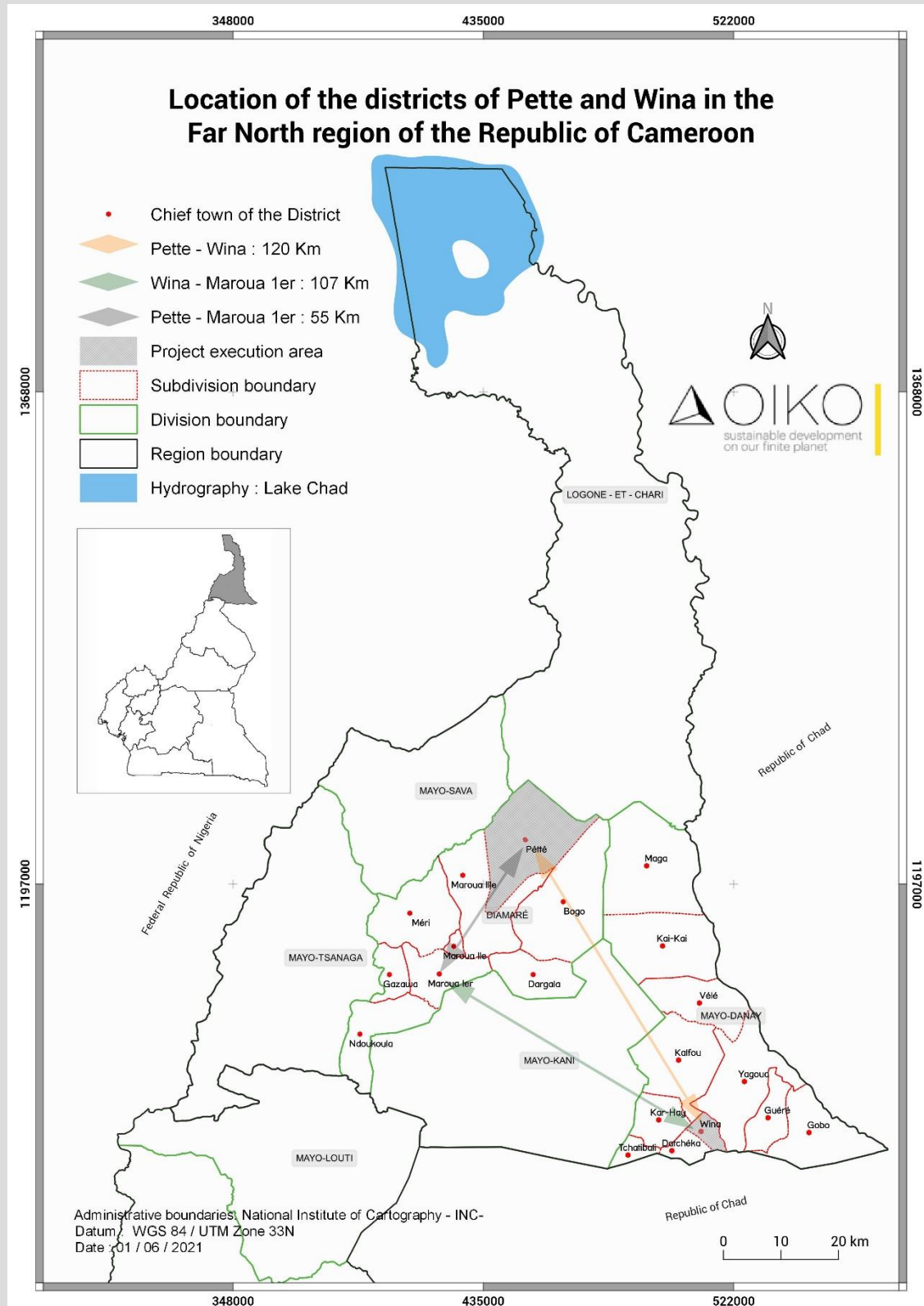
Farmers-herds conflicts increase as access paths to local (transhumance) pastures are obstructed. Mixed crop-livestock production systems in the Northern sub-zone are growing in importance as population pressure rises and demand for arable land increases. Farmers look for alternatives to fallow to maintain soil fertility as extensive techniques of soil fertility maintenance become inadequate to meet crop production demand. Farmers prepare their manure in the compounds on the basis of droppings from ruminants and crop residues. Because the quantity of manure produced by farmers is usually insufficient to cover the whole farm in any given years, it is only applied to specific spots in the field, with each field receiving manure in average every two to three years. There is, however, evidence, which indicates that irrespective of the extent of integration of crop and livestock production, many of the direct benefits of closer integration are small<sup>3</sup>. The notable benefits in improved soil quality and fertility, as result of manuring and the use of animal traction may not always result in large increases in crop yields due to low output response of available crop varieties and the inadequate quantities of manure applied. This may imply that along with closer crop-livestock interactions, new technologies development involving breeding adapted high yielding varieties, and improvement in feed production are needed to raise overall agricultural productivity.

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<sup>1</sup> Swift, 1977; Horowitz, 1983

<sup>2</sup> Scoones, 1984)

<sup>3</sup> Sandford, 1989, McIntire et al., 1992



Source: Map produced by Maxime Kamden based on National Institute of Cartography data.

### Dairy Products consumed in the region

- Fresh milk (*mbiradam* in fulfulde) consumed in restaurants as a hot beverage.
- Whole curdled milk (*kindirmou* in fulfulde) consumed in some milk bars but mostly bought from itinerant vendors (Peuhl nomads) in the different markets in the region.

- Curdled milk from which butter has been removed (*lammoudam* or *pendidam*) bought from producers and especially from nomads, used to prepare porridge (it serves essentially as an ingredient for the preparation of porridge)
- Butter (*leebol* in *fulfuldé*) taken from milk, used for a variety of ends. Rub oneself, ingest to combat some gastric ailments, etc.
- Yoghurt (*kossam*) (several forms): Up there, yoghurts are transformed by a local unit and they are sold at the price of 500F for each (0,33l) bottle, 1000F (0,5l) and 2500F for the 1,5l bottle.
- Cheese (several forms).

**Table 1:** Dairy Processing Stations in the communes, regional and national level

City of Maroua	Commune of Pette	Far-North Region	National level
Sotralait	Yaourt de Pette	Sotralait	Dolait
Gic Kawtal		Gic Kawtal	Camlait
Draka Ndouwoul		Draka Ndouwoul	Nestle
Scoops Agrele		Yaourts de Pette	
		Scoops Agrele	

### 2.3. The *Plan Communal de Développement* (PCD) in Petté and the implications in the dairy sector.

The communal development plan for the commune of Pette presents as major assets the extent of its pasture, the existence of cattle making it possible to create the dairy industry. However, the impassability of the roads in the rainy season is a fundamental limit to the realization of development actions in this municipality. To improve household income and create more wealth, **the communal development plan aims** to achieve two specific objectives: **improve the productivity of livestock** in the commune and **improve the marketing of livestock** products. For this some activities are planned. The construction of artificial ponds, tiquor baths, development of cattle tracks, slaughterhouses, pastoral boreholes, construction of a cold room for the conservation of milk, capacity building of breeders through training in various fields, etc. . at a total cost of 1,475,450,000 (one billion four hundred and seventy-five million four hundred and fifty thousand CFA francs). The activities directly linked to the milk value chain concern training activities, the rehabilitation of cattle tracks for transhumant, activities linked to the feeding of cattle and especially the construction of a cold room for the conservation of milk. However, the communal development plan remains silent on the way in which the works will be financed and given the internal capacity to mobilize own resources, it would be utopian to think that these activities could be financed without external support. This is an opportunity for the dairy value chain project to be able to support the municipality of Petté in achieving their objective of improving productivity and the marketing of livestock products, including dairy products.

### 2.4. The *Plan Communal de Développement* (PCD) in Wina and the implications in the dairy sector.

The commune of Wina was created in 1983, the commune of Wina is located in the department of Mayo-Danay, Arrondissement of Wina. It is limited:

- to the north by the commune of Yagoua,
- to the south respectively by the municipality of Datcheka and neighboring Chad
- to the east by the town of Guéré
- in the west by the municipalities of Datcheka and Kar-Hay respectively.

This municipality has enormous economic potential, of which **breeding is a very important sector**. However, it is practiced in a traditional way. According to the Communal Development Plan, it turns out that women and young

people are more inclined to breed small ruminants and poultry, while men in most cases breed large ruminants. It has been recorded that there are more than 5000 head of cattle. The existence of natural pastures in the dry season is a very good opportunity for the development of livestock in the town and also attracts a good number of transhumants. On the other hand, milk production is not explicitly indicated in the document. Also among the existing economic activities in the municipal area no milk processing unit has been mentioned. This shows that this sector is not yet very developed.

This communal development plan lists a number of priorities needs in the breeding and processing sector among these needs we have the capacity building of breeders in the conduct and processing of livestock products, the opening product collection leads. Nevertheless, among the identified targets we cannot find any specific mention concerning the milk value chain apart from activities related to the demarcation of livestock tracks and pasture areas.

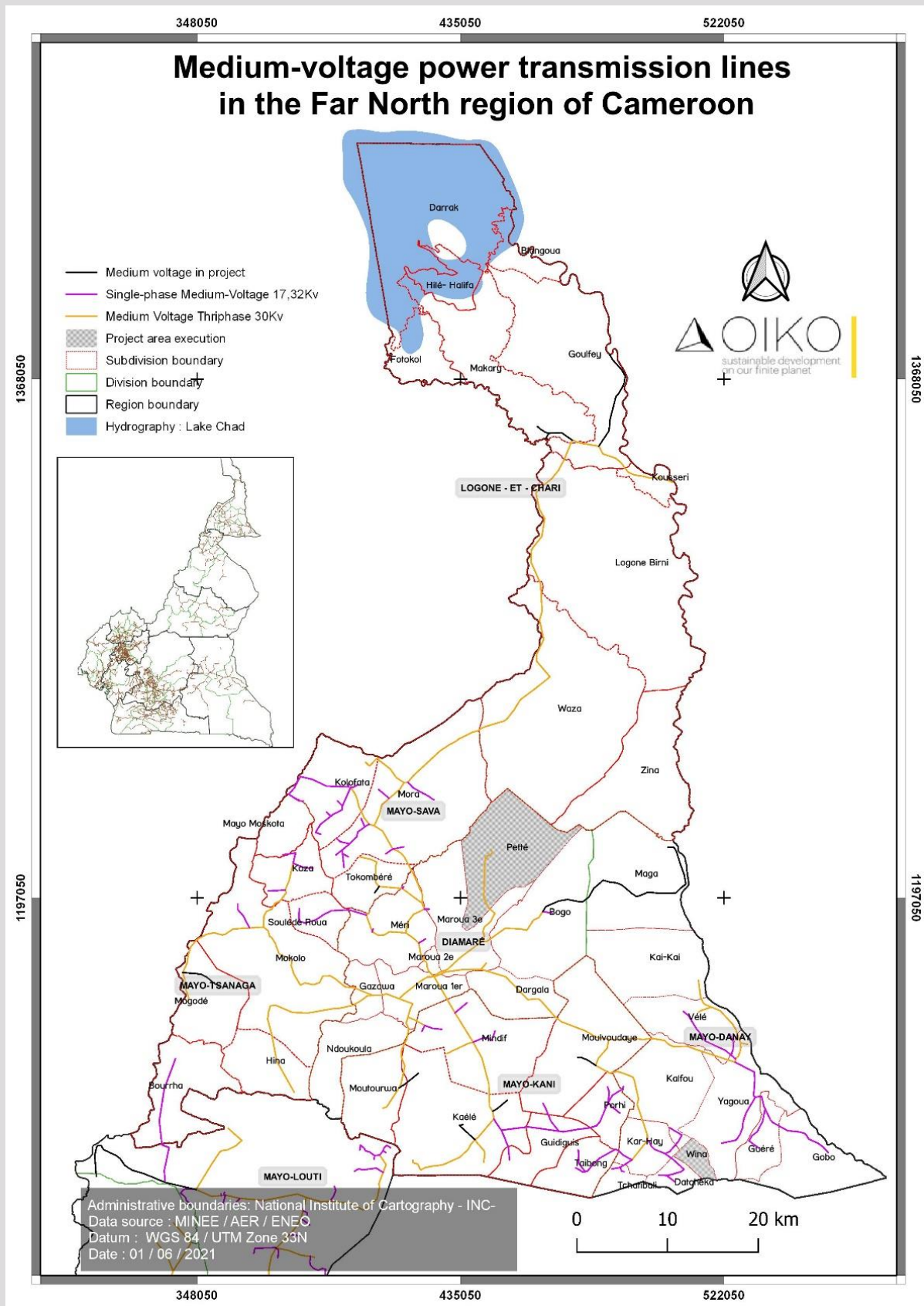
## 2.5. Transport network in the region.

The transport sector, in general, is divided into four main mediums including road, rail, air and sea. In the Far North, road transport is the main medium of movement of goods and people. Travel in urban and peri-urban areas in the agglomerations of Maroua is provided by the informal sector, small operators driving motorcycle taxis, tricycles, bicycles, rickshaws as well as walking. The movement of people in the city is usually done by private cars and motorcycle taxis. The market, which is the meeting place for suppliers and seekers of goods, is populated at the entrance by taximen who transport people and goods. The costs associated with road transport in Maroua remain lower and accessible to the most disadvantaged groups. Urban mobility in Maroua encounters a number of constraints linked to insufficient routine road maintenance. Road transport therefore suffers from a maintenance deficit of urban roads. It should also be noted that young people in certain neighborhoods hire bicycles to learn driving, leisure or go about their business. The emergence of the motorcycle taxi phenomenon will therefore coincide with the increase in insecurity. Alongside traffic accidents, banditry is experiencing a meteoric rise. The evolution of the motorcycle taxi business in the Far North Region places motorcycle drivers at the center of urban and even rural insecurity.

