LIFE Programme's contribution to climate action: the experience of Italian projects

Side event at COP28 UAE
Italian Pavillon
Dubai, 9 December 2023

LIFE agriCOlture

"Livestock farming against climate change problems posed by soil degradation in the Emilian Apennines"

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Central Emilia Reclamation Consortium

Life agriCOlture LIFE18 CCM/IT/001093

Livestock farming against climate change problems posed by soil degradation in the Emilian Apennines

PROJECT LOCATION
Emilia Romagna, ITALY

BUDGET:
Total amount: 1,515,276 Euro
% EU Co-funding: 54.98%

DURATION: *Start: 02/09/19 - End: 29/02/24*

COORDINATING BENEFICIARY:
Consorzio di Bonifica dell'Emilia Centrale

ASSOCIATED BENEFICIARIES:
Consorzio della Bonifica Burana
Centro Ricerche Produzioni Animali - CRPA
Ente Parco nazionale dell'Appennino tosco-emiliano

https://www.lifeagricolture.eu

LIFE agriCOlture investigates, through demonstration and monitoring activities, the contribution that livestock farming can play, in mountain areas, for **soil protection** *and* **climate change mitigation**.

THE EMILIAN APENNINES LIVESTOCK SYSTEM

BASED ON MILK PRODUCTION FOR PARMIGIANO REGGIANO CHEESE

THE HYPOTHESIS:

although its high cow intensity, it can be considered an interesting socio-economic and environmental model *(de Roest, 2000)* of territorial reproduction

THE **EMILIAN APENNINES LIVESTOCK SYSTEM**

BASED ON MILK PRODUCTION FOR PARMIGIANO REGGIANO CHEESE

PROJECT QUESTIONS

Is it also a climatic efficient model?

How to measure and evaluate this efficiency?

How to improve it?

What lesson can be learned for other territories?

AN INTERDISCIPLINARY APPROACH

the evaluation of this efficiency implies new accounting tools and methods but also demonstration activities and the construction of new discursive strategies and scenarios on the present and future of this territory

SIDE EVENT AT COP28 UAE ITALIAN PAVILLON - 9.12.2023
LIFE PROGRAMME'S CONTRIBUTION TO CLIMATE ACTION: THE EXPERIENCE OF ITALIAN PROJECTS

1. EVALUATING THE CLIMATIC EFFICIENCY OF THE LIVESTOCK SYSTEM

1.1 PROJECT TERRITORY: 838 HA MANAGED BY 15 LIVESTOCK DEMO-FARMS

Società Agricola Giavelli

Azienda Agricola La Fazenda

Azienda Agricola Begani

Grisanti e Spagnolo Società Agricola

Azienda Agricola Castellari

Azienda Agricola L'Arcobaleno

Azienda Agricola Bonacorsi e Colombarini

Azienda Agricola Le Cornelle

Cooperativa Sociale Valle dei Cavalieri

Società Agricola La Fattoria di Tobia

Società Agricola Casa Minelli

Azienda Agricola Lavacchielli

Azienda Agricola Le Capre della Selva Romanesca

Società Agricola Rossi Daniele

Azienda Agricola Casoni

1. EVALUATING THE CLIMATIC EFFICIENCY OF THE LIVESTOCK SYSTEM

1.2 EMISSIONS BY 1727 COWS AND 836 SHEEP: 14’685 TON CO2EQ/YEAR

Azienda Agricola Begani Gianpaolo
COWS: 100+75
GWP: 1’435’614 kg CO2eq/anno

Società Agricola Rossi Daniele e Figli
COWS: 130+130
GWP: 2’317’830 kg CO2eq/anno

Azienda Agricola Castellari di Nicasio e Damiano S.S.
COWS: 32+40
GWP: 487’499 kg CO2eq/anno

Azienda Agricola Lavacchielli Ermanno
COWS: 235+280
GWP: 3’916’636 kg CO2eq/anno

Azienda Agricola I Casoni di Lelli Filippo
COWS: 72+72
GWP: 1’509’120 kg CO2eq/anno

Grisanti e Spagnolo Società Agricola
COWS: 28+17
GWP: 374’602 kg CO2eq/anno

Società Agricola Giavelli s.s.
COWS: 57+58
GWP: 871’773 kg CO2eq/anno

Azienda Agricola La Fazenda di Bucciarelli Donato S.S.
COWS: 101+103
GWP: 1’946’683 kg CO2eq/anno

Azienda Agricola Bonacorsi Gualtiero e Colombarini Dolores
COWS: 60+72
GWP: 853’711 kg CO2eq/anno

