

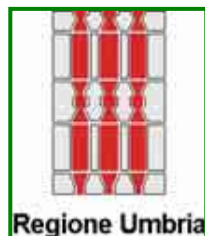


Biomass Resource use, Innovation and Efficiency

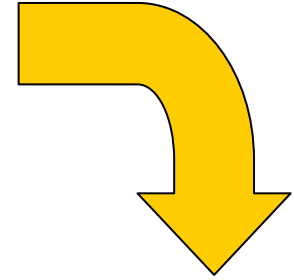
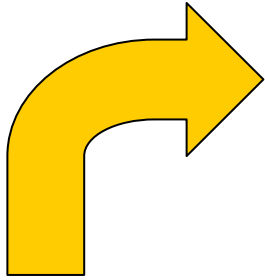
MEETING IN VALAŠSKÉ MEZIRŘÍČÍ

28-29 September 2006

LPT Project Manager: Dr. Renato Cami



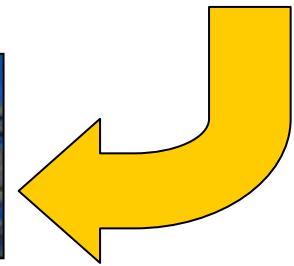
Environment and landscape



**Environmental assessment
of
biomass utilization processes**

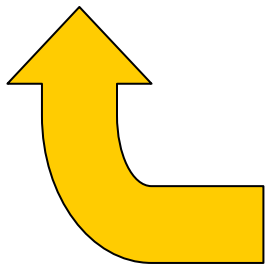


Natural resources



Energy saving

Agricultural development



Green energy

Environmental and economic sustainability

A) Crop choice



- ***Positive energy input/output***
- ***Air, soil and water benefits***
- ***High productivity and adaptability***



B) Production chain

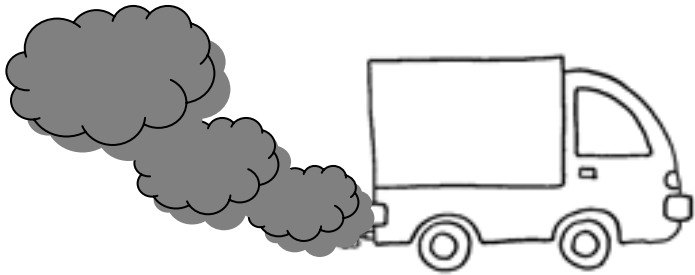


- ***Production, transformation and consumption within short-distance***
- ***Efficiency without public financing***



Environmental benefits

A) Air – CO₂ absorption



Intermediate car (1.7/1.8 cmc) driving on average 15.000 km/year emits, besides the particulate, about 3 tons of CO₂ per year

- 1 m³ of wood absorbs 1 tonne of CO₂ during plant's growth
- Given 10 t of CO₂ ha/year, 0.4 t of C ha/year are absorbed by soil and the rest by trunk and branches



Environmental benefits

A) Air - CO₂ emission

Comparison of CO₂ emissions amongst various fuels

(source: Buwal F. Kessler “Heiz-energie aus Hizol, Erdgas oder Holz”- 2000)

| CO₂ emission (kg/TJ – Tonnes-Joule* of utilizable energy) | Wood product | Gas oil | Methane |
|---|-------------------------|----------------------|----------------------|
| Combustion emissions | 150.000 | 78.700 | 57.700 |
| Emissions for fuel production | -148.000 | 11.900 | 7.900 |
| Indirect emissions for plant and management | 1.460 | 1.370 | 771 |
| <i>Total emissions</i> | <i>3.460</i> | <i>92.000</i> | <i>66.400</i> |

***Joule – Work carried out in order to produce power of 1 watt per second**

Environmental benefits

A) Air – particulate emission

Particulate emission: comparison amongst various fuels

| Particulate emission (mg/MJ* – Mega Joule of utilizable energy) | Wood product | Gas oil | Methane |
|--|---------------------|----------------|----------------|
| Combustion emissions | 109 | 0,106 | 0,103 |
| Emissions for fuel production | 5,29 | 8,22 | 3,82 |
| Indirect emissions for plant and management | 2,71 | 1,53 | 1,91 |
| Total emissions | 117**/5,85 | 9,86 | 5,84 |