Alongside this means of transport we also observe the emergence of another means of moving people and goods from my countryside to the city and vice versa, especially on weekly market days. People and goods often move to the market with the carts carrying agricultural products to sell in the city and also bringing back to the village food and products bought at the city market. This is the cart which is a means of transport consisting of a platform and two wheels which allow a man, one or two horses or oxen to pull it. Known since antiquity, the cart is a means of transporting hay, dead wood, crops of fruits or vegetables. This means of transport is also intended for moving or relocating a household with their household equipment (illustration: figures below).

Furthermore, if one examines the maps found below, it can be seen how roads are scarce. This makes difficult the movement of people, and in a larger extent the movement of goods, consequently hampering economic development in the region. Furthermore, the scarcity of proper roads makes movement almost impossible during the rainy season. Thus, the approach to the development of the dairy sector, also, must concentrate in the transport possibilities of the dairy products.

## 2.6. Overview of the electricity network in the region.



In Cameroon, around 63 % of households have access to electricity (National Institute of Statistics, 2019). Table 2 presents the electrification rate by region.

**Table 2:** Electrification rate of connected localities (Ministry of Energy and Water Resources, 2015).

Regions	Years				
	2015	2020	2025	2030	2035
Adamawa	30%	35%	40%	45%	50%
Centre	37%	44%	51%	58%	65%
East	22%	27%	31%	36%	40%
Far-North	13%	20%	27%	33%	40%
Littoral	46%	52%	58%	64%	70%
North	15%	22%	30%	37%	45%
North-west	26%	29%	33%	36%	40%
West	48%	52%	57%	61%	65%
South	34%	39%	44%	50%	55%
South-west	33%	39%	44%	50%	55%

As one can see in the Table 2, poor energy supply is clearly evident in the Far North Region where the electricity coverage stands at a meagre 22 % (Ministry of Energy and Water Resources, 2020). Even households that have access to energy face frequent cuts due to the insufficient production, and thus rationing of electricity by ENEO, the company currently managing energy distribution in Cameroon. In fact, the North, Far-north and Adamawa regions are supplied by the Lagdo electric dam with an installed capacity of 72 MW and available power of less than 60 MW

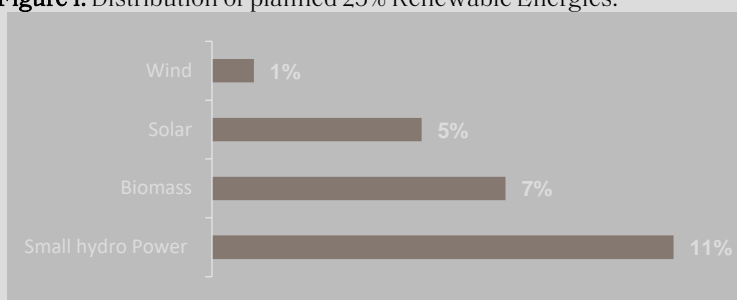
Consequently, if one observes the Table 2 and the map above, with the corresponding power transmission lines, we can realize how the provinces where we have to conduct the project are isolated and disconnected from the national power system. Petté only has one medium-voltage power transmission line, meanwhile Wina is completely isolated. Taking into account that the Dairy value chain needs a constant power supply in order to work effectively, alternative energy sources will need to be explored and developed in the region in order to carry out our entrusted task.

## 2.7. Renewable Energy Sector.

An assessment carried out in Cameroon in 2012 (Global village Cameroon) highlighted the existence of significant potential in renewable energies, as well as concrete possibilities of development and use of these forms of energy notably solar energy and biomass, although their contribution to national energy balance is still very marginal. This is why the Cameroonian authorities intend to focus their action in the sector of energy on the promotion of the use of renewable energies as stipulated in the Growth and Employment Strategy Paper (GESP) 2010-2020 (page 60). This commitment has led to the creation of a separate Department dedicated to the promotion of renewable energy within the Ministry of water and energy resources (Prime ministerial decree N°2012 /501 of 7th November 2012). **This situation could be beneficial for Wina and Petté.**

The Government of Cameroon has adopted its National Development Strategy for 2030 (SND30). The availability of energy is presented as an essential factor in achieving the objectives of economic development and livelihood improvement for the population. Knowing the impact of the energy sector on the environment and on climate change, the Government of Cameroon has chosen the path of sustainable development. Thus, at the 21st Conference of the Parties in Paris (COP21), the State of Cameroon pledged to the objective of increasing the share of renewable energies in its energy mix to 25% by 2035, distributed as follows:

**Figure 1.** Distribution of planned 25% Renewable Energies.



Indeed, the current installed electric power is 1,354 MW (Ministry of Water and Energy, 2019), but the country intends to increase this power to 6,000 MW; according to the previous percentages, this includes 660 MW for small-scale hydroelectricity, 420 MW for biomass, 360 MW for solar and 60 MW for wind.

Cameroon has access to abundant renewable resources (Ministry of Water and Energy, 2019). It has the second largest hydroelectric potential in sub-Saharan Africa (most of its administrative subdivisions are named after the watercourses that cross them). Moreover, its geographical location allows it to benefit from abundant sunshine with a stable and constant average irradiation of 4.9 kWh/m<sup>2</sup>. Likewise, 46.3% of its area is covered in forests, suggesting a rich forest biomass. In addition, its cultivated land represents about 4.7 million hectares, or 9.89% of the total area, and more than 90 million reared animals, which augurs a large amount of plant and animal biomass. Its 402 km-long coastline on the shores of the Atlantic Ocean and its highlands (up to 4000 m altitude) bode well for wind power. The presence of a 1,600 km volcanic line crossing Cameroon from its coast to the north (passing through the West, North-West, Adamaoua and North Regions) suggests a geothermal potential.

The solar potential is abundant and available especially in the northern areas. According to the measurements taken on the ground, the average insolation over the whole territory is 4.9 kWh/m<sup>2</sup>/day, with 5.8 kWh/m<sup>2</sup>/day for the northern part and 4.3 kWh/m<sup>2</sup>/day for the southern part of Cameroon. This means a total potential of 2,327 TWh/day (Ministry of Water and Energy, 2019).

The Rural Electrification Master Plan (Plan Directeur d'Électrification Rural /PDER) was presented in 2016, and in it solar energies were mentioned as a potential energy sources which could be installed in isolated areas with sufficient annual sunshine. Nevertheless, they were initially rejected because of:

- Availability limited by climatic conditions and the diurnal and nocturnal conditions of the location
- Limitation of consumption by the system;
- High investment costs; and
- Insufficient yield from the localities retained

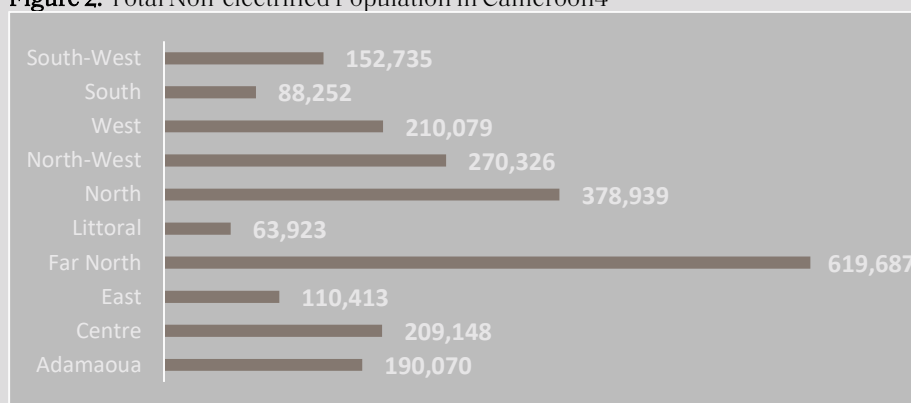
Consequently, off-grid solar solutions were not integrated in the PDER, and for the targets presented up to 2035 prioritization was made on small hydropower and grid extension.

### Energy demand

The total non-electrified population of Cameroon is approximately 5.6 million, its distribution evidences how the Far-North region is the most remote and isolated one, having consistent problem with the energy supply. The distribution of the total non-electrified population in Cameroon is shown in Figure 3

At the same time, despite there still being many populations which are non-electrified, those are located closer to the Cameroonian Main Grid Network. Table 3 illustrate these figures and show how 77% of non-electrified population is located 20 km far from the grid, representing approximately 4.5 million people.

**Figure 2.** Total Non-electrified Population in Cameroon<sup>4</sup>



**Table 3.** Distance of Non-electrified Households and Populations from Main Grid Network in Cameroon<sup>5</sup>

Households and Populations	Buffer 10 Km	Buffer 20 Km	Buffer 30 Km
Non-electrified households	5,918	7,406	8,678
Non-electrified households (percentage remaining to electrify)	60%	76%	88%
Non-electrified population	3,606,809	4,470,699	5,168,997
Non-electrified population (percentage remaining to electrify)	62%	77%	88%

### Brief overview of the renewable energy sector in the far-north region

Despite the significant energy potential in Cameroon, access to energy remains very precarious, especially in rural areas. This precariousness is more accentuated in the Far North Region where the electrification rate is still very low, less than 22%, and where more than 95% of households use firewood and energy-intensive technologies. However, this region is located in an area with a fragile ecology, presenting a socio-economic and environmental vulnerability which increases under the effect of climate variability. The electricity grid remains almost non-existent in many rural areas, and there is a good chance that it will remain so in the near future. It is difficult even for households in urban areas to access clean energy sources because the electricity supply is unreliable. Illumination in rural places in this area is often provided with candles or kerosene lamps. Rarely, generators are used for the better-off households. Flashlights powered by expensive disposable batteries are used as a mobile light source for intermittent use.

In the Far North region, the sectors of renewable energy technologies and energy efficiency that stand out include solar photovoltaic, solar thermal, improved households, biogas, and ecological briquettes. But the overall trend is the dominance of solar photovoltaic. Indeed, this region benefits from the country's most important solar resource. In fact, the number of effective hours of sunshine per year is greater than 2,500 hours, corresponding to an annual solar irradiation in excess of 2,200 kWh/m<sup>2</sup>. This good solar radiation coverage facilitates the implementation of various projects in the field of solar energy in the region.

<sup>4</sup> World Bank Group (2016)

<sup>5</sup> Rural Electrification Master Plan (Plan Directeur d'Électrification Rurale [PDER]), Ministry of Energy and Water Resources, World Bank, 2016, PDF Report

## 2.8. Socio-Economic features of the Far-North Region.

Considered the poorest region in Cameroon, with 74,3%<sup>6</sup> of its population living under the poverty threshold, the Far North region has structural deficits in the economic dimension. The estimation of population is around 5 million inhabitants, with 1.5 million of young people, representing more than or 30% of its population<sup>7</sup>.

Industrialisation there is almost non-existent, and entrepreneurship remains limited to the informal sector. Local economy is based on an extensive agricultural activity, a familiar and informal type of livestock breeding<sup>8</sup>, original handicraft that struggles to establish itself on the international playing field, and a commercial activity mainly enlivened by trade with neighbouring countries: Nigeria and Chad. Because of weak education and professional qualification, youth and women who represent the larger share of informal entrepreneurs do not always fit into defined industry roles.

Ecological and security crises plaguing the region since dozens of years make it hard to formulate any reconstruction and economic development perspective, in particular in the zones going through stabilization affected by the abuses of armed groups<sup>9</sup>. In this context of insecurity, the closing of the borders with Nigeria has devastated the regional economy. The conflict has weakened the local economic and commercial network, impoverishing thousands of traders and generating a severe humanitarian crisis which caused thousands of internal displacements, accentuating this way pressure and competition over insufficiently available natural resources. The access to economic opportunities and to methods of resource control rest mainly on traditional mechanisms which exclude or marginalise women and youth in a fragile agroecological context<sup>10</sup>.

### Gender in the dairy value chain.

The place and the role of women and those of young people in the dairy value chain fit into a global dynamic of the social and cultural cartography of the two municipalities on the background of patriarchal limits and cross-generational gaps. It is important to note that the family and community network plays an important role in the sharing of tasks and roles according to the gender of each member. This familiar and community organisation is very expansive in the Petté and Wina municipalities, as in all African communities protecting the whole familiar and social structure, attributing to each person obligations and responsibilities in the family dimension: conjugal, children, father, mother, parents-in-law... according to clan, ethnicity, religion, and many other traits coming from differential identities. The alliance game is the foundation upon which the members of these different sociological units stand to ensure their economical, ecological, and socio-cultural resilience. However, the place and role of women contribute to the upkeep and adaptability of the mechanisms of this resilience which, from a socioeconomic point of view, remains mainly feminised for the protection of all. Moreover, the education of women remains principally oriented towards the domestic and private sphere preparing them for marriage above all, even if a slight trend towards female entrepreneurship is gradually seen emerging in the Far North. Women are also those who, through their reproductive role, perpetuate the members of the community and, by rebound, renew and regenerate the local workforce. This both increases competition on available resources and creates on both sides a system holding visible cross-generational tensions sticking to more or less exclusive cultural norms and patterns. This general socio-anthropological dynamic leaves an important place to the specific contexts relating to each municipality. In Wina and Petté, the insertion of women and youth in the dairy value chain presents some traits which need to be described through a double approach on opportunities and barriers.

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<sup>6</sup> Institut National de la Statistique (INS), 2015, « 4<sup>e</sup> enquête camerounaise auprès des ménages (ECAM4) : Tendances, profil et déterminants de la pauvreté au Cameroun entre 2001 et 2014.