Azienda Agricola L’Arcobaleno di Cavalletti Andrea
COWS: 35+30
GWP: 453’446 kg CO2eq/anno

Cooperativa Sociale Valle dei Cavalieri
SHEEP: 185+52
GWP: 143’891kg CO2eq/anno

Società Agricola La Fattoria di Tobia s.s.
SHEEP: 180+46
GWP: 194’606 kg CO2eq/anno

Azienda Agricola Le Capre della Selva Romanesca di Tonelli Donatella
SHEEP: 83+104
GWP: 168’464 kg CO2eq/anno

Azienda Agricola Le Cornelle di Giuliano Gabrini
SHEEP: 153+33
GWP: 10’696 kg CO2eq/anno

OVERALL VALUES

8’316 TONS OF MILK / YEAR

1727 COWS

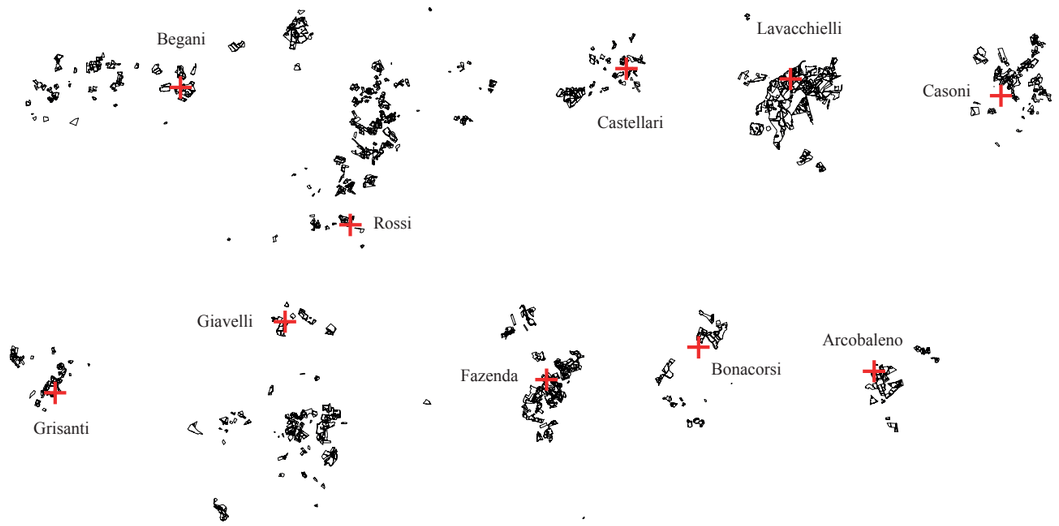
836 SHEEP AND GOATS

CO2 **GWP = 14’685 TONS OF CO2 EQ/YEAR**

1. EVALUATING THE CLIMATIC EFFICIENCY OF THE LIVESTOCK SYSTEM

1.3 A PATRIMONY OF 75’648 TONS OF SOC TO PRESERVE AND INCREASE

BOVINE FARMS



SHEEP AND GOATS FARMS

NO ANIMALS

BASELINE REALIZED THROUGH AN EXTENSIVE MONITORING ACTIVITY ON 225 PLOTS, BOTH WITH **NIRS TECHNOLOGY** AND **CHEMICAL-PHYSICAL CHARACTERIZATION**

CROPLAND WITH MANURE SUPPLY
24.22 g/kg of carbon

MULTI-YEAR ALFALFA
21.55 g/kg of carbon

MARGINAL FIELD
23.45 g/kg of carbon

PERMANENT GRASSLAND
25.92 g/kg of carbon

1.4 A COMPARISON BETWEEN STOCK AND EMISSIONS

8’316 TONS OF MILK / YEAR

GWP (MILK) = 14’685 TONS OF CO2 EQUIVALENT / YEAR

CARBON STOCK = 75’648 TONS OF SOC SEQUESTERED

= 277’376 TONS OF CO2 SAVED

2. FORMS AND STRUCTURES OF SOIL DEGRADATION IN THE EMILIAN APENNINES

2.1 SOIL DEGRADATION AND DYNAMICS OF MARGINALIZATION

HIGHER INTENSITY OF MANAGEMENT
CLOSE TO THE FARM CENTER

FREQUENT TILLAGE AND MANURE, DRAINAGES
(WHEN NEEDED)

EROSION AND LIMITED LANDSLIDE DUE TO
UNSUITABLE OR TOO FREQUENT PLOWING

LOWER INTENSITY OF MANAGEMENT GETTING
FURTHER FROM TO THE FARM CENTER

EXTRACTIVE USE AND ABANDONMENT

EROSION, EXTENDED LANDSLIDE, DECREASE
OF SOC DUE TO LACK OF MANAGEMENT

2. FORMS AND STRUCTURES OF SOIL DEGRADATION IN THE EMILIAN APENNINES
2.2 SOIL DEGRADATION AND EXPLODED PROPERTY STRUCTURE