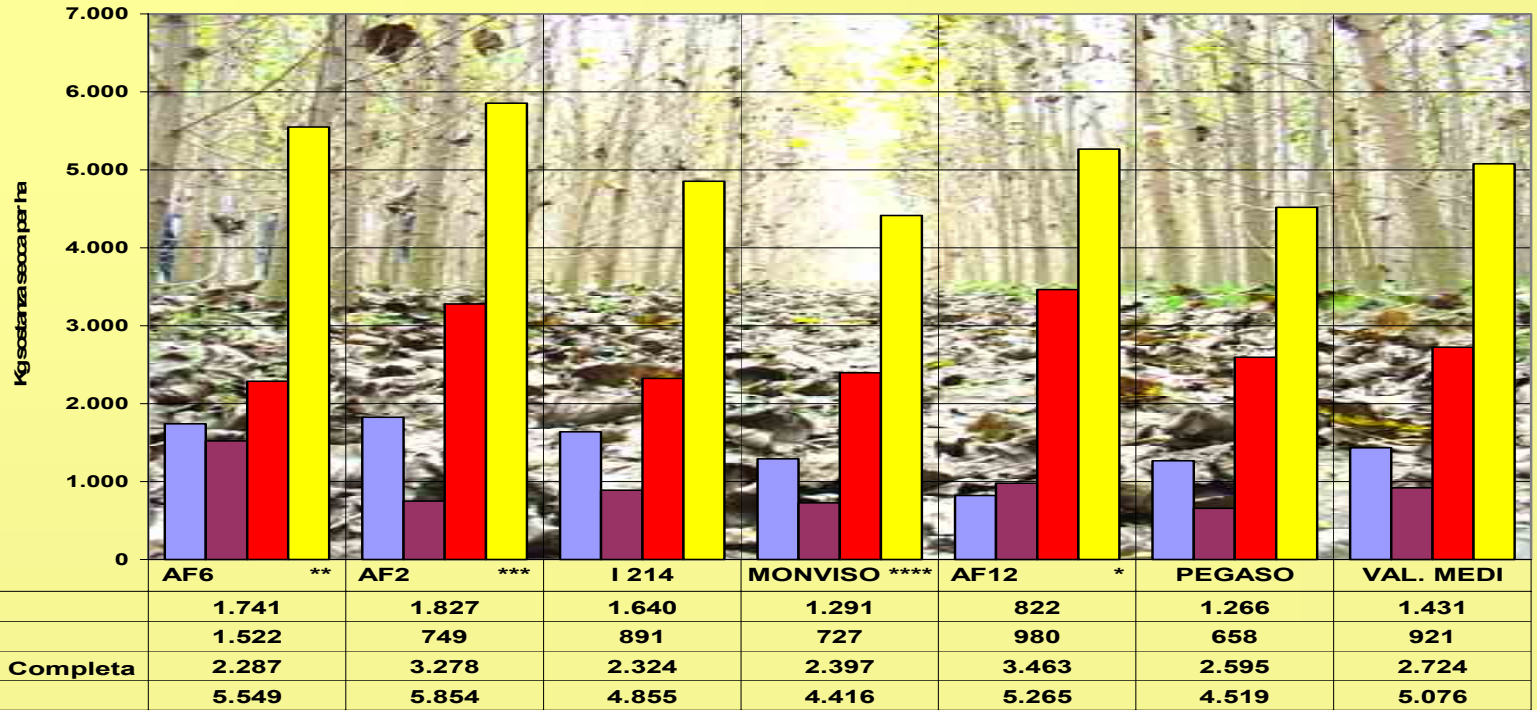
***Joule – Work carried out in order to produce power of 1 watt per second**

**** *Recourse to simple filters completely solves the problem, reducing particulate emissions by more than 95%***

Environmental benefits of Poplar Srf

B) Soil

Annual quantity analysis of natural organic matter released into soil by various Poplar types



N.B. After two years, shadows of cultivation prevent from weed growth controlling the agricultural soil in natural way