<sup>7</sup> Projections population cibles, INS 2016.

<sup>8</sup> Avec un cheptel bovin représentant 30% du total national (Fédération des producteurs laitiers de l'Adamaoua), la région de l'Adamaoua connaît une forte activité pastorale qui occupe plus de 20% de la population rurale (ACDIC, 2006, Filière lait au Cameroun). Les régions du Nord, de l'Extrême-Nord et de l'Est regorgent 40% du cheptel national.

<sup>9</sup> Atsuyuki Kado et Isidore Kemawou Fotabong, 2018, Etude des filières économiques et de formation à fort potentiel d'emploi pour les jeunes et les femmes (Extrême-Nord), PNUD Cameroun

<sup>10</sup> Zone Soudano Sahélienne (Régions Nord et Extrême-Nord) ; Zone des hautes savanes guinéennes (Plateau de l'Adamaoua et une partie de la région de l'Est) ; Zone des hauts plateaux de l'Ouest (Régions nord-ouest et Ouest)

### **Specificities of the municipality of Wina**

The principal ethnicities in the municipality are the Toupouri and the Massa. Minority ethnicities such as the Foulbé (Peuhls), the Kera, the Kokoto, and the Mousey can be counted. The common point facilitating the installation of these people, is the availability of lowlands with agropastoral potential and closeness to the Logone river.

The traditional social organisation is based on socio-political entities, more or less hierarchical, with dynamical cross-ethnic relations and stable social structures. Case in point, the larger share of the population is rural, but the actual trend sees a quick expansion of a lifestyle that is increasingly more open to foreign cultural influences. This trend poses a serious menace towards natural resources, with respect to supply and anthropic pressure on existing potential. Local economy rests on the exploitation of local opportunities such as agriculture, livestock, fishing and the exploitation of plant and animal resources. Populations practice small domestic husbandry in rural zones and large cattle breeding in grazing areas. In general, livestock activity depends on sex and age<sup>11</sup>. There are the men who raise swine, goats, cattle and poultry (chicken, ducks, guinea fowl); women raise more swine, goats and poultry (chicken, ducks, guinea fowl) while young people devote themselves to raising swine, goats and chicken as well. In the light of these information derived from the Municipal Development Plan (PCD), it is clear that in Wina men, women and youth have socio-professional orientations directed principally towards the agropastoral sector with an internal division among the sectors of activity.

### **Specificities of the municipality of Petté**

The municipality of Petté includes 116 villages<sup>12</sup>. The urban population represents 12,178 inhabitants: 6,178 male and 6,000 female. In rural areas, the total population is 43,522: 21,913 male and 21,609 female. Young people in the 15 to 34 years old bracket constitutes 34.7% of the total municipal population<sup>13</sup>.

The biophysical context of Petté has among its main strong suits the availability of exploitable land for agricultural development, extensive space for grazing, and its closeness to the city of Maroua, the regional capital of Extreme North (60 Km). With a population made up for its majority of Peuhls and Kanuri, explaining the tendency towards livestock husbandry, agriculture and commerce as a cultural aspect, the municipality remains a historical stronghold of cattle breeding and dairy production. The municipality then offers several opportunities, like the presence of cattle allowing the creation of dairy industries; the existence of yaérés allowing the promotion of small-scale market gardening and large-scale livestock breeding.

### **Women and Young people in the dairy value chain in the two municipalities**

The desk review does not mention the studies conducted on the role and place of women and young people in the dairy value chain in the municipalities of Petté and Wina. Nevertheless, the ecological characteristics and the agropastoral potential of these principal locations foreshadow a dynamic in the livestock activity whose sexist, ethnic and religious trajectories ought to be investigated across different phases, specifically production, transformation, commercialisation, and consumption.

In Petté, at the production level, we can observe a contribution of several villages of farmers with semi-structured breeding where the familiar-entrepreneurial connection of activities has made women, men and young people owners. With this in mind, the municipality has seen the endowment of a herd of French cattle recently bought by Cameroon. The production is destined in its majority to Common Initiative Groups (GICs, mostly GIC Avenir Femme), to local traditional consumption, and to informal circuits of supply and consumption outside of the municipality. At the transformation level, GIC Avenir Femme has a monopoly in the municipality (yoghurts, cheese, butter... manufactured and well packaged), even if artisanal transformation allows populations from different villages to consume milk and butter coming from traditional transformation. Regarding commercial potential, two circuits exist. The formal circuit (GAF) has a shop in the centre of Petté and storage places in Maroua. We can also observe informal circuits of raw milk commercialisation to other transformation units in the city of Maroua

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<sup>11</sup> Plan Communal de Développement de la commune de Wina.

<sup>12</sup> Exploitation des données du RGPH de 2005

<sup>13</sup> Plan Communal de Développement de la commune de Petté.

especially since consumption potential remains large. This potential, which for the moment keeps to the city of Maroua, could be expanded to other secondary cities in the Far North (Mokolo, Mora, Kaelé...) and other cities in Cameroon (Ngaoundéré, Garoua, Guider, Yaoundé et Douala...). Thereby, it is important to investigate in order to know the real place of women and youth in the dairy value chain, including production, supply, storage, transformation, and sale/consumption. What is the profile of women members of GICs Avenir Femme? Which leadership roles are held by women and youth in the parallel sectors of milk transformation and sale in Petté?

In Wina instead, at the production level, family livestock breeding involves small herds of cattle and goats based on tradition (heritages and acquisitions) whose functions are connected to marriages, rites, sacrifices, savings... at the family, (inclusive) community, and local level, with a weak profitability. We can also observe a deficit in milk transformation in the municipality: few appropriate transformation structures. The sector is dominated by women who sell milk from gourds and transform milk at the primary and secondary stage (artisanal butter and yoghurt). However, if milk production is boosted and organized and transformation is more or less modernised, the potential for commercialization appears enormous given the proximity of the commune with large cities such as Maroua, Yagoua, Kaelé, Garoua, as well as export possibilities towards Chad, to be precise towards Fianga, Bongor and Ndjamena

## 3. Intervention Logic

### 3.1. Objective, purpose & expected results

The overall goal of this consultancy is to develop sustainable and climate-resilient dairy value chains in Cameroon through the use of low-carbon technologies.

The fundamental goal is to set up of an Energy-Milk-Processing-Commercialization project in the communes of Pétte and Wina in the far North of Cameroon. In this context, the market study, master plan, and socio-economic impact study will enable the definition of a roadmap and capacity building that will provide the necessary guidance to implement clean technologies for the communes of Pétte and Wina.

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#### Box 2. The Expected Outcomes

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Outcome 1: Deployment of identified technologies for the preservation of dairy products through funding shared between international sources, the state and possibly even an association of producers

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Outcome 2: The creation of an intermediate storage area shared between producers

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Outcome 3: A secure delivery system to the point of sale

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Outcome 4: The creation of small businesses participating in dairy value chains and the conservation of dairy products

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Outcome 5: The creation of companies for the repair, sale and maintenance of technologies

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Outcome 6: An increase in the self-sufficiency of milk in the region

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### 3.2. Expected outputs

The main outputs that will be delivered by this technical assistance are the following:

1. **Updated mapping of the current dairy value chains** in the communes of Pétte and Wina in Cameroon, with correspondent socio-economic and technical relevant information. This will be the result of a thorough analysis and data collection on the dairy value chains with a special focus on the impacts of the COVID-19 pandemic and its historical evolution.
2. **In-depth market study of low-carbon technologies** which can be introduced in the dairy value chain and are applicable to the local context. Together with the diagnosis of the current dairy value chain situation we will analyze which are its strengths and weaknesses and correlate them with the low-carbon technologies available in the market. The goal of the market study will be to provide products and mechanisms that will strengthen the dairy value chain and make it environmentally sustainable.
3. **Integrated and consistent master plan for the conservation of dairy products** (production, storage, transport) with the support of clean technologies for the communes of Pétte and Wina. The master plan will focus on all the steps composing the dairy value chain, and integrate optimization techniques based on renewable energies.
4. **Socio-economic impact study** of selected technologies and methods. We will consider all the wide-ranging social and economic implications derived from the technologies selected in order to better understand which is their reach and select the appropriate actions to have a positive impact on the targeted communities.
5. **Roadmap including regulatory instruments and financial mechanisms**. This tool will ensure the long-term sustainability of the project in terms of institutional support, legal backing and economic feasibility.
6. **Training and capacity-building of dairy farmers** on the implementation of a sustainable and resilient dairy value chain. In order to ensure the long-term sustainability of the project, it is indispensable to raise awareness among the targeted communities and to teach the beneficiaries in the use of the new technologies introduced.

## 4. The Rationale

The logical framework that we will follow will be based on a well-balanced **intervention logic balancing three tools**:

- a) the development of an embracing diagnosis of the dairy sector in the Far-North region of Cameroon, that will conceive the different socio-economic impacts and technical handicaps,
- b) the inclusion of carbon-free technologies that will provide energy supply in order to ensure the development and consolidation of the sector in a remote area, and
- c) a comprehensive training and capacity building process to farmers, municipal officials and stakeholders in the local communes to promote the long-term sustainability of the transfer of environmentally sound technologies for low carbon and climate resilient development.

**The goal** is to develop an integrated Water-Energy-Livestock implementation plan for the dairy sector in the Far-North Region of Cameroon, that will be adapted to the local patterns of development, cultural features and socio-economic challenges. We also understand that the CTCN expects an integrative methodology that will take into account all social groups and involved stakeholders, under the precept that women and young people will be actors of change.

We understand that the ultimate goal of this project is to pursue the priorities set in the UN Support Plan for the Sahel (2018-2030), which focus on the stabilization of the region through the promotion of inclusive, comprehensive, climate resilient and updated local development. For this purpose, the CTCN has selected two communities that are culturally and environmentally representative of the region, and has used them for implementing a project of revitalization of the dairy industry, which is relatively decimated.

According to our initial research and review of the available literature on the sector and the region, we comprehend that the use of carbon-free technologies not only serves mitigation purposes but also it has been introduced because of the challenges related to energy accessibility and the existent electric network. The remoteness of the region has supposed a strong brake to local development as 80% of the Far-North Region is not electrified. This issue is a strong impediment to economic growth due to most of the transformative, storage and transport activities require energy for its proper implementation. Then, the use of off-grid solar panels presents as an interesting opportunity that can bring the energetic autonomy that is clearly needed.

We will conduct a thoroughly data collection process in order to deeply understand the constraints that go beyond technical difficulties (political, social, economic and cultural). Furthermore, it will be important to create a value chain approach that will consider all the stages from milk extraction to commercialization, in order to have a consistent impact of development. Ultimately, the representation of women and youth will be a decisive condition for success as they have been identified as actors of change and their capacities have been underestimated. Nevertheless, despite the possible challenges, we understand the replication opportunities that this project will suppose for Cameroon but also for the region.

Finally, it will be vital to conduct an efficient and integrative capacity building process as a final step for the proper implementation of the Water-Energy-Livestock project developed. Technology and knowledge transfer is one of the main mottos of the CTCN, and this goes together with the direct integration of local communities in the development of the project. For this purpose, our team is composed by 4 experts based in the Far-North Region, that have the support of the main University in the region (the University of Maroua). Having a foot on the implementation ground will allow us to properly conduct the capacity building and training workshops which will ensure the technology transfer.

## 5. Risk Assessment and Assumptions

Assumption / risk	Possible mitigation action
Capacity Building has always been challenging and difficult to measure and analyse in Africa.	We rely on a network of researchers and professionals who have already absorbed our tools, methodologies and will be able to send clear messages and transfer the knowledge and technologies to the end users. Institutional strengthening and financial and technical support to a set of selective successful replicable and scalable experiences and public awareness
Effectiveness and efficiency of the Renewable energy solutions presented because weak historical lack of public Interest. This will present challenges to identifying some tools, indicators and tracking some statistics to monitor progress.	Keep the farmers, stakeholders and civil society engaged from the beginning of the project to follow up on the required information, data collection and analysis.
Reticence to follow the gender and youth based approach due to phalocratic and gerontocratic historical tendencies.	Use local team to operate according to the gender and youth approach meanwhile they constantly bear in mind the different contextual and cultural features. Calibrate the intensity of the approach according to social responses which will be observed during the implementation.
Problems to conduct the Data Collection Process according to the presented Work Plan due to mobility problems derived from the rainy season in the Far-North Region.	We will conduct the Data Collection Process as fast as possible, and design the Work Plan accordingly. The stakeholders that can be contacted by video call will be scheduled for the last weeks of the process in order to carry out the indispensable field work before the Rainy Season.
Problems to access the project's communes due to transport infrastructure deficiencies	We will check the different road networks and design the Work Plan for the Data Collection accordingly. The places to conduct the Field Work, Interviews, Focus Groups, etc. will be selected according to accessibility.
Access to the most programme documents, reports and records.	Scales, policy incidence criteria and priority setting of actions, building a strategic approach to socio-economic and infrastructural obstacles and following a hierarchy setting to ensure potential transformative change.
Key information / data is available, reliable and updated when necessary.	A comprehensive Reference Group Steering Committee to follow up the assignment with a diverse evaluation group, maintain permanent communication with stakeholders before and during the mission.

Risks	Possible Mitigating Actions
Presence of Boko Haram in the Far-North Region, difficulting the implementation of the project. The presence of the armed group can stop our team from accessing the communes where we work and pose a serious danger for the lives of the whole team.	The team will keep in contact with the Security Forces authorities of the region in order to obtain regular updates about the advances of the armed group. Besides, the team will also get information from the villagers of Petté and Wina. The travel of the Team Leader is subjected to this matter, and in case of existing the minimum threat the travel to the region will be suspended. Furthermore, in case that the presence of the armed groups will be an impediment to carry out the field work, the team will resort to the use of virtual communication tools.
Limited access to sources of information: difficulty to contact key informants or lack of time / interest for the interview.	Use of a local team with a rooted regional network which will have perfect knowledge of local populations and will use a timeline adapted to local cultural dynamics.

