



# ***LIFE farming***

## **Topic “Nitrates”: project AQUA**

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# Achieving good water **QU**ality status in intensive **A**nimal production areas

**Activities and results of the LIFE+ AQUA project**

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**LIFE INTERNATIONAL**  
networking conference  
LIFE farming-environmentally  
sustainable agriculture  
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# The LIFE+ AQUA project

## Achieving good water Quality status in intensive Animal production Areas

- LIFE+ Environment Policy & Governance
- October 2010 – March 2014 (42 months)
- Study area: 5 Regions in the North of Italy (Piemonte, Lombardia, Veneto, Friuli Venezia Giulia, Emilia-Romagna)

# LIFE+ AQUA: Objectives

- To reduce nitrogen in manure by increasing the N efficiency in livestock intake.
- To improve the fertilisation effects by maximising the nutrients (N-P) use efficiency (slurry application techniques – crop management)
- To reduce the pressure and impact in intensive livestock areas by manure separation and transfer of the solid fraction outside NVZ.
- To reduce N and P losses through the application of good agro-environmental practices.

# The demonstrative Farms



 Pig farms

 Farm with buffer strips

 Dairy cattle farms

 Beef cattle farms

# Why Northern Italy?

In this part of Italy more than 70% of the livestock is reared:

- 68% of dairy cattle,
- 61% of other cattle,
- 85% of pigs,
- 80% of poultry.

