

Executive Summary on the Study

Energy Efficiency and Sustainability as an Austrian Solution for Kenyan Dairy Industrial Processes

Kenya has a long-lasting tradition in milk farming. The dairy industry goes back to the 1900 with colonial farmers establishing large scale dairy farms. The market is segregated into a formal and informal sector. The dairy industry contributes an estimated 5% of Kenya's GDP and 14% of Kenya's agricultural GDP. It provides livelihoods to 1,8 Mio. smallholder dairy farmers and provides estimated 750.000 direct and another 500.000 indirect jobs.

The milk production is mainly undertaken by small dairy farmers with a very low productivity between 5-9 litres of raw milk per cow and day, mainly due to poor feeding including water issues, genetic issues and poor animal husbandry practices.

Milk production and especially small milk farming has been promoted by the Kenyan Government supported by school milk programmes, organization of dairy farmers into cooperatives and subsidized agriculture. Anyhow, the sector is still suffering from low productivity and low raw milk prices for small milk farmers.

Depending on the detailed processes in the milk processing, the used energy source and temperature levels can vary with an impact on the energy demand and the energy saving potential. Technical improvements are necessary in the area of energy access and the utilization of energy as the access to the electrical grid and the grid infrastructure is low, cost for energy is unpredictable and high with a low reliability as power outages occur several times a week. All these technical factors influence the industrial production and have an impact on the productive development of this sector. On the other hand, beside all these obstacles a steady rise in demand for save, processed and packaged milk products in the country, changes in consumer preferences for conveniently packaged and flavourful milk products, the rising urbanization and incomes, the emergence of innovatively formulated and packaged dairy products and changes in the retail industry, are creating the best future opportunities for the dairy industry.

The aim of this project is to identify opportunities for an upgrade of the milk production processes and to develop business models for financing of the identified technology. The study is a pilot project that aims to show opportunities for Austrian technology providers. As Austrian knowledge and technology is used, the results give Austrian companies visibility in Kenya, a high possibility to build up future oriented businesses and establish new distribution channels in this promising market.

As a partner for this study a local Dairy named Aspendos Dairy in Kangema, Kenya has been chosen. This company represents a strong player in the dairy industry in the area. It has been founded back in 1990 as a family business and currently employs 450 people, works with 180 distribution outlets and buys raw milk from approximately 8.500 mostly small farmers and 38 organised farmer groups.

The methodology used was a combination of desk research, personal contacts and meetings with Austrian technology providers and milk processors, cattle husbandry experts, technology providers and Banks as well as Kenyan dairies, Banks and Leasing Companies for financing. During the whole work period contacts have been established with the defined stakeholders to ensure a practical approach and workability. Finally, we also worked closely with the Commercial Section of the Austrian Embassy in Nairobi, especially, the Trade Commissioner, Mrs. Edith Predorf, who also presented at our event where we introduced and discussed the results of the study.

The starting point of the project was an evaluation process at Aspendos Dairy in order to understand the actual technical and economic situation. Main identified issues and challenges can be summed up as:

- Energy Access & Utilization - due to problems with the access to grid-electricity from Kenya Power and the existing energy supply
- Energy Expense – as cost for electricity is unpredictable and expensive
- Reliability - regular power outages, ranging from 3-5+ times per week, resulting in a need for fossil-based backup systems (primarily diesel generators and fuel), increased wear and tear on equipment (through frequent stops and starts) and spills, jams, and other mishaps on the packing lines
- Technology Innovations – ageing energy infrastructure and instable supply, inefficient, not stable running processes

These issues create a high possibility for Austrian companies to build up future oriented businesses and establish new distribution channels in this promising market.

Energy access and utilization cost of energy has been identified as a key factor for the dairy production process and the economic development of the dairies. The various milk production processes are represented both in Africa and in Austria since the quality requirements for milk are almost identical. Likewise, the various processes used to produce dairy products from Aspendos Dairy Limited are very similar to those used by Austrian companies and small businesses. Therefore, Austrian dairy companies have been approached and literature has been searched to identify technical system components from Austrian milk producers in the production process.