## 6. Action Plan

Phases	Outcomes	Actions	Timeline <sup>14</sup>
<b>PHASE 1. Contracting &amp; preparation of data collection tools</b>	<b>Outcome 1.</b> Prepare the Work Plan	<b>Action 1.1.</b> Develop a Detailed Work Plan	Mid-Late June 2021
		<b>Action 1.2.</b> Develop a M&E Plan	Mid-Late June 2021
		<b>Action 1.3.</b> CTCN Impact Description	Mid-Late June 2021
<b>PHASE 2. Data collection and analysis of this data</b>	<b>Outcome 2.</b> Analysis and Data Collection on dairy value chains in Petté and Wina (with a focus on the COVID-19 pandemic impacts)	<b>Action 2.1:</b> Data collection from dairy farmers	June 2021 – Mid August 2021
		<b>Action 2.2.</b> SWOT analysis of the data	September 2021
		<b>Action 2.3.</b> Diagnosis of the technological needs of the dairy value chain.	September 2021
<b>PHASE 3. The drafting and restitution phase</b>	<b>Outcome 3.</b> Market Study of Technologies with productive use of energy applicable to the local context	<b>Action 3.1:</b> Identification and selection of technologies and methods for sustainable and resilient, less costly, socially acceptable dairy value chains	July 2021 - October 2021
		<b>Action 3.2:</b> Workshops with involved stakeholders to validate the report about clean technologies to offer in value chain	October 2021
		<b>Action 3.3:</b> Finalize report according to stakeholders comments	November 2021
<b>PHASE 4. Development of the master plan to support actors in the milk value chain to improve profitability and sustainability of the latter</b>	<b>Outcome 4.</b> Elaborate a Master Plan for the conservation of dairy products with the support of clean technologies for the communes of Petté and Wina	<b>Action 4.1:</b> Define the operation of a pilot project in Petté.	November 2021 - January 2022
		<b>Action 4.2:</b> Define the operation of a pilot project in Wina	November 2021 - January 2022
		<b>Action 4.3.</b> Analyze the possibility of optimizing costs by defining storage areas and supply chain common to both communes.	January 2022
	<b>Outcome 5.</b> Socio-economic impact study of selected technologies and methods	<b>Action 5.1:</b> Socio-economic study of the proposed master plan for the commune of Petté.	February 2022
		<b>Action 5.2:</b> Socio-economic study of the proposed master plan for the commune of Wina.	February 2022
		<b>Outcome 6.</b> Definition of a roadmap including regulatory instruments and financial mechanisms	<b>Action 6.1:</b> Development of a roadmap
<b>PHASE 5. Training of actors</b>	<b>Outcome 7.</b> Training and capacity building of dairy farmers on the implementation of a sustainable and resilient dairy value chain	<b>Action 7.1:</b> Installation of an appropriate temporary storage system	March 2022
		<b>Action 7.2:</b> Training and capacity building workshop for dairy farmers on the master plan, the proposed roadmap and selected technologies.	March 2022 - April 2022
		<b>Action 7.3:</b> Development of a technical guide to ensure an integrated approach	April 2022
		<b>Action 7.4:</b> Development of Closure and Data Collection Report	April 2022

<sup>14</sup> Tentative and depending on the development of the COVID19 pandemic

## 7. Methodology

The methodology will consist of 5 phases, some of which can be implemented simultaneously. The first phase is the phase of contracting and preparing the data collection tools. The second phase is data collection and analysis, The third phase will be the drafting of reports and the presentation of the results of the study , fourth phase will be the development, based on the results obtained, of the accompanying master plan for the units identified and the appropriate clean technologies for better conservation and quality treatment for the transformation of milk into various products (cheese, yogurt, etc.) , The fifth phase will be devoted to training the various stakeholders in the milk production and processing chain in these two municipalities and in the areas of high consumption identified. In this last stage we will include the development of monitoring systems which will bring our local partner, the capacity to ensure the sustainability of the achievements.

During all these different phases, the Gender Expert and the Social Embeddedness Expert will be in charge of assuring that the process embrace the all the social groups involved in the dairy production sector, and specially those which have been historically marginalized, the youth and the women. Both groups can be comprehended as the engines to revitalize the dairy activities through the sustainable development mottos. For this purpose, the Gender Expert will use her more than 10 years of experience in gender mainstreaming in the Far-North Region to ensure that both groups are taken into account in the analysis and included in the plans. Their powerful individual and collective labor capacities will be approached with upstream and downstream considerations on the dairy value chain. For this purpose, they will be represented in all the different stages of the project, and we will elaborate a gender gap analysis in the second phase of the project, looking into the different skills, challenges, fragilities, vulnerabilities and precariousness.

The gender study of the dairy value chain will employ a mixed methodology with a predominance of qualitative methods. The study will be founded in the double qualitative and quantitative approach with a strong descriptive perspective on principles, processes, methods, mechanisms connected to traditional customs structuring access, role, place and trajectories of women and young people in the dairy value chain. This approach also seeks to question the contexts generating adversities for the capacity of women and youth to profit from a quality of life connected to their levels of implication in the dairy value chain and their everyday relation to the cattle/milk resource. Sampling will be in two stages: first probabilistic casual for the identification of households and women in the municipalities of Petté and Wina; then non-probabilistic purposive for the interviews and the Focus Group Discussions.

As mentioned above, in “our solution section”, the hole methodology has been based in the Value Links approach, which will ensure that the Dairy Production Value Chain will enhance the local development of micro and medium size enterprises. This approach will permit us to materialize our commitment in building resilience at the local level, through the conception of contextual particularities and the support for all possible involved groups or minorities.

In order to follow this approach, our methodology will have the following axes/orientations and anchorages for the study:

- Cartography of zones/sited of milk production, transformation and commercialization
- Social and cultural cartography
- System description (actor profiles, technical processes of transformation, circuits, production and commercialization, consumer profiles)
- Sector management mechanisms (State/Sectors, NGOs, projects, beneficiaries)
- Sector impacts (employment, cohesion, reconversion; life stories)

Following what it has been explained above about the under-development of the Far North region of Cameroon (Septentrion) in terms of electrification, we can note that the electric network does not cover rural areas at all, where the herds of cattle and dairy cows that produce milk are located. Thus, renewable energies need to be addressed as far as possible, as a necessity because there are no other options in rural or peri-urban zones where the network is absent, for technical and economic reasons, and which are also beneficial for climate protection.

## Use of renewable energy

Among the potential renewable energies in the Far North of Cameroon, there are solar energy, small-scale hydraulics, wind energy, biomass, and geothermal energy. However, these last energies are not available in a secure and competitive manner, except in very specific cases (wind flow is too low and insufficient for wind power generation; biomass resources are insufficient, unless there is agricultural waste in significant and regular quantity; absence of geothermal resources...)

Solar energy is available everywhere in the region, at an increasingly competitive price, with proven technical solutions (solar power plants, mini grids). Then, solar energy will be the most used source of energy for the uses of milk cooling, its storage and treatment, either in electrical form (kWh supplying a refrigerator suitable for milk) or directly by solar thermal cooling, where solar energy is used to transmit heat to a production system.

**The storage of the energy generated by solar panels** can be done in the form of batteries, partly or directly in the form of fridges or refrigeration units (to be optimized according to the relative cost of the two forms of storage: in the form of electricity, or in the form of fridges). It can be argued that storage in the form of fridges is probably more economical if a fairly large volume of milk is collected. The energy needs for the milk sector will have to be specified by the field phase, in a participatory mapping using the data collection in the field.

Energy is needed for cooling the milk (cooling, chilling, etc.) after milking the cow's milk at the collection level, and for intermediate storage before sale.

The parameters to be taken into account, depending on the field data that will be collected, are:

1. Geography, distance from milk storage and processing points (creamery, packaging site, milk powder manufacturing plant, etc.) and transport distances.
2. The quantity of milk produced for each production site on the field (depending on the number of dairy cows, their milk production, and the quantity of milk that the cattle owners will market, as well as the quantity of milk which should increase if the dairy value chain is valorised).
3. The amount of milk collected, if there is an intermediate milk storage phase, taking into account the transport of milk from the point of milking to the point of storage.
4. The most appropriate technical solutions use solar energy as a source of cold, as the necessary cold can be produced by Solar Photovoltaics (PV), which by nature is produced during the hours of sunshine (which are also the hottest hours of the day) with maximum production at noon when the sun is at its apex.

Solar Cooling Solution provides a natural “fit” between solar energy and the need for cooling since they both peak during the middle of the day, in high sunshine time.

## Phase 1. Contracting and preparation of a work plan, data collection tools and M&E plan.

Activities of Phase 1	
Outcome 1.	Prepare the Consultancy’s work plan.
	Activity 1.1. Develop a Detailed Work Plan of all activities, deliveries, outputs, deadlines and responsible persons / organization and detailed budget to implement the CTCN response.
	Activity 1.2. Develop a Monitoring and Evaluation Plan to valuate the timeliness and appropriateness of the implementation.
	Activity 1.3. A two-page CTCN Impact Description to be update/ revised once the technical assistance is fully delivered.

This so-called preparatory phase will consist not only for the various actors involved in the realization of the project in clarifying the role of each (preparatory meeting and launch meeting), but also the validation of the data collection tools prepared for the cause, which will be adapted to the coetaneous background of the project, paying special attention to the COVID situation. As mentioned before, in the preparation of the data collection tools and the work

plan we will have special consideration for gender and youth, ensuring that they are consistently represented and taken into account.

The expected data collection tools for the project are the following:

- 1) Interviews.
- 2) Focus Groups.
- 3) Field visits and diagnostics.
- 4) Fieldwork surveys.
- 5) Desk Review.

## Phase 2. Data Collection and Analysis of this data simultaneously.

Activities of Phase 2	
Outcome 2.	Analysis and Data collection on dairy value chains in the communes of Petté and Wina in Cameroon with a special focus on the impacts of the COVID-19 pandemic.
Activity 2.1	Data collection from dairy farmers.
Activity 2.2	SWOT analysis of the data.
Activity 2.3	Diagnosis of the technological needs of the dairy value chain.
Outcome 3.	Market Study of Technologies with productive use of energy applicable to the local context.
Activity 3.1	Identification and selection of technologies and methods for sustainable and resilient, less costly, socially acceptable dairy value chains at the production, intermediate storage and point of sales.

The main documentation sources will come from the decentralized services of some Ministries (Water and Energy; Agriculture and Rural Development; Economy, Planning and Territorial Development; Livestock, Fisheries and Animal Industries; etc.) and whose object relates to Water-Energy-Livestock project for the dairy value chain. We will also collect information from Non-Governmental and support organizations, private actors, research and training institutions and resource persons. Furthermore, the main framework which will be taken into account will be the Livestock Development Project (PRODEL- Projet de Développement et l'Élevage) of the Government of Cameroon and the World Bank. The PRODEL will serve as the baseline to build up the analysis, ensuring that the results completely align with the national strategy regarding livestock management.

On the other side, the subjects with whom we will interact will vary according to the role played by the latter in the sector. In doing so, the discussions will focus on the main projects relating to Water-Energy-Livestock project for the dairy value chain in which their structure has been involved. In more detail, we will ask for the title of the project, the project leader (donors and others), the potential beneficiaries and in certain measures the conditions to benefit from it. Information on the level of implementation and monitoring of the achievements of these projects will also be necessary.

Besides the different ongoing projects we will also look into the users (households). We will collect their opinion on their assessment (satisfaction and difficulties). It is at this level that we will fundamentally carry out the characterization of the technologies implemented. In order to meet the aspirations of potential beneficiaries and ensure better ownership, we will also collect the expectations (the most popular technologies) of households.

Therefore, the data collected will come from the various players in the milk value chain in the two municipalities and the data for market research from existing consumers and local processors and in the large agglomerations of the area. As for the actors of the chain in the two communes, a sample of sedentary producers and transhumans will be constituted for representativeness. With them we will also elaborate a sample of transformers, collectors and the carriers. Beyond these direct actors, upstream actors such as umbrella organizations, sectoral ministries and potential financial institutions supporting the activities of chain actors will be involved in the analysis.

For the market study, we will select local, regional, national and international processors, in order to identify not only the existing bottlenecks in the supply chain but also the supply as in the distribution chain. At each stage of data collection, the focus will be on the energy sources used and desired for better consideration in the clean energy

proposal for improving the profitability of units and actors in the chain. of milk values in the two municipalities of intervention and therefore in the far north region as a whole. The data collection tools prepared in step one will take into account all aspects of the project and the validation of these tools will be done on this basis. After data collection, the processing and analysis of this data will follow for better restitution of the data collected in the field.

This phase will be featured by the strong weight of the gender component and the character of the Value Links Approach. The Gender Expert, in conjunction with the Social Embeddedness Non-Key Expert and the Socioeconomic Expert, will be in charge of developing a previous and ongoing integrative approach which will gather all the stakeholders involved, including Women and the youth. As mentioned above, this approach will focus on the downstream and upstream benefits that both groups can offer, and will convert them in central actors of change within the targeted background. Furthermore, the knowledge of the Gender Expert in Peacebuilding, based in more than 10 years of experience in the region, will grant that all socio-economic and cultural implications are bear in mind and included in the diagnosis of the technological needs and the ongoing posterior Market Study.

Furthermore it will be fundamental the contribution of GIS and cartography in this phase, as we aim to produce maps identifying the location of production and sale of milk and dairy products using ICT, GIS and cartographical tools.