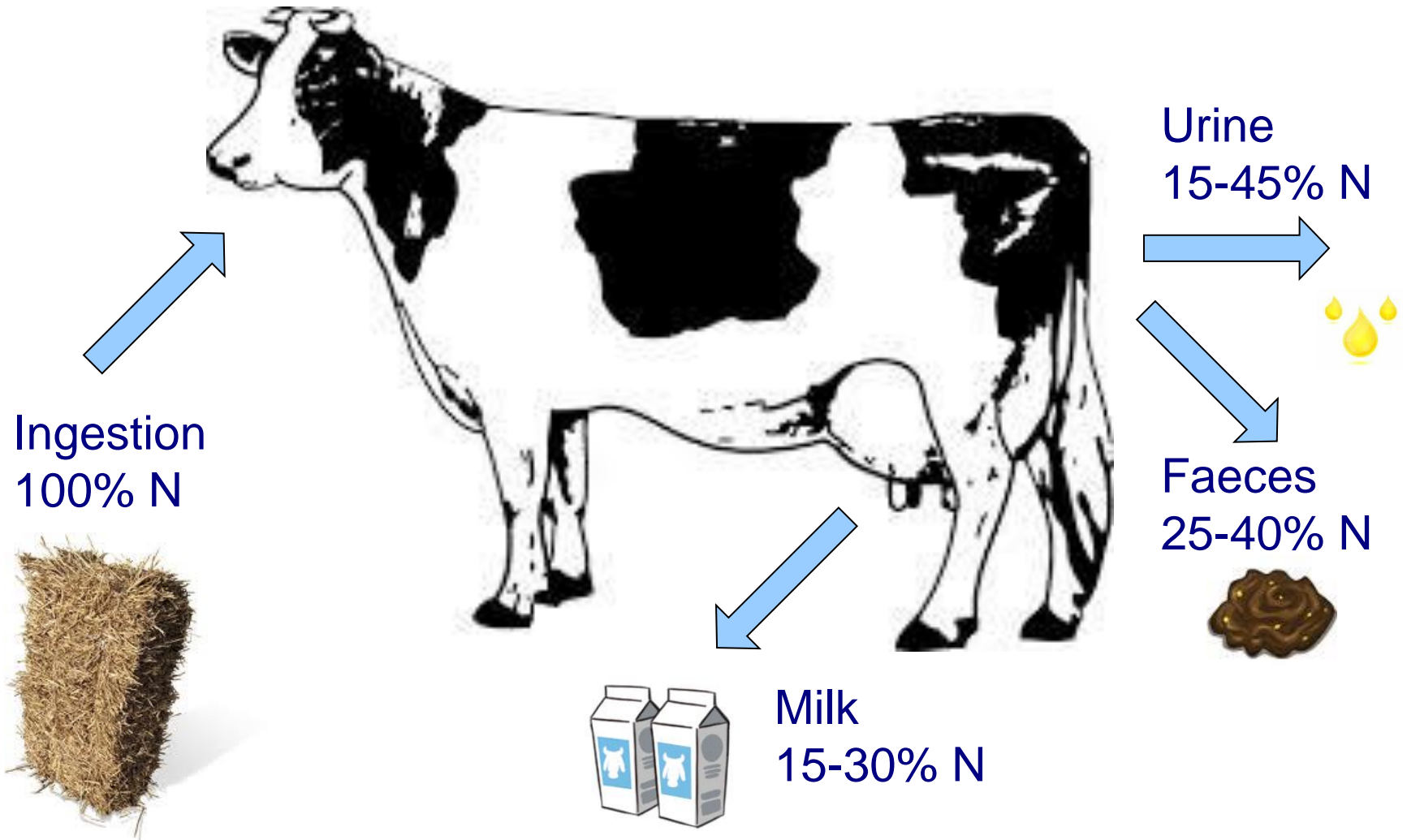
# Action 1

## Reduction of excreted N

- Reduction of N excreted through the application of low N diets in pigs and high N efficiency diets for dairy and beef cattle



# N efficiency in the diet, dairy cattle





# N balance in dairy farms

results of LIFE AQUA project

farms	Pinotti		Mori		Sgambaro		Bolzon	
	before-after <sup>(1)</sup>		before-after <sup>(1)</sup>		before-after <sup>(1)</sup>		before-after <sup>(1)</sup>	
Raw protein in the diet (%)	16.0	15.2	14.8	14.2	14.6	14.3	15.5	14.8
N use efficiency <sup>(2)</sup> (%)	24	25	23	23	20	22	19	20
N excreted / t l.w. / year (kg)	193	182	187	174	177	179	197	193

<sup>(1)</sup> 'after' means as a result of changes in diet with the AQUA project

<sup>(2)</sup> kg N in milk / kg N in feed



# N balance in pig farms

results of LIFE AQUA project

farms	Zambelli		Comazoo		Mana		Biagi	
treatment	before-after <sup>(1)</sup>		before-after <sup>(1)</sup>		before-after <sup>(1)</sup>		before-after <sup>(1)</sup>	
Raw protein in the diet (%)	14.3	13.3	14.3	11.6	13.4	12.7	16.7	14.2
N use efficiency <sup>(2)</sup> (%)	28	33	28	35	30	31	23	28
N at field / place / year (kg)	11.3	9.9	11.9	8.7	9.1	8.3	13.6	10.2

<sup>(1)</sup> 'after' means as a result of changes in diet with the AQUA project

<sup>(2)</sup> kg N in meat / kg N in feed

# Action 2

## Cropping management

- Adoption of management and agronomical techniques to reduce N losses to water and to the atmosphere.
  - Application of the best available techniques to distribute slurries: umbelical systems, use of trailing shoes or band spreading on meadows, fertigation, ...
  - Crop rotations characterised by high N uptake, long growing seasons, ecc.



