

# Energy Efficiency in Dairy milk farms

Implementation of 500 standardized energy audits

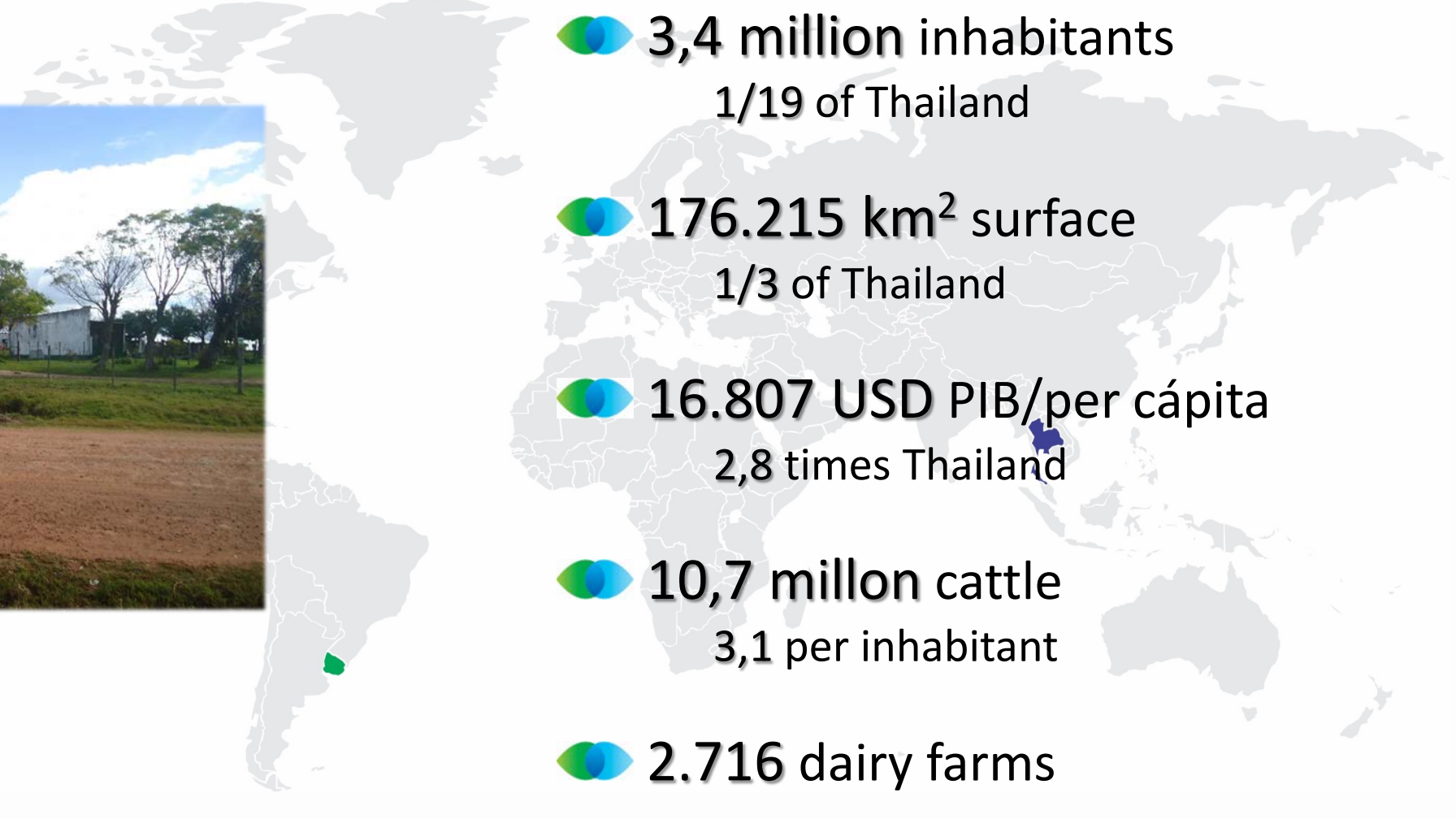







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# Uruguay: quick overview



- 
-  **3,4 million inhabitants**  
1/19 of Thailand
  -  **176.215 km<sup>2</sup> surface**  
1/3 of Thailand
  -  **16.807 USD PIB/per cápita**  
2,8 times Thailand
  -  **10,7 million cattle**  
3,1 per inhabitant
  -  **2.716 dairy farms**