This has been compared with the Aspendos dairy data and based on the results the following technology opportunities for Aspendos dairy have been identified:

- Hot water steam systems
- Heat recovery by upgrading the existing steam boilers
- Combined heat and power (CHP)
- Wastewater treatment
- Geothermal energy in connection with an absorption chiller

As shown, technical improvements are necessary in the area of energy access and the utilization of energy as the access to the electrical grid and the grid infrastructure is low. Concerning the industry, the expenses for energy as a cost factor are unpredictable and expensive as smart meters are not used and final energy bills are not reliable. Furthermore, frequent power outages occur several times a week which makes it necessary to use back-up systems mainly based on fossil fuels.

Within this feasibility study an evaluation on the potential use of photovoltaic at the Headquarter has been made. Therefore, at the premises of the Aspendos Dairy Headquarters two different options have been analysed in detail. Additionally, for the milk collection stations a 100% solar coverage with no grid connection has been analysed.

- Option 1: Use of the total roof area for PV integration
- Option 2: 100% solar coverage of the electrical demand of the production process

As a 100% solar coverage of the electrical demand can't be met within the provided area, an open area is defined in the vicinity of the dairy, on which further modules are placed. If a 100% solar coverage cannot be achieved, the remaining energy requirement is covered by a battery storage system and additional generators to be able to guarantee energy self-sufficient electricity operation.

- Option 3: For the milk collection stations, a 100% solar coverage via a PV system needs to be achieved as the grid infrastructure is not available.

Based on the economical assessment it turned out that option 1 - the PV roof installation – is the most economically feasible option with an amortisation period of around 3 years.

Additionally, to this effort and in a cooperation with Austrian LSG Group, offers for the installation of PV plants in varied sizes and options have been provided to Aspendos Dairy. These offers are currently evaluated. This Austrian Technology partner has also been considered as part of the business model development, as financing banks and institutions require a strong and reliable technology partner with an established track record.

The profitability of an investment in a PV power plant has been calculated and has shown a significant cost savings potential in combination with an increase of energy reliability and a positive environmental impact.

For the development of business models for the concrete installation contacts have been established with several partners along the project chain including:

- Austrian Technology Provider LSG as EPC for the technology
- I&M Bank as Kenyan Financial Institution to finance the investment
- Quipbank/VAELL as Leasing or PPA partner

The following three business models for implementation have been developed and discussed with the involved stakeholders:

- PV Purchase Model including a bank loan: the dairy purchases the PV plant from the technology provider financed by a bank loan.
- PV Leasing Model: a local leasing company buys the PV plant and leases it to the dairy. The leasing company is refinanced by a bank and the dairy pays a leasing fee to the Leasing company. Additionally, there is an option for the dairy to take over the PV plant after the leasing period.
- PPA Model: an independent power purchase producer (IPP) buys the PV plant and installs it at the dairy. The dairy pays the used electricity to the IPP. The IPP finances the purchases of the PV plant with a loan from a bank.

Additionally, as a business model opportunity for small milk farmers we identified possibilities on how to finance small milk farmers. There is a livestock management solution available that includes a software for tracking of cattle, an insurance product and a dairy loan supporting financial growth. The loan product is available for stock replacement, purchase of new stock, farm structural improvements, purchase of farm implements and inputs. The maximum size of the loan is KSh 120.000.-. Milk farmers can create a credit history with repayment of loans and over time qualify for higher amounts for financing. The maximum tenor of the loan is 10 months and the interest rate 5% per month. For this model the microcredit organization Fortune Credit has been identified as possible local partner,

This model could be also extended with training by experts from the Austrian Fleckviehzuchtverband to combine know-how improvements with the financial opportunity for business growth.

As dissemination activities we included various activities including calls, MS Teams meetings, visits and conferences, meetings in person and trips to Kenya. In order to reach our goal, we also included our local representative, Mr. Michael Simiyu and the Commercial Counsellor at the Austrian Embassy in Kenya, Mrs. Edith Predorf and her team.

We established contacts with Austrian dairies, technology providers and experts. Additionally, we included local financial institutions, dairies and milk farmers in Kenya. In May 2022 we also organized an event at the Austrian Embassy in Nairobi presenting our work and the results of the project. Finally, we published this Executive Summary on the SA Consulting GmbH Website.