



COSTS AND BENEFITS OF CLEAN ENERGY TECHNOLOGIES IN TUNISIA'S MILK VALUE CHAIN

The adoption of renewable energy (RE) technologies in the Tunisian milk sector is facing challenges, both in the dairy and the energy sector. Business opportunities are limited by fixed milk prices and lack of incentives for farmers to improve milk quality and hygiene. Artificially low energy prices due to fossil fuel subsidies lower the competitiveness of renewable energy alternatives.

The energy interventions assessed as case studies were unattractive from a financial point of view due to the high subsidies on electricity prices and low returns in markets for co-products (such as the digestate from anaerobic digestion). However, in both cases, including social and environmental externalities makes the investment economically positive.

Public, private and financial actors can facilitate the adoption of clean technologies in the milk value chain through revision of energy subsidies and milk prices, the introduction and enforcement of quality standards, financing programs, as well as capacity building and awareness raising activities.



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ENERGY TECHNOLOGIES IN THE TUNISIAN MILK VALUE CHAIN

The milk sector in Tunisia is concentrated mainly in the north of the country where it is dominated by small-scale farmers owning less than 10 hectares. Almost 100 percent of the population has access to electricity, but lack of incentives for farmers to improve milk quality and hygiene results in many small-scale dairy farmers not cooling milk at the farm level. In fact, there are usually no appropriate milk quality checks at milk collection centres (MCCs). Business opportunities in the milk sector are also limited by fixed milk prices.

As farmers have access to cheap electricity, renewable energy technologies are usually not competitive. Artificially low energy prices (in particular due to subsidies for grid electricity and agricultural diesel fuel) reduce their financial returns. This is particularly challenging for dairy smallholder groups who face difficulties in accessing credit, and therefore cannot meet the relevant initial investment in RE.

Moreover, there is low awareness of modern clean technologies (e.g. anaerobic digestion for power generation), especially in rural areas, as well as lack

of qualified experts in the sizing, design, and safety of systems, lack of support services and few demonstration projects. Uncertain regulations and bureaucracy are additional barriers to RE deployment.

Dairy farmers are reluctant to mix their milk with that from neighbours due to lack of trust. This may hinder the trend towards farmer clustering around MCCs.

Women are normally in charge of indoor activities such as animal caring and feeding, while men are involved in marketing of the milk and managing the resources. Women's role in the value chain is often undervalued and men typically control the largest portion of household income.

CASE STUDIES

Biogas for power generation and solar milk cooling with about 600 l capacity were selected as examples of suitable clean energy technologies. The technical potential for these technologies was estimated to be 73 and 580 installations respectively.

While dairy farming usually concerns small herds, trends towards increasing herd size and electricity prices

will increasingly make **biogas for power generation** a competitive technology, if current electricity subsidies are reduced and the digestate market becomes widespread.

Groups of small farmers or cooperatives are often located relatively far from the MCCs and hence face greater risk of having their milk rejected on delivery. **Solar milk coolers** can be a positive option for them, thus improving milk quality and value throughout the value chain.

None of these energy interventions is attractive from a financial perspective. However, social and environmental co-benefits make the investments positive from an economic perspective.

Grid electricity is heavily subsidised in Tunisia, and this makes the investment in biogas for power generation unable to financially pay back. Yet, the socio-economic and environmental benefits (from reducing electricity subsidies, taxes, digestate sales, GHG emissions avoided and employment creation) overcome the negative financial flows. A revision of the current electricity subsidy scheme would facilitate the adoption of clean technologies.

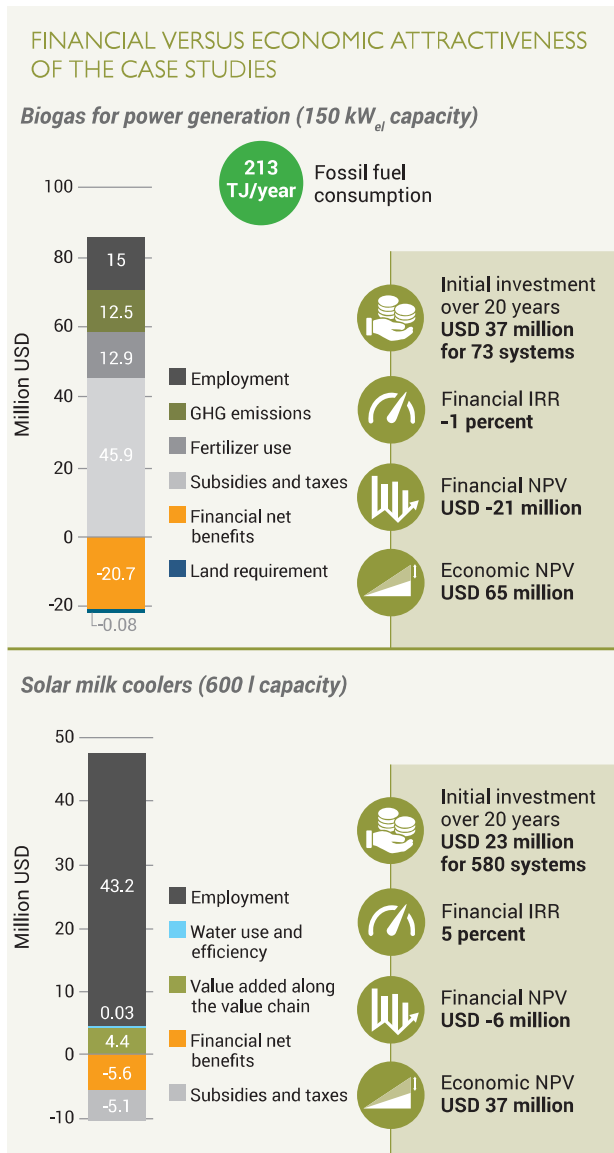
Furthermore, establishing a market for the digestate would make biogas technologies even more attractive.

Without the establishment and enforcement of minimum milk quality standards and a price premium for refrigerated quality milk, the investment in cooling technologies does not pay back from a financial point of view. The solar milk cooling technology would bring co-benefits in terms of employment and value added that would overcome the negative flows.

POSSIBLE SUPPORT INTERVENTIONS

Public, private and financial actors can facilitate the adoption of clean energy technologies in the milk value chain through target setting, regulatory framework schemes, investment and fiscal incentives, and knowledge and education schemes. Examples of possible interventions to spur the adoption of clean energy technologies in the Tunisian milk value chain include:

- simplifying **regulatory environment** for the adoption of RE;
- **revising subsidy schemes** for electricity and fossil fuels;
- establishing **codes and standards** for RE equipment (e.g. batteries) and co-products (e.g. digestate);
- setting **minimum milk quality standards** for milk collected from farmers and **enforcing stricter milk quality check** at collection points;
- introducing a **price premium** (backed by public funds) for refrigerated quality milk;
- facilitating **business opportunities** in the dairy sector, in particular for young and women farmers;
- developing **financing programmes**, including government-backed financial mechanisms for RE solutions, such as low interest subsidized loans or loan guarantees;
- promoting **awareness raising** activities on the benefits of RE to farmers and public officials;
- promoting **capacity development** through ad hoc university courses and professional training programmes, including in rural schools;
- providing **training and equipment** to interested farmers and milk collectors; and
- including **team and trust building activities** for farmers in existing extension service programmes.



Note: NPV: net present value; IRR: internal rate of return. Non-monetized impacts are depicted as circles (green: positive, orange: variable, red: negative impact) and quantified where possible.



For more information on the INVESTA project and a description of the case studies please visit: www.fao.org/energy/agrifood-chains/investa