# New techniques for slurry spreading

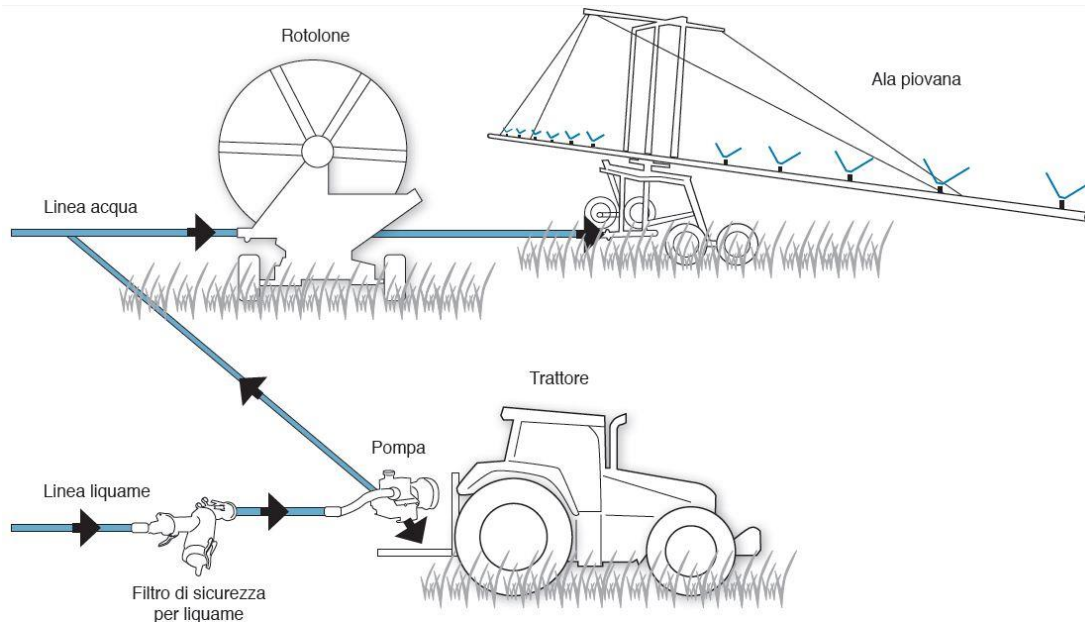




# Fertigation

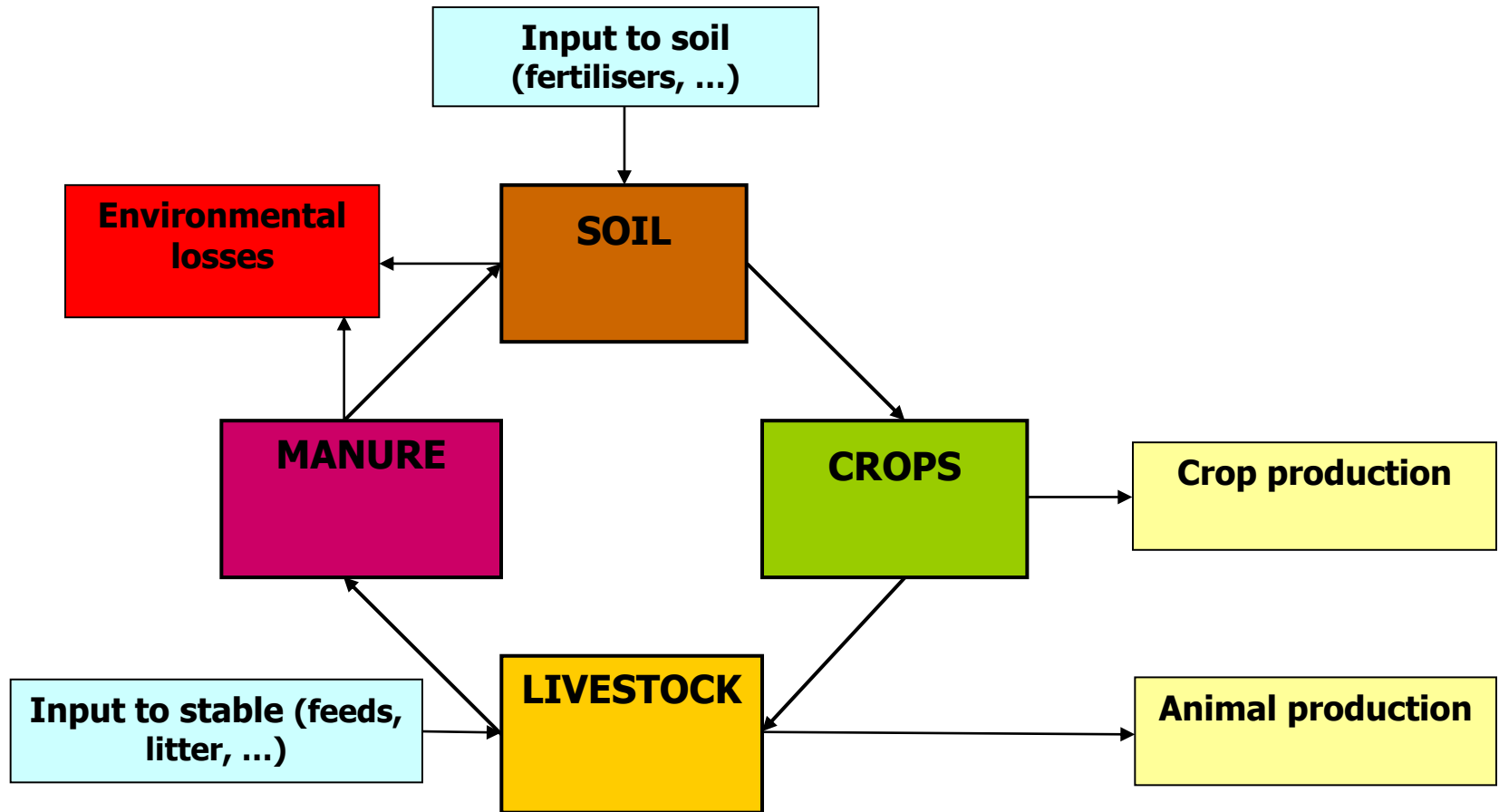
Fertigation allows the distribution of slurry diluted with irrigation water.