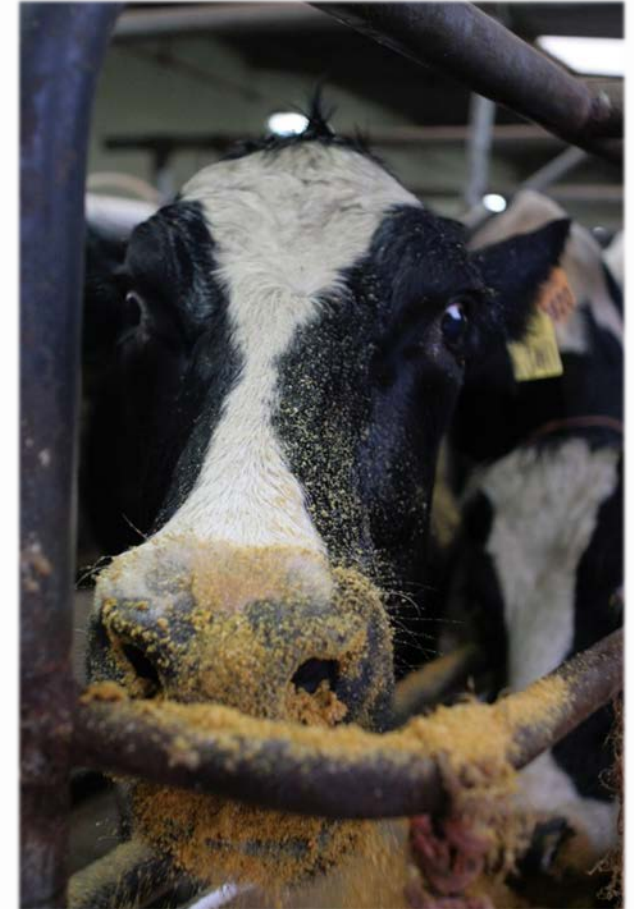
# Energy Efficiency project

Funded FOMIN / IDB & CONAPROLE

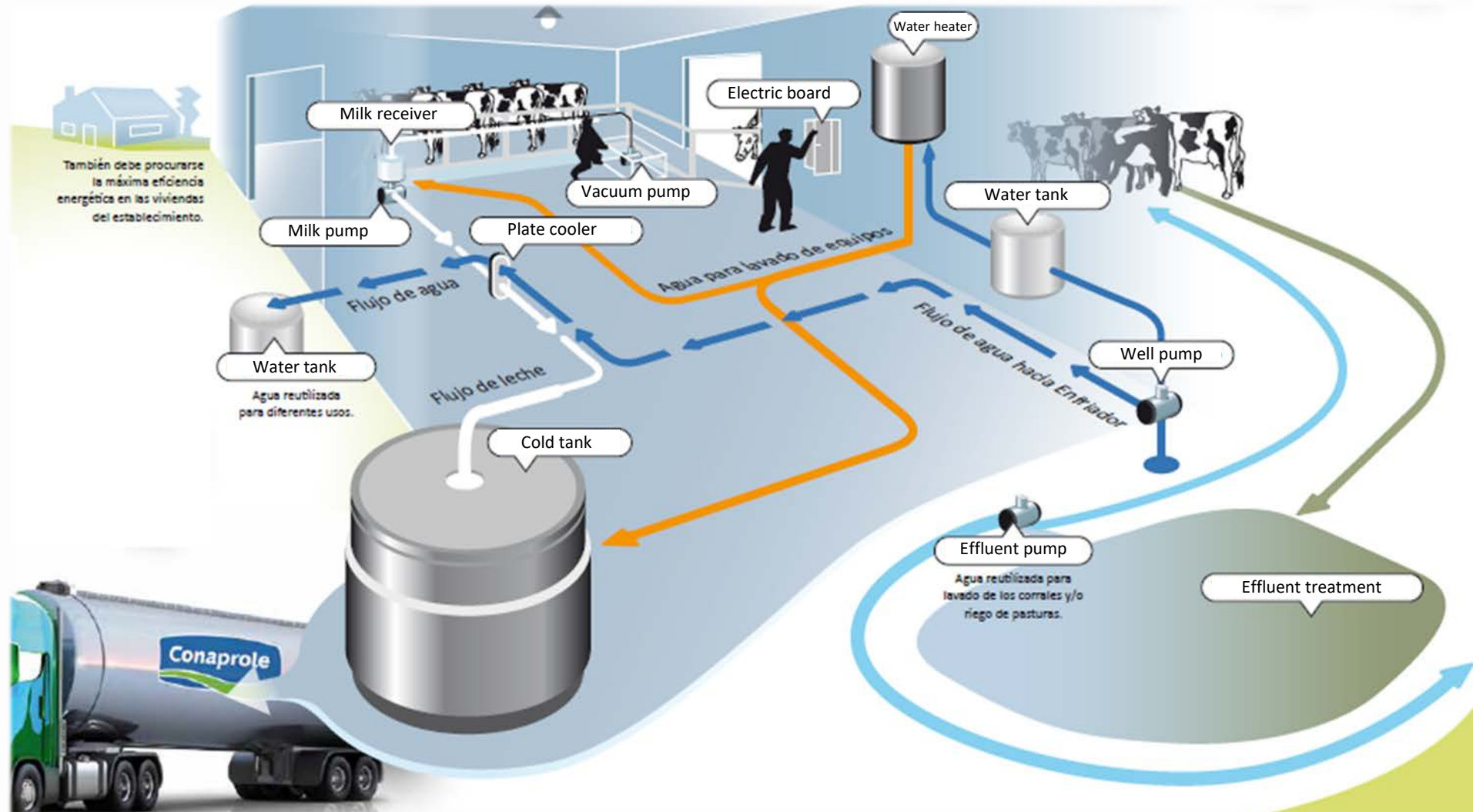
Purpose is to improve the energy efficiency of dairy farms

Standardized methodology for conducting 500 low cost energy audits.  
By April 2016, 540 dairy farms were audited.

IMPACT ANALYSIS: Asses the outputs of the Energy Efficiency project in 540 dairy farms (2017).