Specifically, necessary prior actions are:

- Proceed with geo-localisation of breeding zones for cattle and goats
- Identify the different districts of the two municipalities with their borders
- Proceed with a territorial analysis (relief, climate, soil, hydrography, vegetation, grazing zones, cattle estimation)
- Identify the potential locations for photovoltaic electrical installations, given that the municipality of Petté does not dispose of a continual access to electricity and that of Wina is completely off-grid. This identification will lead to the evaluation of different costs relating to the installation of autonomous systems of storage and solar energy-powered transformation
- Evaluate communication and mobility pathways
- Water and vegetation, given that they could be affected by climate change
- Evaluate mobility means
- Identify the gender component in the livestock activities for cattle and goats in the production of milk
- Evaluate the quantities of milk produced for each district in the two municipalities, as well as the production and storage potential. This will allow to evaluate the transformation and development potential for the local industry.
- Uncover the intentions of farmers towards transformation and commercialization of milk and its derivate products.

The maps produced as part of this study on the dairy value chain in the municipalities of Petté and Wina are collective products obtained from "a technique of questioning and interview intended to bring out knowledge" (Parsky, 2010) about the dairy value chain. Cartographic processing for the production of maps and other cartographic elements will need to be optimized with free GIS tools (QGIS, R, Google Earth, Google Maps) in order to increase the value of the initial data (Gartner 2009) obtained from collectors.

Collective mapping will make a global contribution to the management of all geographic information in the dairy value chain. It will make it possible to experiment or analyse the location, production, storage and distribution of milk and dairy products.

### Phase 3. The drafting and consultation phase.

Activities of Phase 3:	
Outcome 3.	Market Study of Technologies applicable to the local context.
	Activity 3.2 Workshop with involved stakeholders to validate the report about clean technologies to offer in value chain
	Activity 3.3 Finalize report according to stakeholders comments and recommendations.

The drafting phase will begin from the first phase with the review of the literature on the dairy sector in the Sahelian zone and particularly in the far north of Cameroon and the data collection. Furthermore, during this drafting we will pay special attention to other international experiences in the Sahelian countries, to examine best practices and errors. These regional experiences will be compared by other international organization's behavior towards this same field in other regions with similar features, meaning under-development, volatility or climate risks. Also, this process will be supervised by our external advisor in Value Chain and Value Links approach, Paul Schaun, who will compare our analysis with his previous successful experiences, in an attempt to replicate other effective and participatory strategies. This process will continuously take into account the PRODEL framework, the UN Support Plan for the Sahel and the African Union Agenda 2063.

After the drafting, a first reading will be made by the various actors involved and the partners. A consultation workshop will be organized to the actors to check the results in relation to the actors' point of view. Following the integrative and participatory approach that we promote, we have included this extra consultation workshop. We will gather a group of stakeholders which composition will be based on transversal representation, including leaders of the civil society representing the Youth and Women, in order to outline the challenges, responsibilities and capacities to offer by these collectives in the dairy production value chain.

After this feedback, the report will be corrected by integrating the various points raised by the participants and by integrating the recommendations of all the actors present. After this consultation workshop and the integration of the recommendations, the report will be send to the involved stakeholders for the validation of the activities to be carried out within the framework of the project in connection with the development of the appropriate technologies for the production, the collection and the transformation of the products. dairy products in the two municipalities of the project.

#### **Phase 4. Development of the master plan to support actors in the milk value chain to improve profitability and sustainability of the later.**

Activities of Phase 4:	
Outcome 4.	Elaborate a Master Plan for the conservation of dairy products with the support of clean technologies for the communes of Pétté and Wina.
	Activity 4.1. Define the operation of a pilot project in Pétté.
	Activity 4.2. Define the operation of a pilot project in Wina.
	Activity 4.3. Analyze the possibility of optimizing costs by defining storage areas and supply chain common to both communes.
Outcome 5.	Socio-economic impact study of selected technologies and methods.
	Activity 5.1 Socio-economic study of the proposed master plan for the commune of Pétté.
	Activity 5.2 Socio-economic study of the proposed master plan for the commune of Wina.
Outcome 6.	Definition of a roadmap including regulatory instruments and financial mechanisms.
	Activity 6.1. Development of a roadmap of mechanisms for the promotion and implementation of sustainable and resilient dairy value chains.

To elaborate this master plans, on the one side, we will see what PRODEL is doing and articulating, and analyze how this study could better help PRODEL to be more efficient, fostering the complementarity between PRODEL and this project. On the other side, we will also refer to the "Communal Development Plan" of each Commune, to have a good idea about their needs and how they intended to develop their municipalities, and following the directives of the Government of Cameroon and the WB

The results obtained from the various studies carried out will be used to define the master plan for supporting actors. To do this, a few workshops will be organized for the development and validation of this master plan. Nevertheless, before organizing this workshops we will conduct 3 separated Focus Groups, which will

composition will be: one for Youth representatives only, another for Women only and the third one for Men only. These previous Focus Groups will evidence the perspectives of each of the 3 groups in order to include them in the workshops, consequently assuring a participatory approach representing the maximum points of view. To this end, the appropriate technologies for improving the activities of actors in the value chain will be identified and the process of financing this equipment identified. Also the process of implementing these technologies will also be build up. During the development of the master plan, the various training themes are identified and the actors to be trained and the periods are also noted, assuring that the posterior phase goes in hand with the embeddedness and contextual priorities.

In this Master Plan we will present a figure representing the components of the dairy value chain. On each component (production, storage, derivative products, etc), we will first see which technology people are using and evaluate the annual yield. Afterwards, we will propose other efficient technologies that could be associated to each component. We will refer to the countries which have the best scores in dairy value chain in Africa and the world to see how they have proceeded, which technologies they have used and the amount of investment.

The socioeconomic impact study, following the general dynamic of the project will be done by the Socioeconomic Expert assisted by the Gender Expert and the Social embeddedness Non-Key Expert, externally overlook by our International advisor in Value Chain. Gender, Value Links, the National Frameworks and the local particularities will be the main parameters.

In the definition of the roadmap, we will explain what PRODEL is now proceed, evaluate the gaps and propose innovative financial mechanisms, which can ensure the long-term feasibility and the correlation with existent legal frameworks. International and regional examples will be taken and replicated in case of being effective.

## Phase 5. Training of actors.

Activities of Phase 5:	
Outcome 7.	Training and capacity building of dairy farmers on the implementation of a sustainable and resilient dairy value chain.
Activity 7.1	Installation of an appropriate temporary storage system.
Activity 7.2	Training and capacity building workshop for dairy farmers in Pétté and Wina on the master plan, the proposed roadmap and selected technologies.
Activity 7.3	Development of a technical guide to ensure an integrated approach combining the different technical and technological solutions for the management of dairy products.
Activity 7.4	Development of Closure and Data Collection report.

The training of chain actors will be carried out following the development of the master plan and the acquisition of these clean technologies for better management of these tools and their sustainability. This training will be carried out by the local experts and the Maroua University, following pedagogical and capacity building principles. The required workshops will be done for dairy farmers, and the rest of involved stakeholders and groups. Those will be determined by Gender considerations and will have a special focus on Youth. All the process will be supervised by the OIKOLOGICA Project Management, the Team Leader (who will visit the country according to COVID restrictions) and our external advisor. For this purpose the latter team will be present in the workshop through video calls.

To ensure the sustainability of the achievements of this project, the technical guide will include a monitoring and evaluation mechanism, which can be implemented and the funding mechanism for the monitoring and evaluation committee identified.

Finally, the whole team will develop a Closure and Data Collection Report which will serve for future projects in the region or worldwide, and will reflect on the possible challenges found, consequently developing recommendations.

## Tools to be used

In order to follow our methodology, we expect to use the following tools:

- Desk Review
- Interview guide (managers, GICs, Associations, Cooperative of youth and women working in the dairy sector; sectorial managers for livestock, agriculture, youth and civic education, small and mid-sized businesses; cattle owners; informal entrepreneurs in the dairy sector)
- Focus group (young and women producers, transformers, and other actors in the dairy sector)
- Life stories/trajectories and paths of actors
- GIS
- Questionnaires
- Workshops.

Data production takes the form of data collection. It needs tools such as GPS receivers, questionnaire forms in digitized form, such as kobo collect or ODK collect, and GIS tools to establish the differential of geographic information collected on the implementation areas of the project. This production consists of qualified voluntary information (Goodchild 2007) coming from a sample made up of breeders, collectors, district leaders and administrative authorities. The participation of the sample in the formulation of the maps will identify all the areas in the relevant territories where the project will be optimized in the short, medium and long term.

## 8. Kick off meetings Minutes.

### 8.1 NDE Meeting.

**Issue: Meeting with the National Designated Entity (NDE) for the official kick off of the Project to Support the implementation of an integrated project Water-Energy-Livestock for the dairy value chain in the municipalities of Pette and Wina. CTCN/UNIDO.**

**Date:** June 14th 2021 / Time: 16:00-16:30 (CET)

**Format:** Video Call (Zoom Platform)

**Participants:**

- ▲ Ms. Nadège Trocellier (CTCN)
- ▲ Mr. Patrick Mbomba (National Designated Entity, Deputy Managing Director of the National Observatory on Climate Change)
- ▲ Mr. Henri Boyé (Team Leader- Rural Electrification Expert)
- ▲ Mr. Toni Sastre (OIKO Team)

**Agenda:**

1. Introduction (10 mins).
2. Presentations (15 mins).
3. Closing (3 mins).

**Summary of main points discussed:**

- ▲ Brief discussion concerning the person that will serve the NDE position in Cameroon, and when will Mr. Mbomba be replaced. (Ms. Trocellier & Mr. Mbomba)
- ▲ Presentation of the TA request, the involved parties (CTCN/UNIDO; Help Community; OIKO in consortium with the University of Maroua); rationale; expected outcomes and subsequent developments. (Ms. Trocellier)
- ▲ Presentation of OIKO team, initial movements, team mobilization and basic expected timeline for the implementation of the project. (Mr. Sastre)
- ▲ Presentation of the Team Leader Profile and its experience in the region and in the field of rural electrification. (Mr. Boyé)
- ▲ The NDE communicated its readiness to assist OIKO team in the implementation of the project and to facilitate any required communication. (Mr. Mbomba)
- ▲ The Team Leader communicated that he will be travelling to Cameroon at the last week of June, and expressed his interest in having a meeting with the NDE. (Mr. Boyé)
- ▲ Closing of the meeting.

**Next Steps:**

- ▲ OIKO will remain in close contact with the CTCN and the NDE for the implementation of the project, and will keep them updated about all the advancements that will be done or about any difficulties that may surge.
- ▲ The CTCN and the NDE will remain available for any assistance that OIKO may need.
- ▲ The Team Leader (Mr. Boyé) will have a meeting with the NDE (Mr. Mbomba) the last week of June for discussing further details about the implementation of the project.

### 8.2 Help Community Meeting.

**Issue: Meeting with Help Community for the Project to Support the implementation of an integrated project Water-Energy-Livestock for the dairy value chain in the municipalities of Pette and Wina. CTCN / UNIDO.**

**Date:** June 11th 2021 / Time: 10:30-12:15 (CET)

**Format:** Video Call (Zoom Platform)

**Participants:**

- ▲ Ms. Nadège Trocellier (CTCN)
- ▲ Mr. Jean Raphael Hei Djob (Help Community, requesting organization)
- ▲ Mr. Henri Boyé (Team Leader- Rural Electrification Expert)
- ▲ Dr. Maxime Kamdem (Socio-economic and Renewable Energies Expert)
- ▲ Dr. Babette Koulchoumi (University of Maroua, Gender Expert)
- ▲ Mr. Toni Sastre (OIKO Team)
- ▲ Mr. Niccolò Pinzauti (OIKO Team)

**Agenda:**

4. Introduction (35 mins).
5. Discussion about next steps (1h 5mins).
6. Closing (5 mins).

**Summary of main points discussed:**

- ▲ Presentation of the TA request: the involved parties (CTCN/UNIDO; Help Community; OIKO in consortium with the University of Maroua); rationale; expected outcomes and subsequent developments. (Ms. Trocellier)
- ▲ Presentation of the requesting organisation (Help Community): past experiences with CTCN/UNIDO and in the Far North region of Cameroon; resources that can be shared with OIKO to empower the intervention, access to the local social contexts, data collection tools and practices. (Mr. Hei Djob)
- ▲ An initial meeting between Mr. Hei Djob and Dr. Kamdem (on behalf of the OIKO team) is arranged in Yaoundé to coordinate actions and share useful information and documentation.
- ▲ Both Help Community and OIKO have access to a data collection tool to digitally administer questionnaires. It is agreed that the parties shall compare the available resources to develop an effective course of action. (Dr. Kamdem and Mr. Hei Djob)
- ▲ The OIKO team needs detailed geographical information to better orient the interventions in the dairy sector and the renewable energy installations. Such information could also be collected through the population survey. (Dr. Kamdem)
- ▲ Help Community has experience in participatory cartography in dairy production zones, from a past project in adaptation to climate change. (Mr. Hei Djob)
- ▲ The main climate threats affecting the Far North region are floods and droughts, which have consequences on human and livestock health. Considerations on livestock husbandry for dairy production should be included in the intervention. (Mr. Hei Djob)
- ▲ Mr. Boyé presents himself and his experience as consultant in energy. He highlights the need for cartographic information on energy to identify the places where to realize energy installations. He will also be in Cameroon shortly to coordinate with the other parties.
- ▲ Access to energy in Petté and Wina is almost or completely non-existent. The only feasible alternative is autonomous solar mini grids. (Mr. Hei Djob and Mr. Boyé)
- ▲ The gender aspect is discussed. Women have a central role for livestock husbandry, energy provision (by collecting firewood) and the other household- and climate-related issues. Since the geography of livestock is gendered, the best way to approach the gender dimension is to consider the access of women to cattle, more than to dairy products. (Dr. Koulchoumi and Mr. Hei Djob)
- ▲ The available information for the livestock sector cover mostly the amount and distribution of cattle, not milk production per se. This could later lead to a study of the role of each group (women, youth, etc.) in cattle management. (Mr. Hei Djob)
- ▲ Men are usually tasked with livestock management, while women are in charge of milk collection and first processing. (Dr. Koulchoumi)

- ▲ The OIKO team agrees on looking for field data and literature from previous experiences to create a sociological and cultural cartography of husbandry, including the role of each social group and the motive behind each farmer's activity (meat production, milk production, reserve). (Dr. Kamdem, Mr. Boyé and Dr. Koulthoumi)
- ▲ The relationship with the cattle varies according to the community of reference and the relative position in the dairy value chain. (Dr. Koulthoumi)
- ▲ There is some specialization in milk production in Petté and Wina but, given the isolation of the area, most of the production is for domestic or local needs. Most meat and dairy consumed in the larger cities of Cameroon come from the Eastern region. (Mr. Hei Djob)
- ▲ The collection of information about livestock husbandry is proposed to be included in the survey. This could allow to develop a strategy to promote milk production and to make dairy production profitable beyond the domestic consumption. (Dr. Kamdem, Mr. Hei Djob and Mr. Boyé)

#### **Next Steps:**

- ▲ Dr. Kamdem and Mr. Hei Djob will meet to arrange the details of the implementation plan and better coordinate the data collection process, according to what will be agreed internally by the OIKO Team.
- ▲ Help Community will be ready to assist OIKO in the implementation of the project. Specially, the organization offers to introduce the OIKO team (specially the experts from Maroua University) to the different local stakeholders involved.
- ▲ The collaboration between OIKO and Help Community will be arranged in the next meeting in Yaoundé, and communicated to the CTCN accordingly.