Ammonia emissions are considerably reduced and the use efficiency of dissolved nitrogen is high.





# N cycle (and balance) at farm level





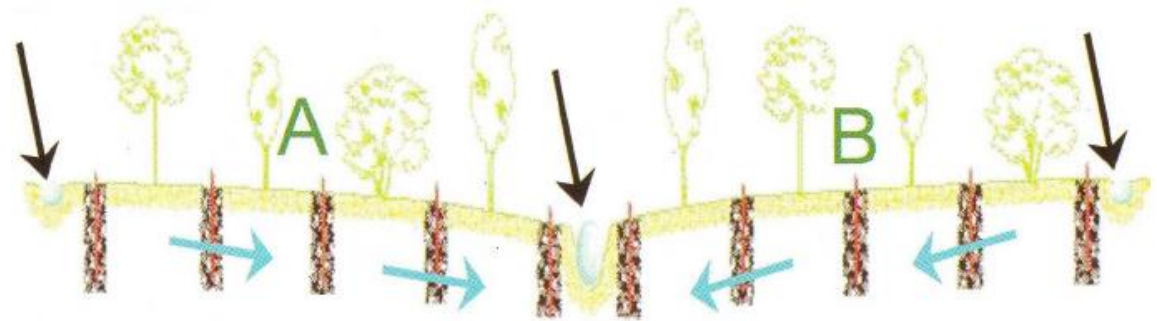
# AQUA farms – N balances at farm level (AQUA project results)

Farms	Efficiency Out/In (%) before	Efficiency Out/In (%) after	Surplus (kg/ha/y) before	Surplus (kg/ha/y) after	Notes
Pinotti	40	44	256	215	Increase of N efficiency due to change of diet and reduction of mineral fertiliser
Sgambaro	25	31	239	247	Like the above but more extensive farm
Mori	33	35	206	194	The most extensive dairy farm
Bolzon	26	26	286	286	Out of the farm both milk and beef
Mana	61	65	454	387	Intensive farm
Zambelli	58	65	491	388	Intensive farm