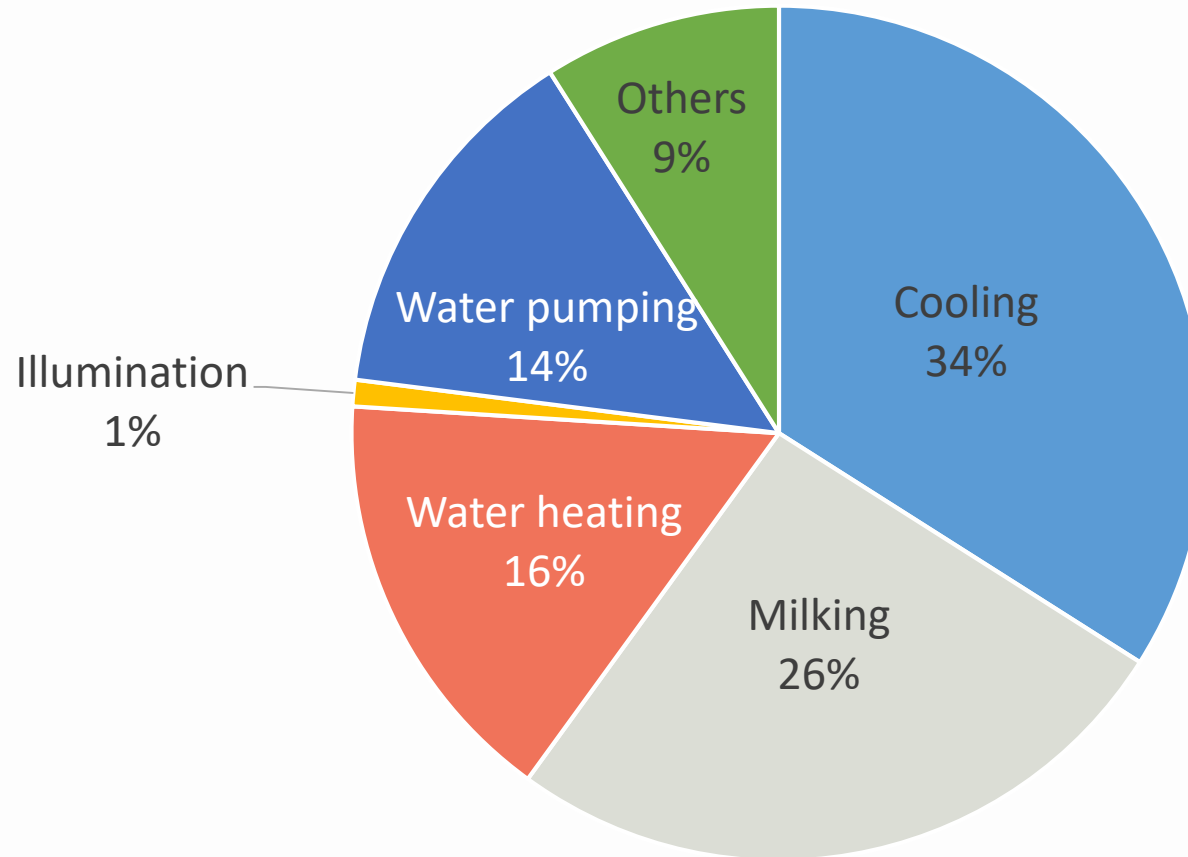


# Production structure of a dairy farm



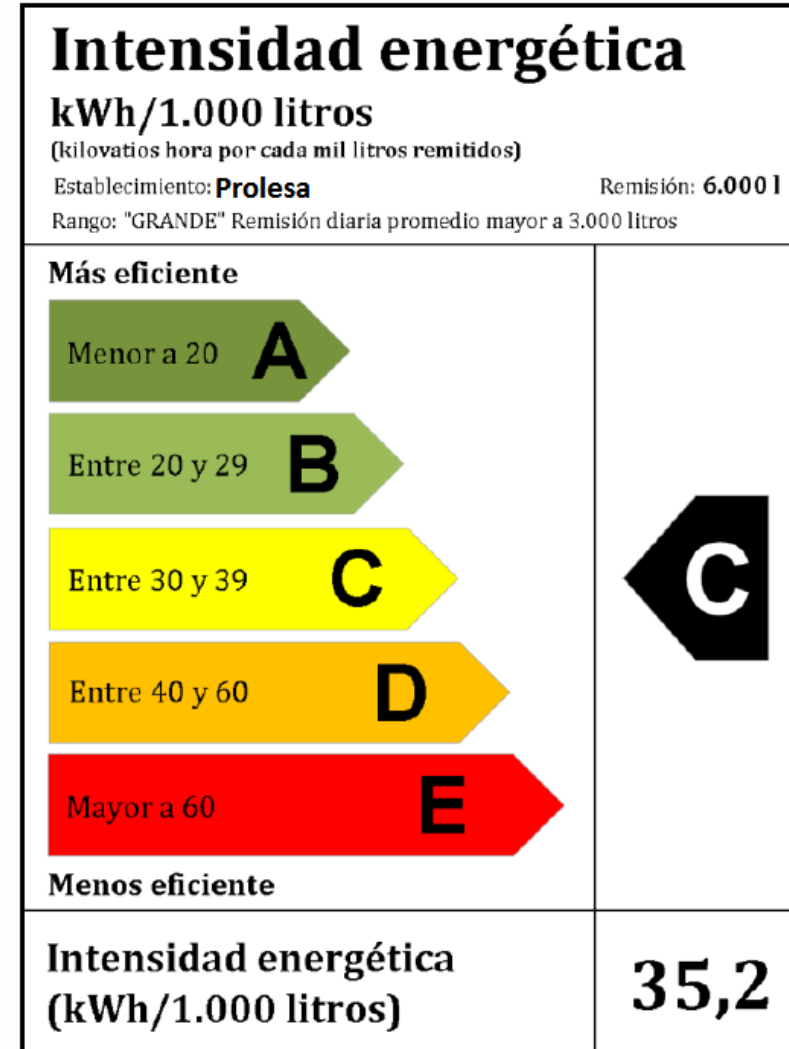