Environmental benefits of Poplar Srf

C) Water

- **Phytodepuration**

Phosphates, nitrates,
and nitrogen sink

Filtration of urban waste
water and agricultural
waste

- **Buffer strips**

Erosion reduction

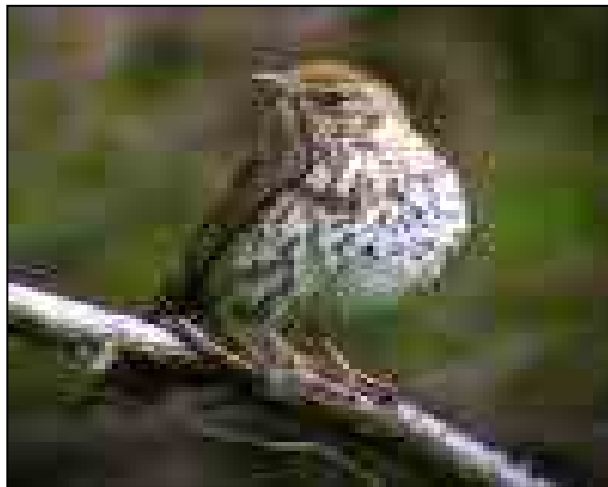
Reduction of drainability

- **Water-saving irrigation**





Environmental benefits of Poplar Srf



**D) Landscape
and nature**



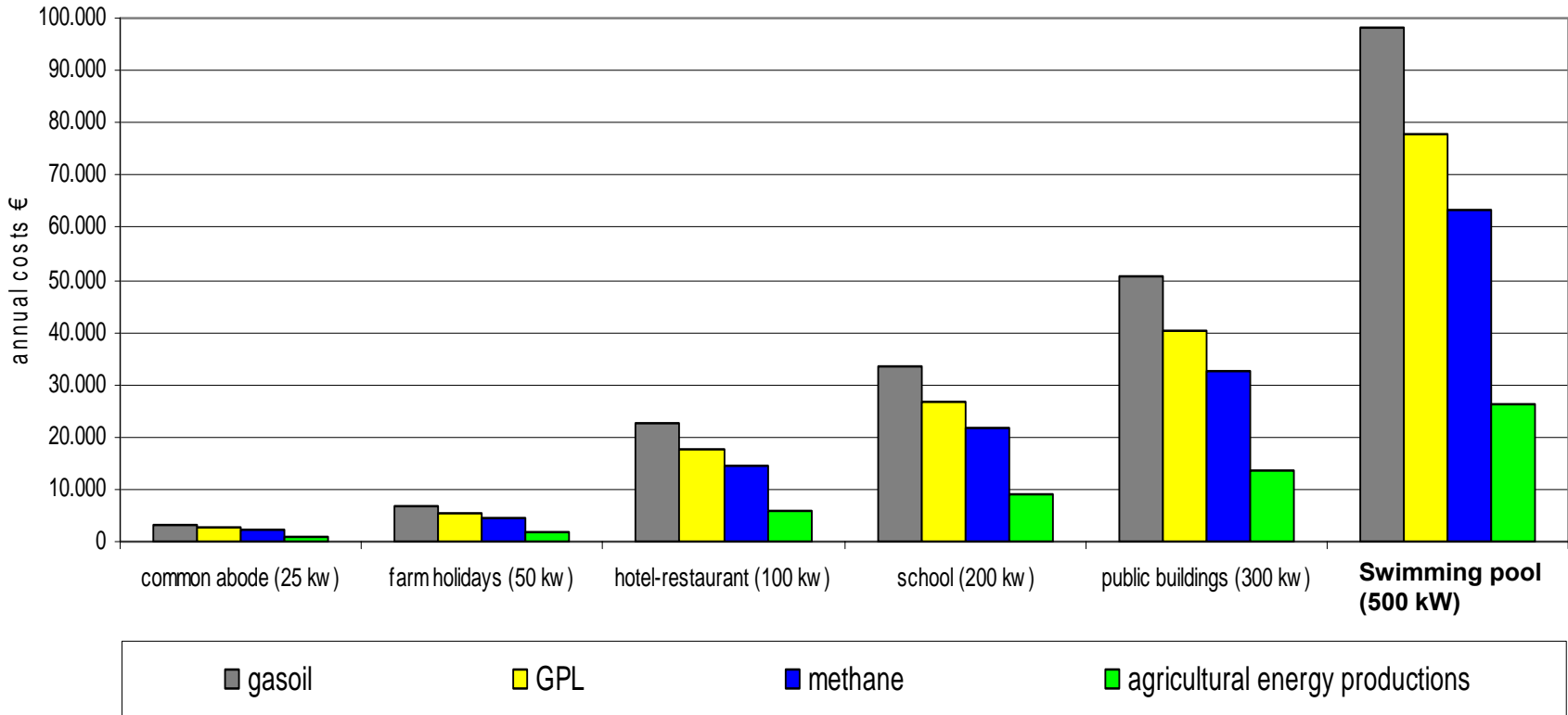
New technologies for energy consumption

- **Maximum energy efficiency and automatic systems for combustion optimization**
- **Economic saving**
- **Environmental sustainability**