# Action 3

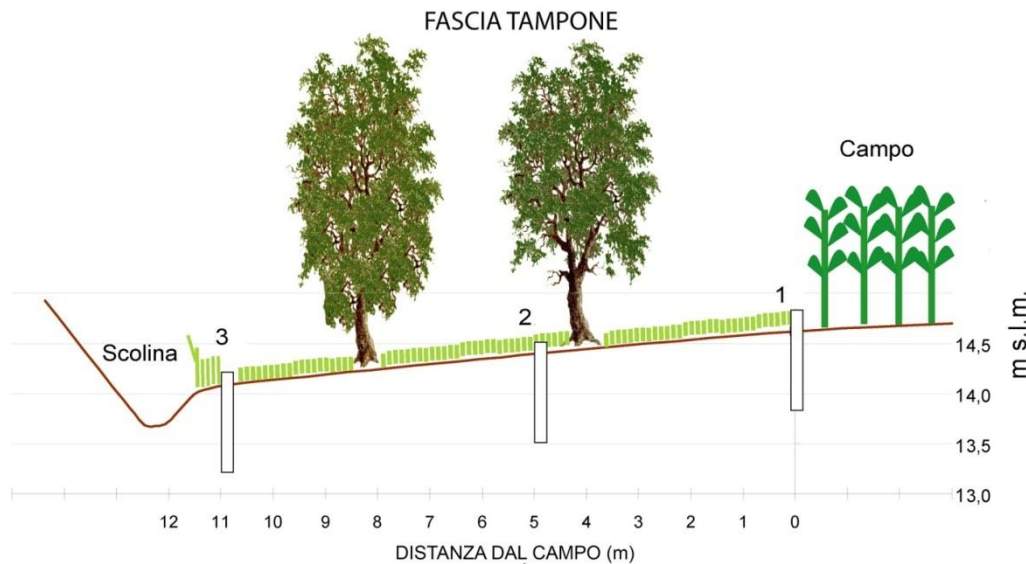
## Environmental measures

- To demonstrate the efficacy of buffer strips and wetlands to reduce nutrient losses to water.
- The effects of water deriving from soils fertilised with 170 kg N/ha/year and 250 kgN/ha/year (*as requested by the Italian Derogation*) were compared in the demonstration sites





# Effects of buffer strips and constructed wetlands



- 5 meters of buffer strip were enough to reduce 70% nitrates and 60% total nitrogen;
- Surface flow constructed wetlands receiving drainage water from the cultivated fields reduced N concentrations up to 90%.

# Action 4

## Transfer of solid fractions

- Manure management through a consortium which separates the solid fraction.
- Manure solid fraction transfer to farms with lack of organic matter in soils



# Solid-liquid separation of slurries

FRAZIONE SOLIDA  
O PALABILE

Up to 30-35% in weight of the cattle slurry. DM content 20% on average.

Organic Matter, Organic N and P are mainly concentrated in the solid fraction .