# CHAPTER 2. Monitoring and Evaluation Plan and CTCN Impact Statement.

## Objective of the M&E Tool & Impact Statement.

The **project's objective** is to provide Cameroon financial and technical support to prepare specific rural development project for the dairy sector, including the use of green technologies, that will reduce greenhouse gas emissions, support adaptation to climate change, strengthen local economies and is consistent with Nationally Determined Contributions and national sustainable development objectives.

The **M&E Plan** has the objective, based on the **Technical Assistance Response Plan**, the contracting firm OIKO and the University of Maroua, to **monitor the implementation process and complete the Closure Report** at the end of the assistance.

The **M&E** identifies relevant quantitative and qualitative indicators as specified in the Closure Report, presenting a sub-set of indicators to monitor and assess must be chosen among these. Additionally, the M&E identifies other specific, measurable, achievable, relevant, and time-bound indicators suitable to monitor Activities, Outputs and anticipated Outcomes from the technical assistance and add to the M&E Plan and Impact Statement. The aggregated data on selected indicators as well as an updated version of the Impact Statement will be presented in the Closure Report at the end of the assistance.

## Basic Information.

Basic Information	
Title of response plan	Support to the implementation of an integrated project Water-Energy- Livestock for the dairy value chain in the municipalities of Pette and Wina- North Cameroon.
Technical assistance reference number	2018000022
Country/ countries	Cameroon
NDE focal point and organization	Mr. Forghab Patrick Mbomba, Deputy Managing Director. National Observatory for Climate Change, Cameroon.
Sector(s) addressed	Energy, Water, Livestock
Technologies supported	Renewable Energy sector, waste sector, storage and supply Technologies.
Implementation period and total duration	12 months (May 2021 - April 2022)
Total budget for implementation	USD 174,440
Designer of the response plan	CTCN
Implementer of response plan	UNIDO (OIKO & University of Maroua)

The overall objective and main outcome of this project is designed around the provision of green technologies that will permit and foster development at the commune level in North-Cameroon and foster resilience towards climate change. In order to achieve this goal we will deliver three main outcomes:

**Outcome 1:** Development of an integrated Energy-Water-Livestock master plan for the dairy sector in Petté and Wina, that will be in line with the necessities, challenges and particularities of both communes and use off-grid solar products that will provide autonomy to isolated communities.

**Outcome 2:** Assist in creating a legal and political framework that will permit the smooth implementation of the developed master plan, aligning it with the current national interests.

**Outcome 3:** The TA will carry out a technology and knowledge transfer to local stakeholders through a constructive and intensive capacity building and training process, enhancing their resilience and awareness towards climate change and its impacts on food security and local economies.

## Monitoring & Evaluation Plan

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments (Assumptions)
<b>Outcome 1 : Development of implementation planning, reporting and communication documents</b>				
Activity 1.1: A detailed work plan of all activities, deliverables, outputs, detailed estimated budget, deadlines and responsible persons/organisations (before the start of the TA)	▲ Number of Communication and Planning Documents developed (including a work plan, a M&E Plan, and a two-page CTCN Impact Description).	▲ 1 Detailed work plan (at the end of Activity 1, before the start of the TA) (Deliverable 1.1).	<ul style="list-style-type: none"> <li>▲ Preparatory meeting, launch meeting among consortium members</li> <li>▲ Validate and adapt the data collection tools to the context:</li> <li>▲ Identify possible time constraints that can alter the smooth implementation of the project.</li> </ul>	▲ Gender and youth dimensions are integrated in the data collection tools
Activity 1.2: A Monitoring and Evaluation plan for the TA implementation, to evaluate the timeliness and appropriateness of the implementation		▲ 1 Monitoring & Evaluation Plan and Impact Statement (at the end of Activity 1, before the start of the TA) (Deliverable 1.2).	▲ Analyze the different stages and steps of the project, and identify the different Indicators for the proper Monitoring and following of the project implementation.	
Activity 1.3: A two-page CTCN Impact Description from the TA drafted at the start of the implementation and revised at closure		▲ 1 two-page CTCN Impact Description document anticipating and describing the expected impacts (Deliverable 1.3).	▲ Update/revise the Impact Description at the delivery of the TA	
Activity 1.4: A TA Closure and Data Collection Report	▲ Development of one Closure and Data Collection report that will be preceded by three different Progress Reports	▲ 1 Closure and Data Collection Report (at the closure of the TA; following the CTCN model) (Deliverable 1.4).	▲ To conduct a Closure and Data Collection Report based on the M&E Plan presented in the Inception Phase. For this purpose, we will use the	

that will properly monitor the project implementation.

indicators identified and contrast them with the information monitored. Furthermore, we will reflect on challenges and recommendations for future replications

Outcome 2: Analysis and data collection on dairy value chains in the communes of Petté and Wina

Activity 2.1: Data collection from dairy farmers in the communes of Petté and Wina

- ▲ Number of identified past projects in the Water-Energy-Livestock dimension, that will include all relevant variables such as title, actors, beneficiaries, conditions to benefit, level of implementation and monitoring

Excel spreadsheet that will include the:

- ▲ Number of heads of cattle
- ▲ Annual amount of milk production
- ▲ Number of Key basic dairy value chain components identified in both communes, comprising three different groups (those just selling, those producing and selling and those that produce for self-consumption).
- ▲ Number of Storage systems (traditional or modern ones)
- ▲ Number of transforming centers.
- ▲ Number of selling points.
- ▲ Characterization of the technologies employed for on-site milk production and conservation
- ▲ Satisfaction of users with employed technologies

Identify at least:

- ▲ 4 related projects in the Far-North region
- ▲ 7 related project in Cameroon
- ▲ 4 related projects in Central African Region.
- ▲ 7 related projects in African continent

Deliverable 2.1: Excel spreadsheet with the following information :

- ▲ Updated number of heads cattle contrasted with the Plan Communal du Developpement figures
- ▲ Updated ammount of milk production (at households and commercialization levels) contrasted with the Plan Communal du Developpement figures
- ▲ 15 components that just sell
- ▲ 25 components that produce and sell
- ▲ 25 components that produce for self-consumption
- ▲ 3 storage systems
- ▲ 3 transforming centers
- ▲ 14 selling points
- ▲ All technologies employed in the dairy value chain
- ▲ 65 questionnaires with qualitative responses regarding satisfaction of

- ▲ Use the integrative approach developed by the gender expert to check the presence of minority or maginalised groups, such as women and youth.
- ▲ List of stakeholders identified.
- ▲ List of dairy value chain components identified.
- ▲ List of meetings conducted.
- ▲ List of questionnaires done
- ▲ List of zones where the local teams have operated
- ▲ Consider past experiences by other international organizations in the same field in similar regions (under-development, volatility, climate risk)

	<ul style="list-style-type: none"> <li>▲ Historical trends of milk loss</li> <li>▲ Milk sale points (distance travelled and frequency of journeys)</li> <li>▲ Transportation: employed methods and expected losses</li> <li>▲ Climate change impact</li> <li>▲ COVID-19 impact</li> <li>▲ Gender-specific data: number of women producers, historical trends</li> </ul> <p>Workshop presenting the project to the different stakeholders involved, in order to raise awareness and gather maximum attention.</p>	<p>users with employed technologies and identifying different climate change impacts on their daily activities.</p> <ul style="list-style-type: none"> <li>▲ 90% of total historical trends of milk loss.</li> <li>▲ 5 transportation means</li> <li>▲ 20 transportation actors</li> <li>▲ 10 Women Producers</li> <li>▲ 5 Women associations</li> <li>▲ 15 Community leaders</li> <li>▲ 5 Youth associations</li> </ul> <p>1 Report of the presentation workshop with participant list, photos, summary of presentations and questions posed, etc.</p>	
<p>Activity 2.2: SWOT analysis of the data</p>	<ul style="list-style-type: none"> <li>▲ Commune specific and holistic, strong and weak points.</li> <li>▲ Commune specific and holistic opportunities and threats.</li> <li>▲ Focus of SWOT analysis on energy sources used.</li> </ul>	<ul style="list-style-type: none"> <li>▲ 10 specific strong points in Wina and Pette (20 in total)</li> <li>▲ 10 specific weak points in Wina and Pette (20 in total)</li> <li>▲ 10 holistic strong points</li> <li>▲ 10 holistic weak points</li> <li>▲ 5 specific opportunities in Wina and Pette (10 in total).</li> <li>▲ 5 specific threats in Wina and Pette (10 in total).</li> <li>▲ 5 holistic opportunities</li> <li>▲ 5 holistic threats</li> <li>▲ 5 extra opportunities and 5 extra threats of the current energy sources</li> </ul>	<ul style="list-style-type: none"> <li>▲ Critical and empirical analysis based on the Data obtained in the previous activity to integrate the in vivo research.</li> <li>▲ Comparative analysis of the current data obtained with the historical trends and the regional parameters</li> </ul>
<p>Activity 2.3: Diagnosis of the technological needs of the dairy value chain</p>	<ul style="list-style-type: none"> <li>▲ Major issues and roadblocks in the different phases of the dairy production and conservation process related to technology and energy</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 report with the diagnosis of technological needs based on the SWOT analysis (Deliverable 2.2)</li> </ul> <p>The Diagnosis will identify:</p>	<ul style="list-style-type: none"> <li>▲ List of major roadblocks identified</li> <li>▲ List of producers' technological needs</li> </ul>

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| <ul style="list-style-type: none"> <li>▲ Producers’ needs in Petté and Wina, including technological needs</li> <li>▲ Barriers for women in the livestock and food sector</li> <li>▲ Analysis of the role of technologies and access to energy to promote the participation of vulnerable populations in livestock production, and consequent identification of opportunities and threats posed by the use of these technologies.</li> </ul> | <ul style="list-style-type: none"> <li>▲ 10 major roadblocks in the different phases of the dairy production related to technology and energy</li> <li>▲ 8 technological needs of producers in Pette and Wina (16 in total)</li> <li>▲ 5 barriers for women in livestock sector</li> <li>▲ 5 barriers for women in food sector</li> <li>▲ 10 opportunities and 10 threats of using technologies for facilitating the access to energy</li> </ul> | <ul style="list-style-type: none"> <li>▲ List of barriers for women in the livestock and food sectors</li> <li>▲ List of opportunities and threats identified for the use of technologies for facilitating access to energy and consequent report developed.</li> </ul> |
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Outcome 3: Market study of technologies applicable to the local context

Activity 3.1: Identification and selection of the technologies and methods for sustainable and resilient dairy value chains

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| <ul style="list-style-type: none"> <li>▲ Definition of assessment parameters for dairy value chains in the phases of production, intermediate stockage and transport to the sale point.</li> <li>▲ Identification of existing clean technologies with its consequent advantages and disadvantages</li> <li>▲ Identification of bottlenecks in the whole supply and distribution chain</li> <li>▲ Formulation of useful and efficient recommendations</li> <li>▲ Development of a Technical and detailed report on existing clean technologies for the whole dairy value chain.</li> </ul> | <ul style="list-style-type: none"> <li>▲ 1 technical and detailed report on existing clean technologies to ensure the conservation of dairy products at the production, storage and transport phase and adapted to the local context (Deliverable 3.1).</li> <li>▲ Assesment parameters that conceive the following: climate sustainability and resilience, cost, social integration and gender issues.</li> <li>▲ 2 bottlenecks identified in each of the components of the value chain</li> <li>▲ 4 general bottlenecks identified in the whole value chain</li> <li>▲ At least 3 clean technologies identified with at least 5 advantages and 5 disadvantages each</li> <li>▲ 8 useful and efficient recommendations</li> </ul> | <ul style="list-style-type: none"> <li>▲ Assessment parameters for the dairy value chain phases matrix, which will clearly define each of the parameters, and identify the indicators used</li> <li>▲ List of bottlenecks identified</li> <li>▲ List of technologies identified</li> <li>▲ List of recommendations</li> </ul> |
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Activity 3.2: Workshop with involved stakeholders to validate the report about clean

