CASE STUDY

I4F-WP1-Task 3

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the theoretical inner potential of Feng Tech STE system within the agricultural sector of XXXXX.
The current academic example focuses on a holding without on-farm processing and located in Roscommon. The assumptions are that it owns a herd of 90 cows for which it needs around XXXkWh of energy supply per year in order to clean its milking parlours and milk tanks.
After enumerating the main characteristics of this typical and fictional dairy farm, a simulation with the Feng Tech STE system illustrating expected results will be tackled.
This file will be completed and crossed with a real-life case with similar attributes.

!!!!invent for academic/anonymise for field application case!!!!!

PART I: ACADEMIC CASE

- *N°/Nickname:* N°1 / Irish Dairy Farm
- *Type of holding: Dairy Farm (without on-farm processing)*
- *Location (Country/Region): Roscommon, Ireland (Lat/Lon: 53372 ; -8033)*
- *Date: 13/10/21*

1 Initial characteristics of the installation: (Use Market Analysis + Technology Assessment)

- **Size of the surface/number of animals:** 90 cows
- **Water Use (heating/direct use):** Cleaning of the Milking Parlours & Storage
  - **Frequency:** twice
  - **Timeframe:** once in the morning and once in the evening
  - **Quantity:** 900L per day for the whole herd (assuming 10L of water per cow)
- **Version of FT STE system (***ETF 1 / ETF2): ETF 2 (with pressure)*
- **Temperature needed (in °):** 80°
- **Standard fossil energy used:** Electric Boiler
- **Price of fossil energy per €/kWh:** 0.21€/kWh (shift between day and night)
- **Energy consumption for the activity (in kWh/year):** 34994 kwh/year
  cf.with energy waste and differentiated needs depending on the period of the year, the energy need accounts for 34994 kWh/year
- **Expenditure of energy consumption (in EXCL TAX€/year):** 7,348.74€
  cf. 0.21 EXCL.TAX/€/kWh x 34994 kWh/year = 7348.74 EXCL. TAX €/year
  NB : use table by indicating the water consumption
- **Available subsidies for STE:** no subsidy
- **Amount of CO2 emission:** 15,957 kg *CO2/year*
  cf. given that 1kWh produces about 0.456 kg CO2(eq), 0.456 kg CO2/kWh x 34994 kWh/year = 15957 kg CO2/year
  + Beware to indicate the right conversion value in equivalent CO2 (not always 0.1kg CO2(eq)

Prerequisites of installation:

- Located on floor or roof
- Preference = South-West facing
- Not far from the holding to avoid additional energy needs for re-heating

Employed Version of the matrix = V10 Lille Study Case

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 59% (at least 50%; dimensioning so to)
  cf. precising when the farmer wanted willingly a restricted share of power supply + Depending on location and weather + the value is imposed as it is the hypothetical reference we want to check after with the field application case

- **Number of STE units to reach the energy needs:** 5 units
  cf. potential energy savings = 20643 kWh/year

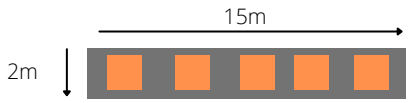
- **Overall front surface of capture:** 20 m2
  cf.1 FT = 4m2 ; 4m2/unit x 5 units = 20 m2

- **Maximum attainable temperature with the current solution (in °):** 100°T (optimal conditions)

- **Power (kW/unit):** 2.5kW/unit

- **Number of sensors needed for remote surveillance and monitoring:**
  Commercial scope = 2 thermometers + 2 flowmeters

- **Surface requirement for the equipment:**
  cf. Length of concrete slab = size of panels (2x2m) + space between panels (1m x t panels) / Width = 3 m



- **Solar energy contribution (in kWh/year)**: 20 643 kWh/year (use matrix)
  - Yearly Basis: 5 FT STE units' full potential = **20 643 kWh/year** *(relating to a specific simulation case)*
    cf. it corresponds to 13 005 kWh/year useful solar energy (depends on distance, insulation etc. / simulation from an average case)
  - Daily Basis: 20 643 kWh/year / 365 days = **56,6 kWh/day**

- **Savings on energy consumption (in €)**: 4 335.03*€ EXCL. TAX/year*
  cf. Given that, with energy waste and to heat 900 L of water, the energy saving accounts for 20 643 kWh/year x 0.21 €/kWh = 4 335.03 €/year

- **Remaining share of the standard energy used (per year):** 3013.71*€/year* (41 % ; 14 351 kWh/year)
  - In %: solar thermal energy represents 59% here so, remaining share of **41%**
  - In kWh: 34994 - 20643 = **14 351 kWh/year**
  - In €: 14 351 kWh/year x 0.21 €/kWh = **3013.71 €/year**

- **Remaining emission of CO2:** 6544 *kg CO2 (CO2 reduction up to 9413 kg CO2)*
  cf. 14 351 kwh/year x 0.456 kg CO2 = 6544 kg CO2

- **Previsionnal Cost (total - subsidies):** 30 000€
  cf. cost of equipment & installation + site preparation - potential aids = previsional cost
  - **Cost of the equipment & installation:** 25 000*€*
    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 3 units x 3800€/unit = 11400 €
  - **Cost of the site preparation:** 5 000*€*
    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *0 €*
    cf. average grant = XXX % ; X1 x X2 = XXX € *in the event of approval by regulating authorities*
    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 3979 *€ / year for 10 years* (in average)
  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **30 000€**
  - Duration: **10 years** / Loan rate = **5.90%** (with yearly increase) / STE Durability = **+30 years**
    => 30 000€ / 10 years = 3000 €/year ; taking into account the loan rate: **3979 €/year** (in average)

- **Return on investment (global expense / annual savings):** 6.9 *years*
  - Global expense = **30 000€**
  - Annual energy savings = **4335.03 € per year** during 30 years so in total : **4335.03** €/year x 30 years = **130 050.9 €**
  - ROI = 30000 € / 4335.03 € = **6.9 years**
  - ROIC = 4335.03 € / 30000 € = **14.5 %**

- **Yearly Earnings (Annual savings and yearly loan payment):** 356*€/year* (for 10 years, then 4335 €/year)
  cf. good if savings > loan
  - Annual savings = **4335.03 €**
  - Yearly loan payment = **3979 €**
  - Difference = 4335.03 - 3979 = **356.03 €/year of earnings during the 10 year-loan period / after = 4335.03 €/year**

- **Network of installers:**

- **Legislation for installation/Procedures and precautions:**

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)