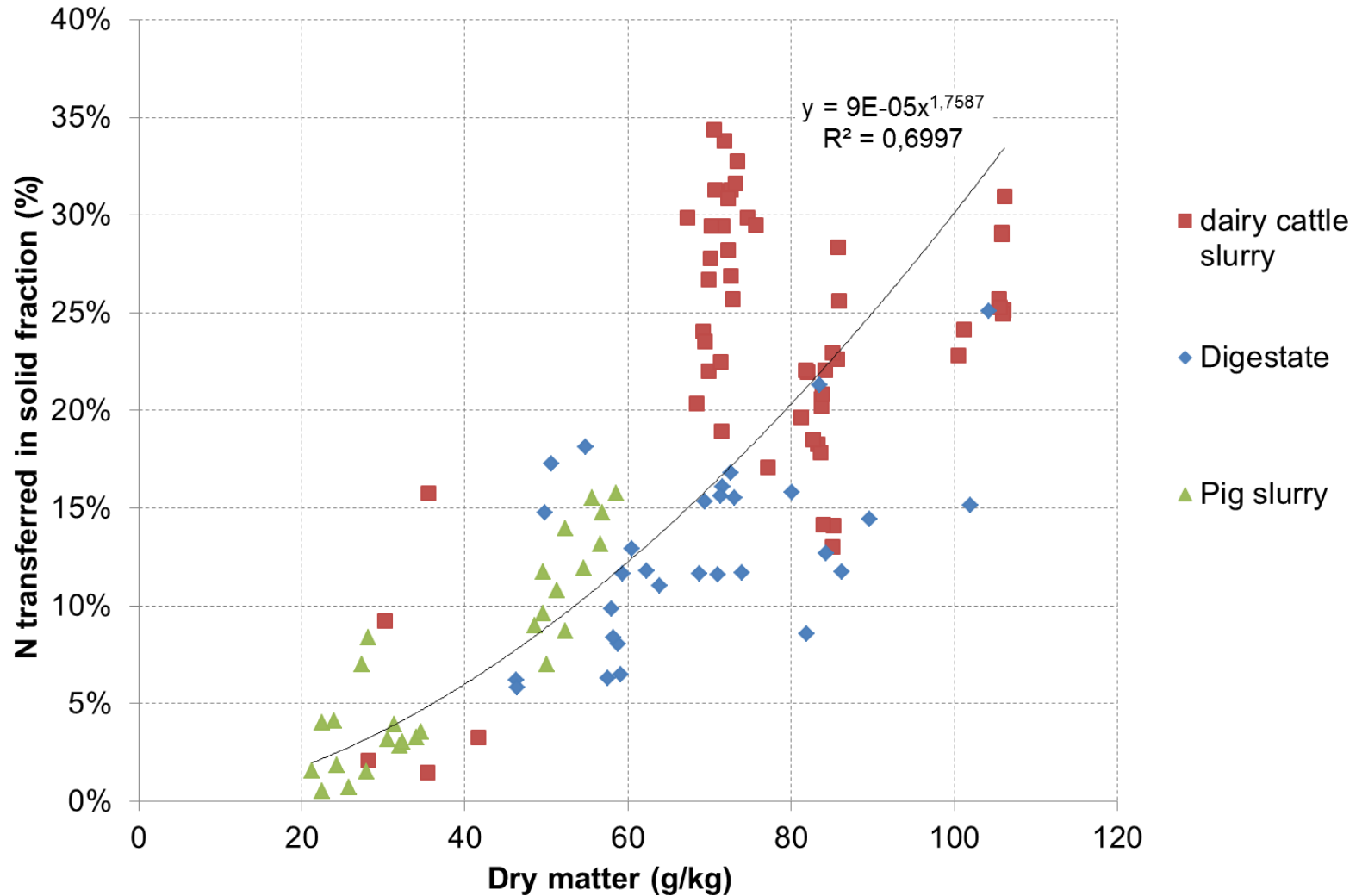
FRAZIONE LIQUIDA  
O CHIARIFICATA

DM content reduced compared to the unseparated cattle slurry.

High content of soluble components included ammoniacal N (**up to 60% of the total N remains in the liquid fraction**).



# Separation efficiency (screw press)





# Consortium for the valorisation of the solid fractions from slurry



(biogas option)