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| <ul style="list-style-type: none"> <li>▲ Number of participant stakeholders</li> </ul> | <ul style="list-style-type: none"> <li>▲ 25 participant stakeholders.</li> <li>▲ All the different components mentioned in the dairy value chain</li> </ul> | <ul style="list-style-type: none"> <li>▲ List of participant stakeholders</li> </ul> |
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technologies to offer in value chain	<ul style="list-style-type: none"> <li>▲ Number of issues discussed in the workshop</li> <li>▲ Number of conclusions and recommendations extracted</li> </ul>	<p>proposed green technologies, are discussed successfully in the workshop, and measured accordingly.</p> <ul style="list-style-type: none"> <li>▲ 5 conclusions and 5 recommendations.</li> </ul>	<ul style="list-style-type: none"> <li>▲ Minutes of the meeting with the main topics approached, the development of the discussion, and the conclusions and recommendations extracted.</li> </ul>
Activity 3.3: Finalize report according to stakeholders' comments and recommendations	<ul style="list-style-type: none"> <li>▲ Development of final report on green technologies for the dairy value chain according</li> <li>▲ Number of conclusions and recommendations included</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Final Report on green technologies for the dairy value chain.</li> <li>▲ 5 conclusions and 5 recommendations are included in the Final Report</li> </ul>	<ul style="list-style-type: none"> <li>▲ Review of the Final report considering the Minutes of the previous workshop</li> </ul>

Outcome 4: Elaborate a master plan for the conservation of dairy products (production, storage, transport) with the support of clean technologies for the communes of Petté and Wina

Activity 4.1: Define the operation of a pilot project, in the commune of Petté	<ul style="list-style-type: none"> <li>▲ Estimated annual yield from the current technologies</li> <li>▲ Number of proposed new technologies</li> <li>▲ Number of appropriate conservation methods presented for the dairy value chain</li> <li>▲ Number of appropriate green energy sources for the conservation of dairy products</li> <li>▲ Existence and Number of intermediate storage point and its appropriate equipment</li> <li>▲ Number of logistical methods to the point of sale (zones of commerce)</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Master plan for the conservation of dairy products with the support of clean technologies from the commune of Petté</li> <li>▲ 2 years annual yield from the current technologies</li> <li>▲ 4 proposed new technologies</li> <li>▲ 2 appropriate conservation methods presented for the dairy value chain</li> <li>▲ 2 appropriate green energy sources for the conservation of dairy products</li> <li>▲ 1 intermediate storage point and its appropriate equipment</li> <li>▲ 2 logistical methods to the point of sale (zones of commerce)</li> </ul>	<ul style="list-style-type: none"> <li>▲ In-depth pilot project review.</li> <li>▲ Analytical matrix with proposed new technologies, conservation methods, green energy sources.</li> <li>▲ Listing and definition of logistical methods to the point of sale.</li> <li>▲ Identification of intermediate storage points.</li> </ul>	<p>Consider the recommendations drawn from the market study</p> <p>Foster complementarity with the state of the art of PRODEL</p> <p>In close relation with the Communal Development Plan of Petté</p>
Activity 4.2: Define the operation of a pilot project, in the commune of Wina	<ul style="list-style-type: none"> <li>▲ Estimated annual yield from the current technologies</li> <li>▲ Number of proposed new technologies</li> <li>▲ Number of appropriate conservation methods</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Master plan for the conservation of dairy products with the support of clean technologies from the commune of Wina</li> <li>▲ 2 years annual yield from the current technologies</li> <li>▲ 4 proposed new technologies</li> </ul>	<ul style="list-style-type: none"> <li>▲ In-depth pilot project review.</li> <li>▲ Analytical matrix with proposed new technologies, conservation methods, green energy sources.</li> </ul>	<p>Consider the recommendations drawn from the market study</p> <p>Foster complementarity with the state of the art of PRODEL</p>

	<p>presented for the dairy value chain</p> <ul style="list-style-type: none"> <li>▲ Number of appropriate green energy sources for the conservation of dairy products</li> <li>▲ Existence and Number of intermediate storage point and its appropriate equipment</li> <li>▲ Number of logistical methods to the point of sale (zones of commerce)</li> </ul>	<ul style="list-style-type: none"> <li>▲ 2 appropriate conservation methods presented for the dairy value chain</li> <li>▲ 2 appropriate green energy sources for the conservation of dairy products</li> <li>▲ 1 intermediate storage point and its appropriate equipment</li> <li>▲ 2 logistical methods to the point of sale (zones of commerce)</li> </ul>	<ul style="list-style-type: none"> <li>▲ Listing and definition of logistical methods to the point of sale.</li> <li>▲ Identification of intermediate storage points.</li> </ul>	<p>In close relation with the Communal Development Plan of Wina</p>
<p>Activity 4.3: Analyse the possibility of optimising costs by defining storage areas and supply chain common to both communes</p>	<ul style="list-style-type: none"> <li>▲ Number of guidelines presented for optimising costs on the supply chain</li> <li>▲ Number of storage areas presented</li> <li>▲ Number of recommendations for the possibility of optimising costs</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 report with recommendations to optimise the implementation costs between the 2 communes</li> <li>▲ 2 of guidelines presented for optimising costs on the supply chain</li> <li>▲ 3 of storage areas presented</li> <li>▲ 8 recommendations for the possibility of optimising costs</li> </ul>	<ul style="list-style-type: none"> <li>▲ Review of the report presented for the optimisation of costs during the implementation of a common storage system for both communes.</li> <li>▲ Guidelines review.</li> <li>▲ List of recommendations</li> <li>▲ List of storage areas presented</li> </ul>	

Outcome 5: Socio-economic impact study of selected technologies and methods

<p>Activity 5.1: Socio-economic study of the proposed master plan for the commune of Petté</p>	<ul style="list-style-type: none"> <li>▲ Features of assessment parameters for dairy value chains in the phases of production, intermediate stockage and transport to the sale point.</li> <li>▲ Features of social groups implicated.</li> <li>▲ Number of identified direct economic beneficiaries from the master plan.</li> <li>▲ Number of civil society and labor union groups implicated in the master plan</li> <li>▲ Expected quantity of general economic benefit that the</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Socio-economic study, including the gender impact of the proposed master plan for the commune of Petté</li> <li>▲ Assessment parameters that will focus on: gender, value links, national frameworks and local particularities</li> <li>▲ Inclusion of varied cultural groups that will include minorities (women and youth)</li> <li>▲ 200 identified direct economic beneficiaries from the master plan.</li> <li>▲ 7 civil society and labor union groups implicated in the master plan</li> </ul>	<ul style="list-style-type: none"> <li>▲ Review of assessment parameters</li> <li>▲ Matrix of social groups implicated explaining the specific participation in the master plan</li> <li>▲ List of identified direct economic beneficiaries from the master plan.</li> <li>▲ List of civil society and labor union groups implicated in the master plan</li> <li>▲ Review formulas used for quantifying the economic benefit for the communes in 5 and 10 years terms</li> </ul>	
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	<ul style="list-style-type: none"> <li>communes would receive in 5 and 10 years terms.</li> <li>Number of general socio-economic positive impacts of the project</li> </ul>	<ul style="list-style-type: none"> <li>100.000 USD of benefit for the communes in 5 years and 400.000 in 10 years.</li> <li>10 of general socio-economic positive impacts of the project</li> </ul>	<ul style="list-style-type: none"> <li>Matrix of socio-economic positive impacts of the master plan with the correspondent explanation of each impact.</li> </ul>
Activity 5.2: Socio-economic study of the proposed master plan for the commune of Wina	<ul style="list-style-type: none"> <li>Features of assessment parameters for dairy value chains in the phases of production, intermediate stockage and transport to the sale point.</li> <li>Features of social groups implicated.</li> <li>Number of identified direct economic beneficiaries from the master plan.</li> <li>Number of civil society and labor union groups implicated in the master plan</li> <li>Expected quantity of general economic benefit that the communes would receive in 5 and 10 years terms.</li> <li>Number of general socio-economic positive impacts of the project</li> </ul>	<ul style="list-style-type: none"> <li>1 Socio-economic study, including the gender impact of the proposed master plan for the commune of Petté</li> <li>Assessment parameters that will focus on: gender, value links, national frameworks and local particularities</li> <li>Inclusion of varied cultural groups that will include minorities (women and youth)</li> <li>100 identified direct economic beneficiaries from the master plan.</li> <li>3 civil society and labor union groups implicated in the master plan</li> <li>60.000 USD of benefit for the communes in 5 years and 280.000 in 10 years.</li> <li>10 of general socio-economic positive impacts of the project</li> </ul>	<ul style="list-style-type: none"> <li>Review of assessment parameters</li> <li>Matrix of social groups implicated explaining the specific participation in the master plan</li> <li>List of identified direct economic beneficiaries from the master plan.</li> <li>List of civil society and labor union groups implicated in the master plan</li> <li>Review formulas used for quantifying the economic benefit for the communes in 5 and 10 years terms</li> <li>Matrix of socio-economic positive impacts of the master plan with the correspondent explanation of each impact.</li> </ul>
Outcome 6: Definition of a roadmap including regulatory instruments and financial mechanisms			
Activity 6.1: Development of a roadmap of mechanisms for the promotion and implementation of sustainable and resilient dairy value chains	<ul style="list-style-type: none"> <li>Number and type of involved actors in the promotion and implementation</li> <li>Number of entry points for the local communities</li> <li>Number of solutions to be scaled up</li> <li>Number and type of regulatory instruments</li> <li>Number and type of credit sources for value chain actors</li> </ul>	<ul style="list-style-type: none"> <li>1 Roadmap, including regulatory instruments and financial mechanisms for the promotion and implementation of sustainable and resilient dairy value chains for the communes of Petté and Wina</li> <li>25 involved actors</li> <li>5 entry points for each commune (10 in total)</li> <li>12 months of implementation</li> <li>2 solutions to scale up</li> </ul>	<ul style="list-style-type: none"> <li>Roadmap review</li> <li>List of involved actors</li> <li>Critical matrix with scale up solutions</li> <li>Timeline for illustrating the roadmap proposed implementation plan.</li> <li>Definition and list of planned entry points</li> </ul>

<ul style="list-style-type: none"> <li>▲ Timeline of implementation</li> </ul>	<ul style="list-style-type: none"> <li>▲ 5 regulatory instruments</li> <li>▲ 2 financing mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>▲ Critical matrix with proposed regulatory instruments and financial mechanisms</li> </ul>
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Outcome 7: Training and capacity building of dairy farmers on the implementation of a sustainable and resilient dairy value chain

<p>Activity 7.1: Installation of an appropriate temporary storage system</p>	<ul style="list-style-type: none"> <li>▲ Location of the appropriate installation site</li> <li>▲ Number and type of storage technologies to be installed</li> <li>▲ Number and type of energy sources harnessed</li> <li>▲ Volume capacity of the storage system.</li> <li>▲ Number of actors involved in installation and maintenance</li> <li>▲ Number of actors involved in operations</li> <li>▲ Number of actors profiting from the storage system</li> <li>▲ Timeline of installation</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Report explaining the implementation of the technologies (with photos and explanation of the implementation process: place, time, present actors, steps of the installation, implementation, etc.)</li> <li>▲ Specific coordinates of the appropriate installation site</li> <li>▲ 1 dairy storage tank to be installed</li> <li>▲ 4 solar panels as energy sources harnessed</li> <li>▲ Number of solar panels used time</li> <li>▲ 800L of the storage system.</li> <li>▲ 8 involved in installation and maintenance</li> <li>▲ 2 involved in operations</li> <li>▲ 30 profiting from the storage system</li> <li>▲ 1 month installation</li> </ul>	<ul style="list-style-type: none"> <li>▲ Identification of the proposed installation site</li> <li>▲ Detailed list of storage technologies to be installed</li> <li>▲ Detailed list of energy sources harnessed</li> <li>▲ Identification of volume proposed for the storage system.</li> <li>▲ List and organigram of actors involved in installation and maintenance</li> <li>▲ List and organigram of actors involved in operations</li> <li>▲ List and scheme of actors profiting from the storage system</li> <li>▲ Review timeline of installation</li> </ul>	
<p>Activity 7.2: Training and capacity building workshop for dairy farmers in the communes of Petté and Wina on the master plan, the proposed roadmap and selected technologies</p>	<ul style="list-style-type: none"> <li>▲ Number of workshops conducted</li> <li>▲ Number of participant stakeholders</li> <li>▲ Number of representatives from different social and cultural groups (women, youth and ethnic groups) involved in the workshops</li> <li>▲ Number of main topics approached</li> <li>▲ Number of questions posed and answered</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Report of the demonstration workshop</li> <li>▲ 3 workshops conducted</li> <li>▲ 40 participant stakeholders</li> <li>▲ 8 different representatives from social groups (women, youth) involved in the workshops</li> <li>▲ Main topics approached (divided according to its pertinence to different components of the dairy value chain)</li> <li>▲ Questions posed and answered (divided according to its pertinence)</li> </ul>	<ul style="list-style-type: none"> <li>▲ Minutes of workshops conducted</li> <li>▲ List of participant stakeholders</li> <li>▲ List of social groups representatives (women, youth) involved in the workshops</li> <li>▲ List of main topics approached</li> <li>▲ List of questions posed and answered</li> </ul>	<p>Follow pedagogical and capacity building principles</p> <p>Both the questions and the topics will vary according to the results of activities 4, 6 and 7.1.</p>

