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 Dairy Farms.
The current academic example focus on a holding without on-farm processing and set in Lincolnshire. The assumptions are that it owns a herd of 175 cows for which it needs around 42 741 kWh 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 / English Dairy Fam
- *Location (Country/Region):* Lincolnshire
- *Type of holding:* Dairy Farm (without on farm processing)
- *Date: 29/11/201*

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

- **Size of the surface/number of animals:** 175 cows
- **Water Use (heating/direct use):** Cleaning of Milking Parlours & Milk Storages
  - **Frequency:** Twice a day
  - **Timeframe:** Once in the morning ; once in the afternoon
  - **Quantity: 5,38 L/Cow/Day; 1963,7 L/Cow/Year; 942 L/Total/Day; 343830 L/Total/Year**
- **Version of FT STE system (***ETF 1 / ETF2): ETF 2 (with pressure)*
- **Temperature needed (in °):** 85°
- **Standard fossil energy used:** Electricity (boiler)
- **Price of fossil energy per kWh:** 0,16 HT/kWh
- **Energy consumption for the activity (in kWh/year): 42 741 kWh/year**
  cf.with energy waste and differentiated needs depending on the period of the year, the energy need accounts for 42 741 kWh/year
- **Expenditure of energy consumption (in EXCL TAX€/year):** 6838.56 €/year
  cf. XXX EXCL.TAX/€/kWh x XXX kWh/year = 6 838.56 EXCL. TAX €/year
- **Available subsidies for STE:** no subsidy for farming in UK
- **Amount of CO2 emission: 9 403 kg***CO2/year*
  cf. given that 1kWh produces about 0.220 kg CO2(eq), 0.220 kg CO2/kWh x 42 741 kWh/year = 9 403 kg CO2/year

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 %): at least 50% (HERE -** 61%)
  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**
  cf. potential energy savings = 25 930 kWh/year

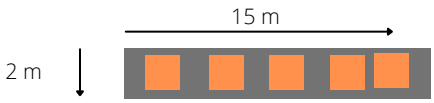
- **Overall front surface of capture:** 16 m2
  cf.1 FT = 4m2 ; 4m2/unit x 5 units = 20 m2

- **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)**: 25 930 kWh/year
  - Yearly Basis: 5 FT STE units' full potential = **25 930 kWh/year** *(relating to a specific simulation case)*
    cf. it corresponds to 16 336 kWh/year useful solar energy (depends on distance, insulation etc. / simulation from an average case)
  - Daily Basis: 25 930 kWh/year / 365 days = **71 kWh/day**

- **Savings on energy consumption (in €)**: 4148.8 *€ EXCL. TAX/year*
  cf. Given that, with energy waste and to heat XXX L of water, the energy saving accounts for 25 930 kWh/year x 0.16 €/kWh = 4148.8 €/year

- **Remaining share of the standard energy used (per year): 2 689.76***€/year* (39% ; 16 811 kWh/year)
  - In %: solar thermal energy represents 61% here so, remaining share of **39%**
  - In kWh: 42 741 - 25 930 = **16 811 kWh/year**
  - In €: 16 811 kWh/year x 0, 16 €/kWh = **2689.76 €/year**

- **Remaining emission of CO2: 3 698.42** *kg CO2 (CO2 reduction up to 5 704.58 kg CO2)*
  cf. 16 811 kwh/year x 0.220 kg CO2 = 3 698.42 kg CO2

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I4F-WP1-Task 3

- **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 = 5000€/unit / 5 units x 5000€/unit = 25 000€
  - **Cost of the site preparation:** 5000*€*
    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 : 3 193** *€/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 = **1,25 %** (with yearly increase) / STE Durability = **+30 years**

  => 30 000 € / 10 years = 3 000 €/year ; taking into account the loan rate: **3 193 €/year** (in average)

- **Return on investment (global expense / annual savings):** 7.2 *years*
  - Global expense = **30 000 €**
  - Annual energy savings = **4 148.8 € per year** during 30 years so in total : 4 148.8 €/year x 30 years = **124 464 €**
  - ROI = 30 000 € / 4 148.8 € = **7.2 years**
  - ROIC = 4 148.8 € / 30 000 € = **13.8 %**

- **Yearly Earnings (Annual savings and yearly loan payment): 1381,48***€/year* (for 10 years, then 3526,48 €/year)
  cf. good if savings > loan
  - Annual savings = **4 148.8 €**
  - Yearly loan payment = **3 193 €**
  - Difference = 4 148.8 - 3 193 = **956 €/year of earnings during the 10 year-loan period / after = 4 148.8 €/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)