# Typical energy consumption



# Categorization of farms

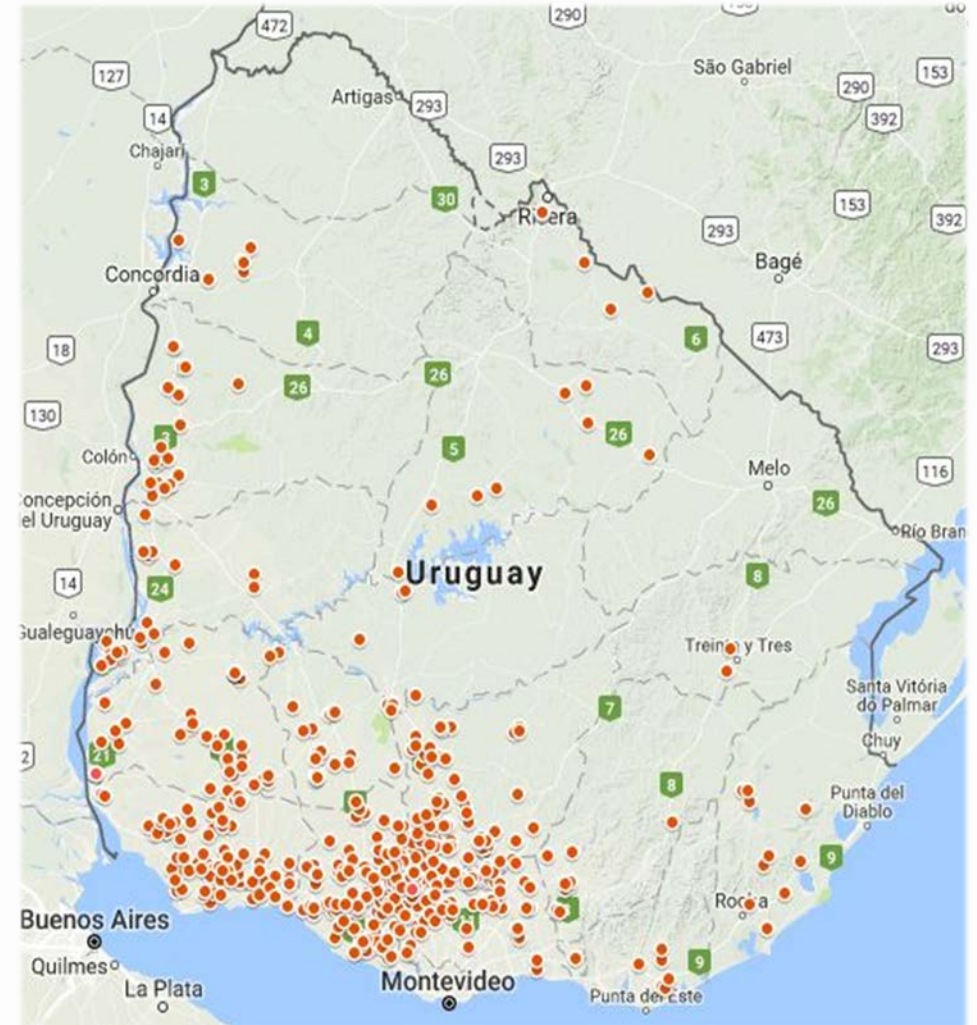
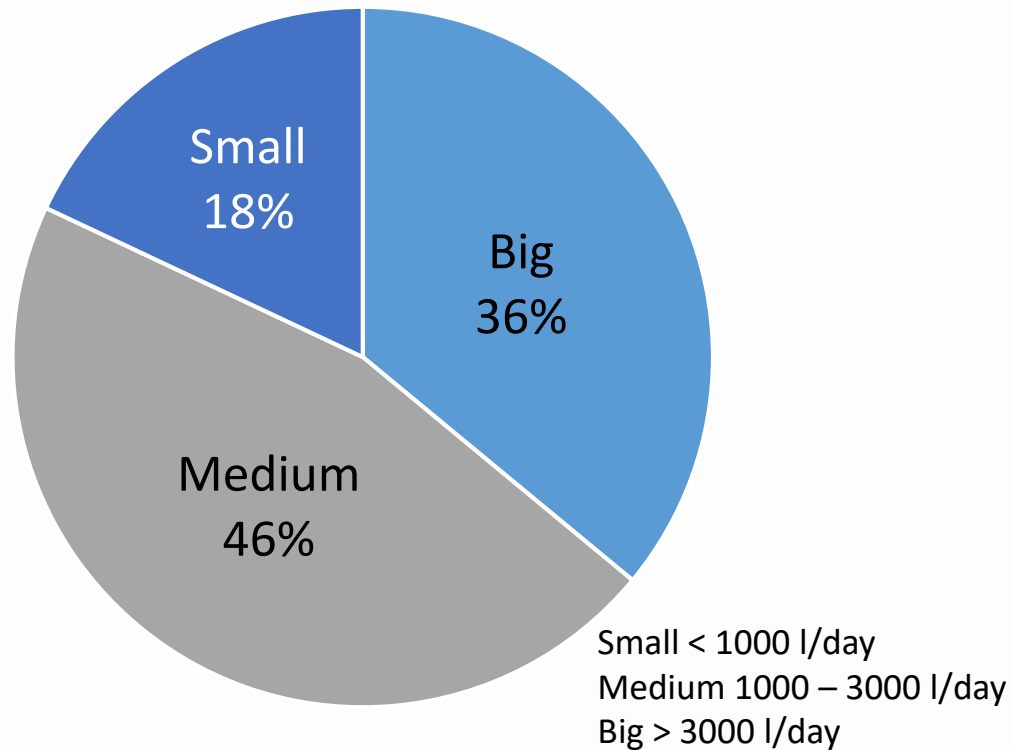
- Energy intensity styled as an "Energy Label".
- Energy Performance Indicator: kWh/ 1000 liters of milk produced