Energy saving for different uses

COMPARISON OF ANNUAL COSTS
AMONGST DIFFERENT TYPOLOGIES OF HEATING SYSTEM

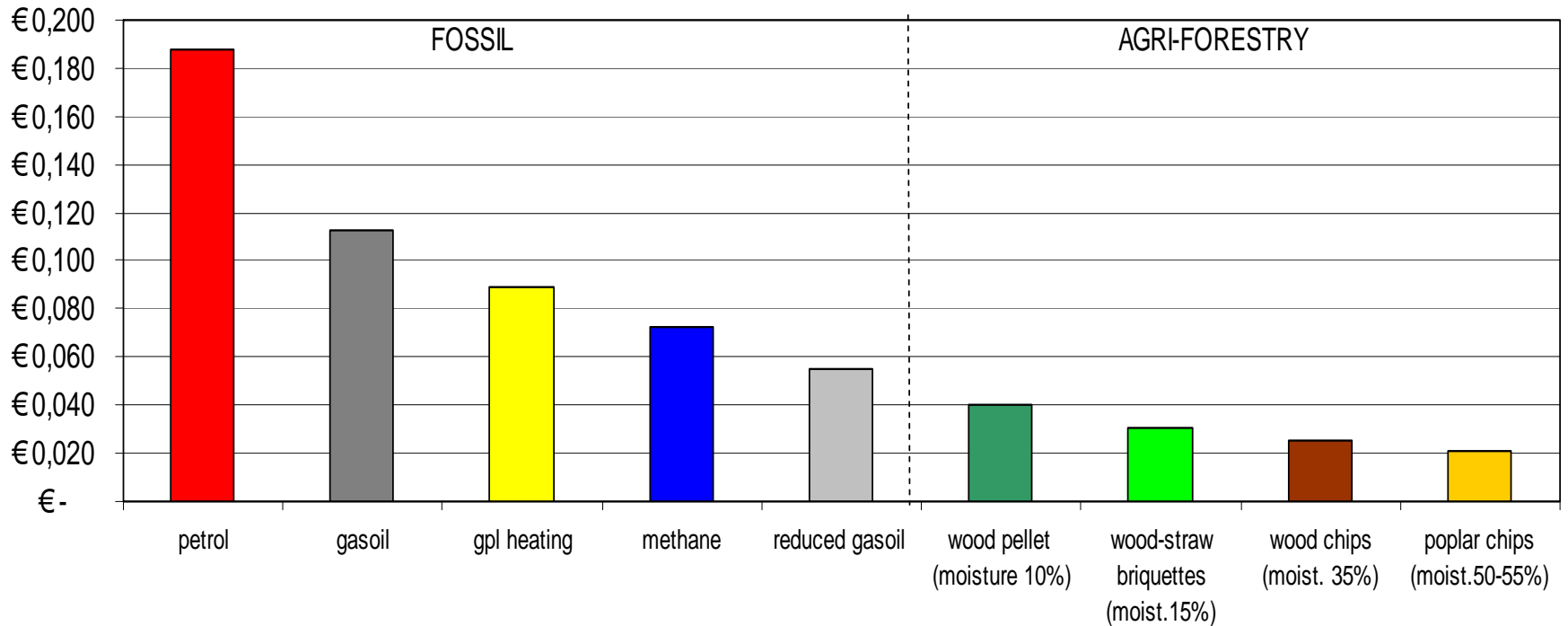


Elaborated costs referred to Crude oil price equal to 42 \$ per barrel

Energy saving

kWh COST OF DIFFERENT COMBUSTIBLES

O R I G I N



Elaborated costs referred to Crude oil price equal to 42 \$ per barrel

Energy saving

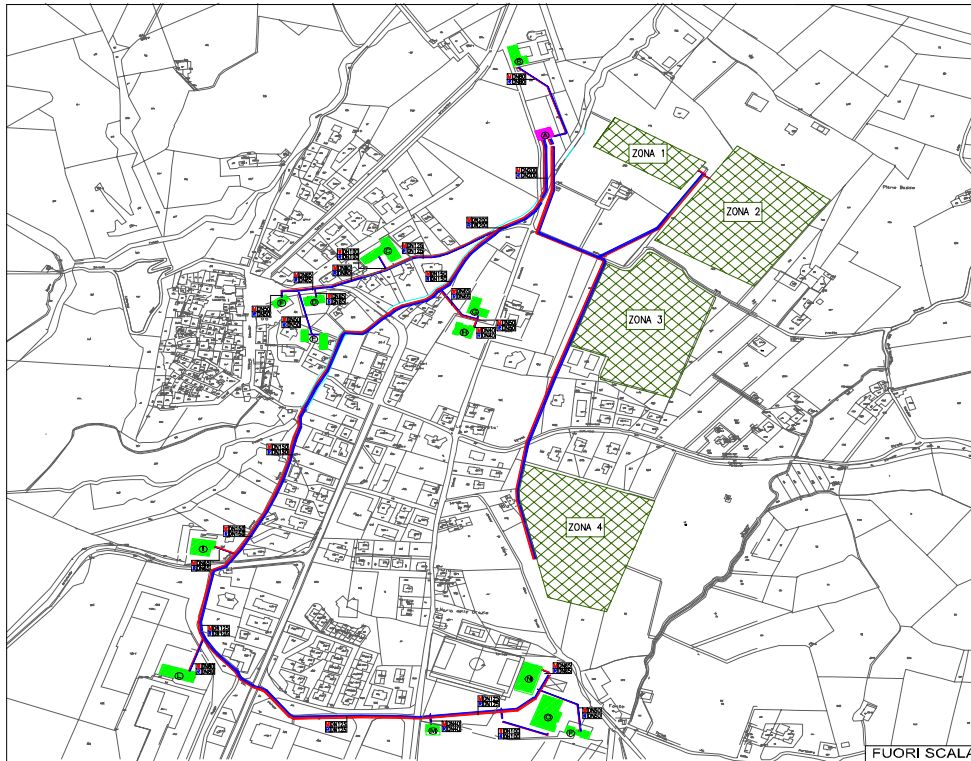
| | Wood chips | Pellet | Methane | Gas oil |
|--|------------------------------|------------------------------|-------------------------------|-------------------------------|
| Boiler cost* | 14.000 € | 13.000 € | 3.000 € | 4.000 € |
| Installation cost | 4.000 € | 4.000 € | 1.500 € | 1.500 € |
| Eventual storage construction | 10.000 € | 8.500 € | 4.000 € | 4.500 € |
| <i>TOTAL INVESTMENT</i> | <i>28.000 €</i> | <i>25.500 €</i> | <i>8.500 €</i> | <i>10.000 €</i> |
| Fuel cost | 5.000 €/year | 6.000 €/year | 12.000 €/year* | 15.000 €/year* |
| Electricity cost for boiler functioning | 120 €/year | 80 €/year | 50 €/year | 60 €/year |
| Maintenance cost | 180 €/year | 160 €/year | 70 €/year | 80 €/year |
| Personal cost | 1.000 €/year | 750 €/year | - | - |
| Fireplace cleaning | 250 €/year | 200 €/year | 80 €/year | 150 €/year |
| Service contracts | 400 €/year | 400 €/year | 200 €/year | 200 €/year |
| Insurance and other costs | 250 €/year | 200 €/year | 100 €/year | 100 €/year |
| <i>ANNUAL OPERATIONAL COSTS</i> | <i><u>8.310 €</u></i> | <i><u>8.839 €</u></i> | <i><u>13.094 €</u></i> | <i><u>16.294 €</u></i> |
| HOUR COST | <u>5.54 €</u> | <u>5.89 €</u> | <u>8.73 €</u> | <u>10.86 €</u> |

*** 100 Kw boiler operating 1500 hours/year**

*** Costs of gas oil and methane do not consider the last price rises occurred that had made a difference between pellet and wood chips even more evident.**

study for district heating system

Block plan of district heating system project for the Municipality of Massa Martana