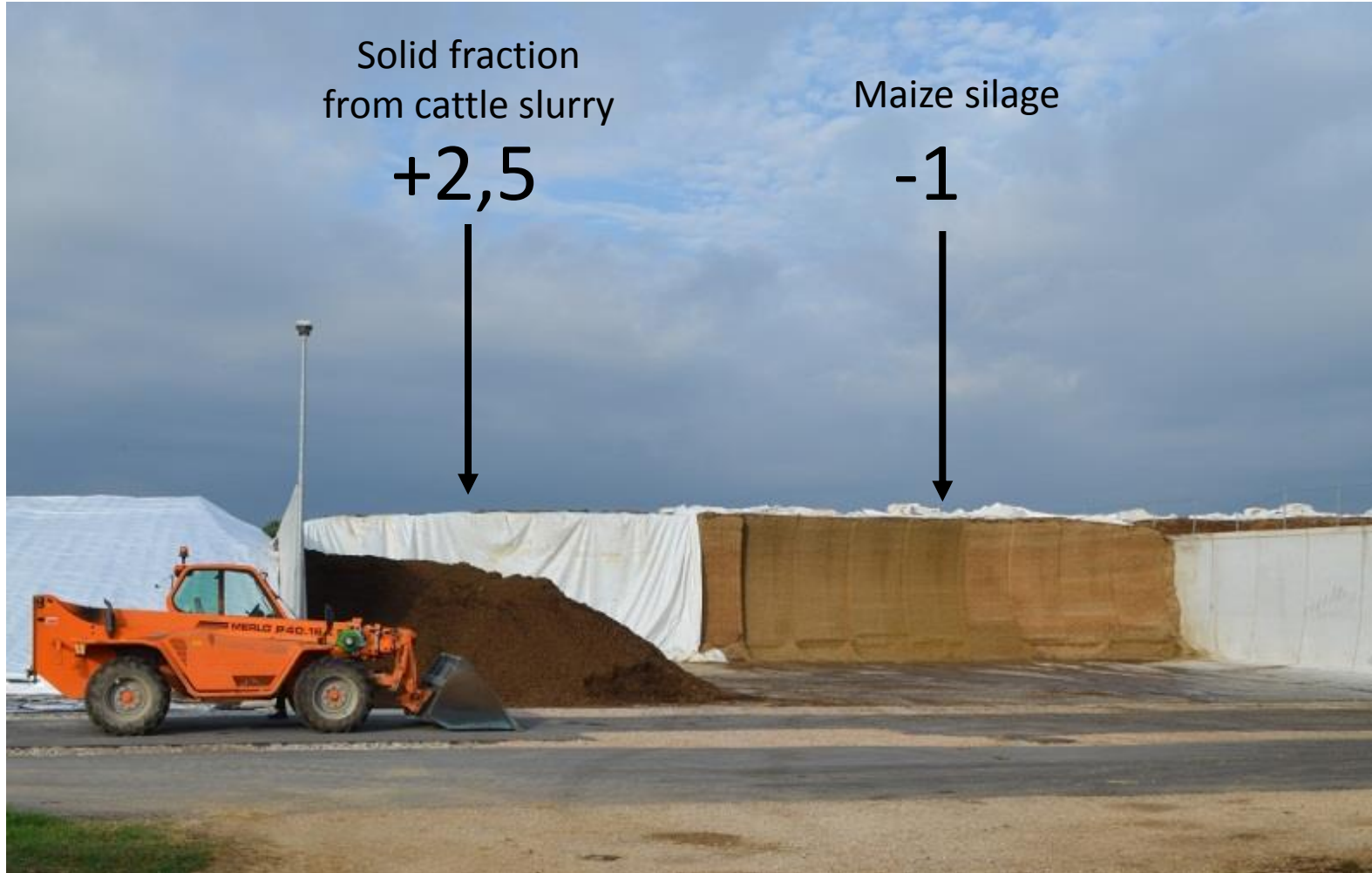


**La Redenta**  
Società Cooperativa Agricola





# Biogas from solid fractions in place of maize silage



# Other actions

- Reinforcement of monitoring and controls by implementing a new tool for traceability and certification of good practices in nutrients management
- Economic balance
- International networking
- Dissemination at local level

# General conclusions

- A series of innovative technologies and agricultural practices can significantly increase the environmental sustainability of farms.
- For further steps it is necessary to continue:
  - research / experimentation
  - demonstration phase
  - real scale application

# The LIFE+ AQUA project



**Thank you  
for your attention**