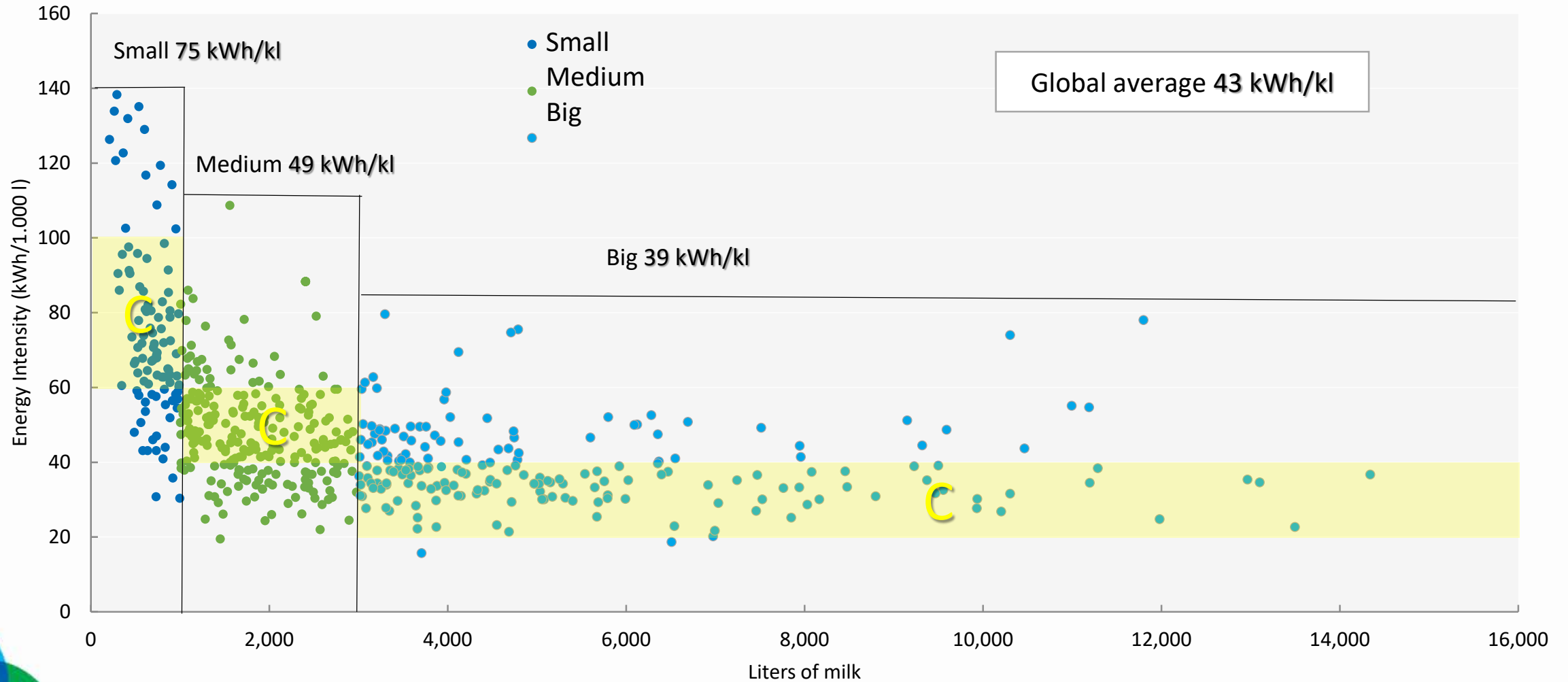
# Energy Audits

 540 audits performed

Distribution by scale



# Energy Intensity





# Types of recommendations

## Measures to reduce energy costs

- Reactive energy
- Change rate / Contracted demand
- Shift times of milking (to off peak rates)
- Timers in water heaters

## Measures for the conservation of energy

- Solar collectors
- Heat recovery from cooling equipment
- VSD in vacuum pump
- Heat recovery from hot milk (plate heat exchanger)
- Timers in water heaters

# Potential Savings

## Measures to reduce energy costs

Measure	Saving per year (USD)	Investment (USD)	Payback (years)
Rate	1.438	315	0,2
Contracted demand	1.258	740	0,6
Compensation of reactive energy	875	355	0,4
Shift milking time	1.029	-	-