	<ul style="list-style-type: none"> <li>▲ Number of conclusions and recommendations extracted</li> </ul>	<ul style="list-style-type: none"> <li>to different components of the dairy value chain)</li> <li>▲ 10 conclusions and 10 recommendations extracted</li> </ul>	<ul style="list-style-type: none"> <li>▲ List of conclusions and recommendations extracted</li> <li>▲ Presentation used in the workshop</li> </ul>
<p>Activity 7.3: Development of a technical guide (infographic) to ensure an integrated approach combining the different technical and technological solutions for the management of dairy products, translated into the main languages of the country</p>	<ul style="list-style-type: none"> <li>▲ Number of solutions included in the guide</li> <li>▲ Number of languages into which the guide is translated</li> <li>▲ Number of distributed copies</li> </ul>	<ul style="list-style-type: none"> <li>▲ 1 Infographic guide to the technical and technological solutions proposed for each stage of conservation (production, storage, transport) translated into 3 local languages</li> <li>▲ 4 solutions included in the guide</li> <li>▲ 4 languages into which the guide is translated</li> <li>▲ 100 distributed copies</li> </ul>	<ul style="list-style-type: none"> <li>▲ Review of the infographic guide produced and the solutions presented in it.</li> <li>▲ List of copies distributed.</li> <li>▲ Review of the local languages in which the infographic guide has been translated.</li> </ul>

## Impact Statement

Challenge	<p>The Far-North Region of Cameroon is highly subjected to droughts, hunger, desertification, environmental degradation and it is a zone highly exposed to climate change. Furthermore, despite having agriculture and animal husbandry as leading sectors in its economy, Cameroon is one of the countries in the world where the production and consumption of <b>milk per capita is the lowest</b>. Together with transport and poor economic growth, access to energy is one of the main challenges which is slowing down local development. This lack of energy derives from a poor, and even inexistent in some parts, electricity network.</p> <p>The Technical Assistance to Cameroon to develop the Energy-Water-Livestock project for the dairy value chain will foster sustainable local development through the use of off-grid renewable energy technologies.</p>
CTCN assistance	<p>To provide a Technical Assistance that will develop a Water-Energy-Livestock plan for the dairy value chain and support its posterior implementation. The project will be focused on the municipalities of Petté and Wina, in North Cameroon. Consequently, this project will entail a feasible and tailored master plan for the conservation and distribution of dairy products, together establishment of a roadmap and development of training and capacity building material. The CTCN TA will respond to an in-depth diagnosis of the whole dairy value chain in the region and will be adapted to the contextual particularities.</p>
Anticipated impact	<ul style="list-style-type: none"> <li>▲ Strengthen the food security of the region and enhance resilience towards against unexpected inconveniences.</li> <li>▲ Inclusion of renewable energies in the value chaing that will increase the economic resources and wellbeing of local populations at the time that will reduce production losses.</li> <li>▲ Creation of a resilient local value chain through the use of varied technologies that strengthen the adaptation component.</li> <li>▲ Creation of multiple jobs, foster economic growth, specifically pursue local development in the selected communes and in generally create economies of scale at regional and national levels</li> </ul>
Anticipated co-benefits from the TA	<ul style="list-style-type: none"> <li>▲ The project will integrate the young people and the women to its solutions, consequently fostering a larger inclusion of these two minority groups in the rural development field.</li> <li>▲ The project will enhance the positive transformation of the local economies, the sustainable development of the region and the empowerment of the different vulnerable groups.</li> <li>▲ The consolidation of the UN Support Plan for the Sahel, accelerating prosperity by ensuring peace and development.</li> </ul>
Gender aspects of the TA	<p>Gender perspective will be one of the main central components that will guide the project and will be present in all its different stages.</p> <p>First, we will conduct an assessment of the women presence in the value and we will measure the level of awareness of gender inequalities, being able to identify all the different weak points to address and vacuums to use. After this analysis, women we will produce adapted master plans for both communes and training material. All the different outputs will need the validation of the Gender expert, in charge of ensuring the gender component, and furthermore, the workshops will have an equal representation of both men and women.</p> <p>The DAC Gender Equality Marker will be used to suggest appropriate interventions that address identified needs.</p> <p>The main benefit from this perspective will result in the empowerment of women in the region, through the acquisition of ownership in the sustainable development of local communities.</p>

<p>Anticipated contribution to NDC</p>	<ul style="list-style-type: none"> <li>▲ Improve access to electricity in rural areas through the promotion of renewable energies, and specially the application of off-grid solar technologies.</li> <li>▲ Strengthening local communities resilience towards climate change derived hazards and effects.</li> <li>▲ Contribution to technology transfer to companies, authorities and research institutions from Cameroon, together with conducting capacity building activities to local stakeholders involved in the dairy sector, in order to correlate climate change mitigation together with development.</li> </ul>
<p>The narrative story</p>	<p>On the one side, the Far North Province of Cameroon is featured by its lack of development, vulnerability towards climate change and food security problems. Furthermore, despite the opportunities bring by the landscape and the strong human capital, the local population haven't been able to exploit its potential of building up a consistent livestock sector due to the lack of a stable energy supply system and a transportation network. Furthermore, the lack of awareness towards climate change, increases the impacts of climate hazards in the region, and hampers local development.</p> <p>On the other side, in its NDCs, NAMA and PNACC, Cameroon has clearly outlined its will to develop a an economic growth strategy correlated with the climate adaptation and mitigation actions.</p> <p>In this context, the TA designed by the CTCN will confront the food security challenge in the communes of Petté and Wina, by the strengthening of the dairy value chain. Taking into account the electricity difficulties, the team will focus in promoting the use of solar off-grid technologies that will grant independent operation and self-sustainability of the different components of the dairy value chain. Consequently by using carbon-free technologies, the dairy sector will be optimized and enhanced creating new jobs and bolstering economic activity in the region.</p> <p>In order to ensure the long-term feasibility and sustainability of the solution presented. The TA will also consist in an intensive and extensive capacity building program that will make effective the technology transfer and reinforce the autonomy of the stakeholders intervened.</p>
<p>Contribution to SDGs</p>	<ul style="list-style-type: none"> <li>▲ SDG 5 : Achieve gender equality and empower all women and girls : The TA will place gender equality in its center, ensuring that all the different activities carried out represent all sectors of society and integrate the historically marginalised social groups, such as women and youth. For this purpose women will be represented in all the stages of the project and will be integrated in the resulting value chain.</li> <li>▲ SDG 13.1: Take urgent action to combat climate change and its impacts: Our project will identify the most appropriate technologies for both launching the dairy sector and at the same time strengthening the adaptation actions. At the same time, the project will focus on a technology transfer to the local population implicated in the dairy value chain, characterized by the use of solar off-grid technologies.</li> <li>▲ SDG 13.2: Capacity building will be the second component which will be covered by our team. The University of Maroua Personnel will be in charge of training and raising awareness among the local, regional and national stakeholders, regarding the sustainable management of resources and food security affected by Climate Change.</li> </ul>
<p>Reference to knowledge products</p>	<ul style="list-style-type: none"> <li>▲ Plan Communal de Developpement de Pette.</li> <li>▲ Plan Communal de Developpement de Wina.</li> <li>▲ Influence des conditions de la traite sur les qualités physico-chimiques et microbiologiques du lait cru collecté à Maroua, Cameroun (2018).</li> <li>▲ Socia-technical changes in the dairy production systems and milk marketing in Sikasso periurban zone (Mali) (2008).</li> <li>▲ Clean Energy for Productive Use in Post-Harvest Value Chains : An Integrated Literature Review with Field Work for the Kenya and Senegal Dairy Sectors (2018).</li> </ul>

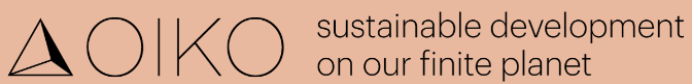
# CHAPTER 3. Work Plan


Outputs	Main-Activities	Activities	Deliverables	Deadlines	Responsibility	TOTAL Days of Work	SMART Indicators	Comments
Output 1: Implementation planning and periodical reporting documents	Preparation of the Inception and reporting documents.	Activity 1.1. To Prepare the consultancy Work Plan	D.1. Detailed work plan of all activities, deliveries, outputs, deadlines and responsible person and detailed budget	Mid June 21	Whole TEAM	11		
		Activity 1.2. To Develop the Monitoring and Evaluation Plan	D.2. Monitoring and Evaluation Plan	Mid June 21	PM and KE1	6		
		Activity 1.3. Develop a CTCN Impact Description	D.3. Two-page CTCN Impact Description	Mid-June 21	PM	5		
Output 2: Data Collection and diagnosis of the dairy value chain in the communes of Petté and Wina	Analysis and data collection on dairy value chain in the communes of Petté and Wina in Cameroon with a special focus on the impacts of the COVID-19 pandemic.	Activity 2.1: Data collection from dairy farmers in the communes of Petté and Wina in Cameroon.	D.1. Excel for data collection classified by years, production centers, production phase and report of the kick-off workshop	Mid August 21	KE1-KE3-NKE1-NKE2	34		The rainy Season can alter the data collection activities
		Activity 2.2: SWOT Analysis	D.2. SWOT Analysis	Early September 21	KE1-KE3-KE4-NKE1-NKE2	14		
		Activity 2.3: Diagnosis of the technological needs of the dairy value chain	D.3. Diagnosis of technological needs based on SWOT analysis.	Early September 21	KE1-KE3-KE4-NKE1-NKE2	19		
1st PROGRESS REPORT				Early September 21				


Output 3: Market study of technologies applicable to the local context	Conduct a Market Study of the different climate friendly technologies applicable to the local context	Activity 3.1: Identification and selection of technologies and methods for sustainable and resilient, less costly, socially acceptable dairy value chains at the production, intermediate storage and point of sales.	D.1. Draft Technical and detailed report on existing clean technologies to ensure the conservation of dairy products at the production, storage and transport taking into account the local context (communes of Pétte and Wima).	Mid October 21	Whole TEAM	50
		Activity 3.2: Workshops with involved stakeholders to validate the report about clean technologies to offer in value chain		Late October 21	KE3-NKE1-NKE2	8
		Activity 3.3: Finalize report according to stakeholders comments	D.2. Final technical and detailed report on existing clean technologies to ensure the conservation of dairy products at the production, storage and transport taking into account the local context (communes of Pétte and Wima).	Early November 21	KE2-KE3-KE3-NKE2	10
2nd PROGRESS REPORT				Early December 21		
Output 4: Master plan for the conservation of dairy products with the support of clean technologies for the	Elaborate a master plan for the conservation of dairy products (production, storage, transport) with the support of clean technologies for the communes of Pétte and Wina	Activity 4.1 Define the operation of a pilot project in the commune of Pétte	D.1. A master plan for the conservation of dairy products with the support of clean technologies from the commune of Pétte	Early January 22	KE1-KE3-KE4-NKE1-NKE2	44
		Activity 4.2: Define the operation of a pilot project, in the commune of Wina	D.2. A master plan for the conservation of dairy products with the support of clean technologies from the commune of Wina.	Early January 22	KE1-KE3-KE4-NKE1-NKE2	44


communes of Pette and Wina		Activity 4.3: Analyze the possibility of optimizing costs by defining storage areas and supply chain common to both communes	D.3. A report with recommendations to optimize the implementation costs between the 2 communes	Late January 22	KE1-KE3-KE4-NKE1-NKE2	18
Output 5: Socio-economic impact study of selected technologies and methods.	Develop a socio-economic impact study of selected technologies and methods	Activity 5.1: Socio-economic study of the proposed master plan for the commune of Pette.	D.1. Socio-economic study, including the gender impact of the proposed master plan for the commune of Pette	Mid February 22	KE1-KE2-KE4-NKE1-NKE2	19
		Activity 5.2: Socio-economic study of the proposed master plan for the commune of Wina	D.2. Socio-economic study, including the gender impact of the proposed master plan for the commune of Wina	Mid February 22	KE1-KE2-KE4-NKE1-NKE2	11
3rd PROGRESS REPORT				Early March 22		
Output 6: Roadmap including regulatory instruments and financial mechanisms	Define a roadmap including regulatory instruments and financial mechanisms	Activity 6.1: Development of a roadmap, including regulatory instruments and financial mechanisms for the promotion and implementation of sustainable and resilient dairy value chains	D.1. Roadmap, including regulatory instruments and financial mechanisms for the promotion and implementation of sustainable and resilient dairy value chains for the commune of Pette and Wina.	Mid March 22	Whole Team	30
Output 7: Training and capacity building of dairy farmers on the implementation of a sustainable	Implementation of a pilot storage system, execution of a training workshop and development of technical material for capacity building	Activity 7.1: Installation of an appropriate temporary storage system	D.1. Report explaining the implementation of the technologies (with photos and explanation of the implementation process: where, when, who were present, the steps of the installation, the set-up, the testing exercise, etc.).	Mid March 22	KE1-KE2-KE3-NKE1-NKE2	15


and resilient dairy value chain	Activity 7.2: Training and capacity building workshop for dairy farmers in the communes of Pétte and Wina on the master plan, the proposed roadmap and selected technologies.	D.2. Report of the demonstration workshop of the selected technologies and presentation of the master plan with the list of participants, photos, presentation etc.	Early April 22	KE1-KE3-NKE1-NKE2	16
	Activity 7.3: Development of a technical guide (infographic) to ensure an integrated approach combining the different technical and technological solutions for the management of dairy products, translated into the main languages of the country.	D.3. An infographic guide to the technical and technological solutions proposed for each stage of conservation (production, storage, transport).	Mid April 22	KE1-KE3-NKE1-NKE2	12
	Activity 7.4: Development of closure and Data Collection Report	D.4. Closure and Data Collection Report	Late April 22	PM and KE1	8



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