**Total network articulation:
about 2 km**

| Public uses to be served (highlighted in green) | Heat rating |
|---|-------------|
| Building "La Pace" | 200 kW |
| Primary and secondary school | 400 kW |
| Puc zone | 100 kW |
| New constructions | 50 kW |
| Nursery school, church | 75 kW |
| Health centre UsI | 60 kW |
| Nursery school | 40 kW |
| Meat plant | 100 kW |
| Energy centre | 200 kW |
| Seniors centre | 25 kW |
| Sport change rooms | 80 kW |
| Sport palace | 400 kW |

**Annual energy needs:
2.002.712 Kwh**

Massa Martana: study for district heating system

Biomass boiler foreseen

- 1.2 MW power
- Vegetable oil reserve boiler

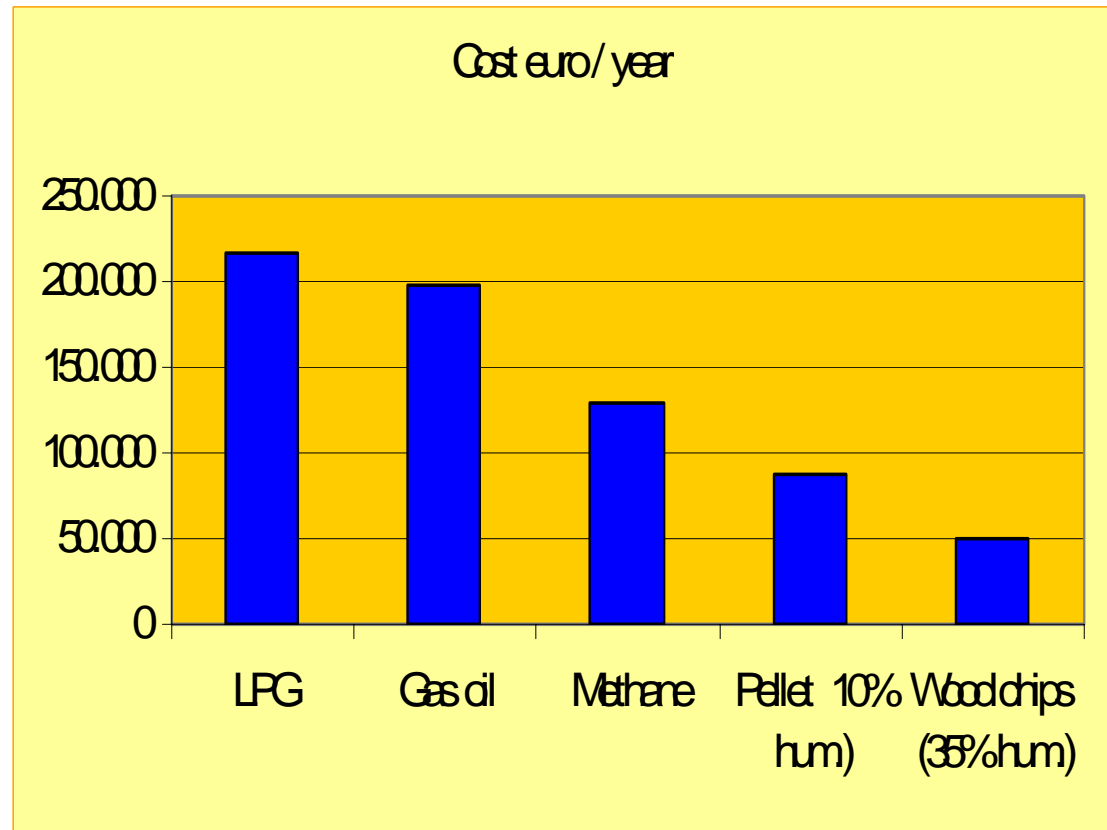
Quantities necessary for annual consumption

- 247.000 m³ methane
- 238.000 l gas oil
- 349.300 l LPG
- 506.000 kg pellet - 10% hum.
- 827.000 kg wood chips - 35% hum.

Surfaces to be cultivated

- 1 – For wood chips:
20- 30 ha of poplar srf
- 2 –For agro-forestry mix:
about 50 ha

Annual energy expenses according to various fuel types





Thanks for your attention!



Dr. Renato Cami