## Measures for the conservation of energy\*

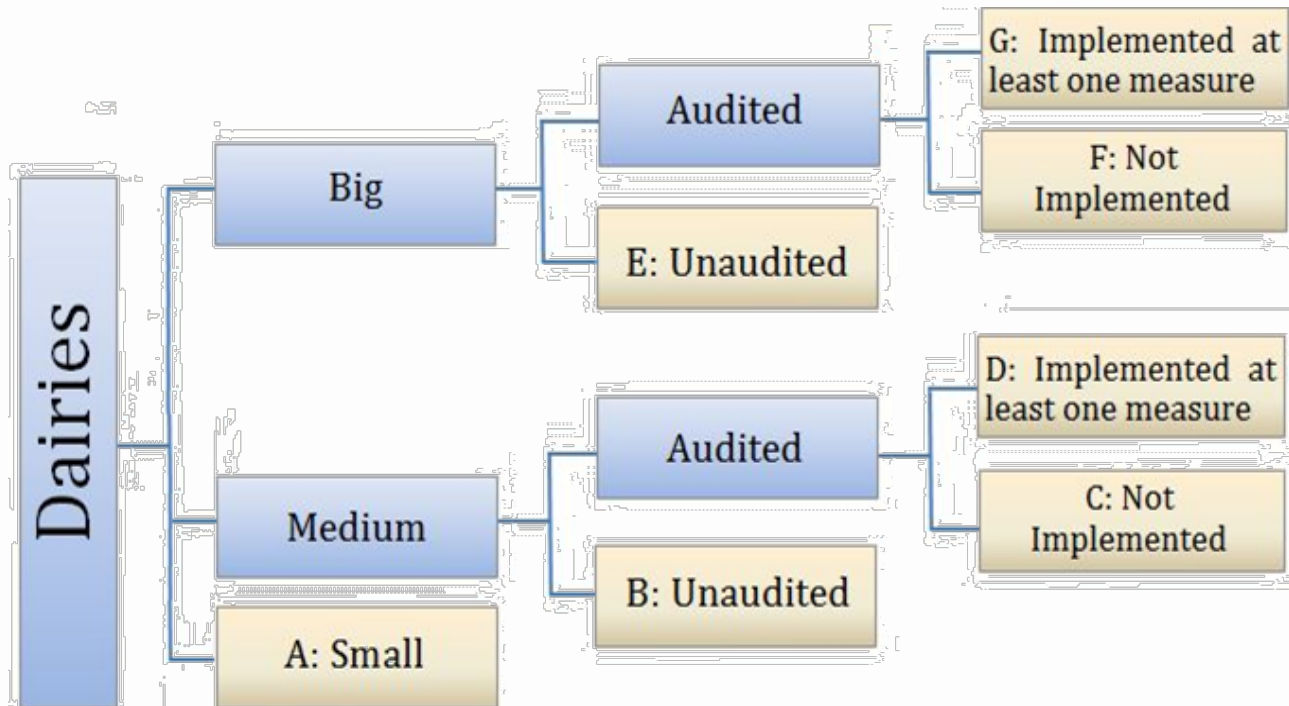
Measure	Saving per year (kWh)	Saving per year (USD)	Investment (USD)	Payback (years)
Plate heat exchanger	389	987	2.514	2,5
Speed Drive	412	833	3.526	4,2
Heat recovery tank	438	899	3.460	3,9
Solar collector	114	263	1.199	4,6
Timer	730	150	11	0,2



# Suggested measures

Annual savings	Big	Medium	Small	General
kWh	14.484	6.060	2.892	7.812
Impact	21%	20%	17%	20%
USD	4.758	2.426	1.630	3.180
Impact	35%	38%	41%	38%

# Impact evaluation



Group	Dairies
A: Small	11
B: Medium (Unaudited)	13
C: Medium (Audited – No implemented)	14
D: Medium (Audited – Implemented)	8
E: Big (Unaudited)	11
F: Big (Audited – No implemented)	13
G: Big (Audited – Implemented)	9



# Impact evaluation

- 82% satisfied or very satisfied with the service received.
- 88% implemented at least one energy efficiency measure.
- Only 12% of medium-sized and 21% of big dairy farms implemented high investment measures.

## Energy cost of production

Size	Before measures (USD/1.000 l)	After measures (USD/1.000 l)	Difference
Small	14,4	12,8	-11%
Medium	9	7,5	-21%
Big	6,9	6,4	-7%

# Conclusions

- Successfully achieved 540 standardized and low-cost energy audits for producers dispersed geographically (SME's)
- Potential savings of 651 kWh/month, or 19% of consumption, representing an average of USD 236/month or 38% of the cost.
- 88% implemented at least 1 measure
- Lack of success with greater investments, only 12% of medium-sized and 21% of big dairy farms implemented them.
- The approach is scalable to other sectors of SME's:



**Thank you**

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<b>Intensidad energética</b>	
<b>kWh/1.000 litros</b>	
<small>(kilovatios hora por cada mil litros remitidos)</small>	
<small>Establecimiento: <b>Prolesa</b></small>	<small>Remisión: <b>6.000 l</b></small>
<small>Rango: "GRANDE" Remisión diaria promedio mayor a 3.000 litros</small>	
<b>Más eficiente</b>	
Menor a 20 <b>A</b>	
Entre 20 y 29 <b>B</b>	
Entre 30 y 39 <b>C</b>	<b>C</b>
Entre 40 y 60 <b>D</b>	
Mayor a 60 <b>E</b>	
<b>Menos eficiente</b>	
<b>Intensidad energética (kWh/1.000 litros)</b>	<b>35,2</b>