\+ FARM CENTER **S-M-L-XL** FARM SIZE

AZIENDA AGRICOLA BEGANI

L

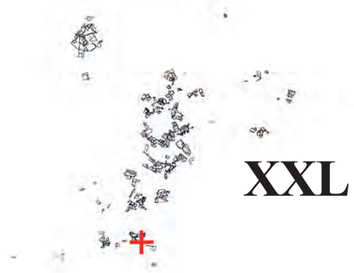
VALLE DEI CAVALIERI

L

LA FATTORIA DI TOBIA

L

ROSSI DANIELE E FIGLI



XXL

LE CAPRE DELLA SELVA ROMANESCA

L

AZIENDA AGRICOLA LE CORNELLE

XS

AZIENDA AGRICOLA CASTELLARI

M

AZIENDA AGRICOLA LAVACCHIELLI

XXL

I CASONI DI LELLI FILIPPO

M

GRISANTI E SPAGNOLO

S

SOCIETÀ AGRICOLA CASA MINELLI

XL

SOCIETÀ AGRICOLA GIAVELLI S.S.

XL

AZIENDA AGRICOLA LA FAZENDA

XL

AZIENDA AGRICOLA BONACORSI

M

AZIENDA AGRICOLA L'ARCOBALENO

XS

2. FORMS AND STRUCTURES OF SOIL DEGRADATION IN THE EMILIAN APENNINES

2.3 UNBALANCED CAPITAL DISTRIBUTION ON AGRICULTURAL SOILS

2. FORMS AND STRUCTURES OF SOIL DEGRADATION IN THE EMILIAN APENNINES

2.4 UNBALANCED MANURE DISTRIBUTION ON AGRICULTURAL SOILS

2.5 SOIL DEGRADATION AND LANDSCAPE TRANSFORMATIONS

Cortogno, Comune di Casina (RE) in the 50s

TODAY

A LANDSCAPE EXTENSIVELY CULTIVATED THROUGH **AGROFORESTRY SYSTEMS** UP TO 600M ASL.

SPATIALLY ORGANIZED AS A MATRIX OF CLOSED FIELDS OF SMALL DIMENSIONS, FREQUENTLY EMBANKED AND BORDERED BY HEDGES.

STRUCTURAL DEFICIT CONDITION OF ORGANIC MATTER

A LANDSCAPE PRODUCED BY PROGRESSIVE LAND MERGERS, REMOVAL OF EMBANKMENTS, PLANTINGS AND HEDGES

FUNCTIONAL TO MECHANIZATION BUT MORE EXPOSED TO SOIL THREATS:
1) LANDSLIDES; 2) EROSION ; 3) SOC DECREASE; 4) COMPACTION; 5) LOSS OF EDAPHIC BIODIVERSITY.

LARGE AVAILABILITY OF ORGANIC MATTER FROM LIVESTOCK WHICH, HOWEVER, IS NOT EFFICIENTLY AND HOMOGENEOUSLY DISTRIBUTED.

3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.1 PACT FOR SOIL PROTOTYPE: STARTING WITH 20’000 EURO AND 15 FARMS

HIGHLY SKILLED TECHNICAL SUPPORT AND TRAINING

TECHNICAL AND ECONOMIC SUPPORT

CRPA Centro Ricerche Produzioni Animali

Parco Nazionale Appennino Tosco-Emiliano

Consorzio di Bonifica Dell’Emilia Centrale

Consorzio della Bonifica Burana

LIFE AGRICOLTURE PARTNERS

SUBSIDIARITY FUND
MONEY AND WORK

“PACT FOR SOIL”
CONTRACT SOLUTION
FOR SUSTAINABLE SOIL
MANAGEMENT

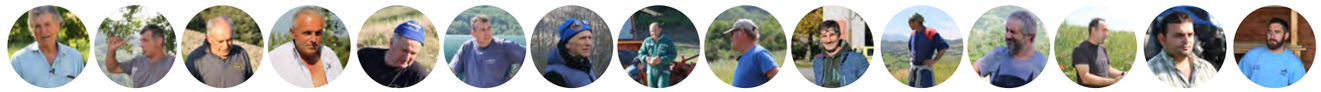
PROJECT SUBSIDY
20.000 EURO FOR EACH FARM

ACCREDITED
“SOIL STEWARDS” FARMS

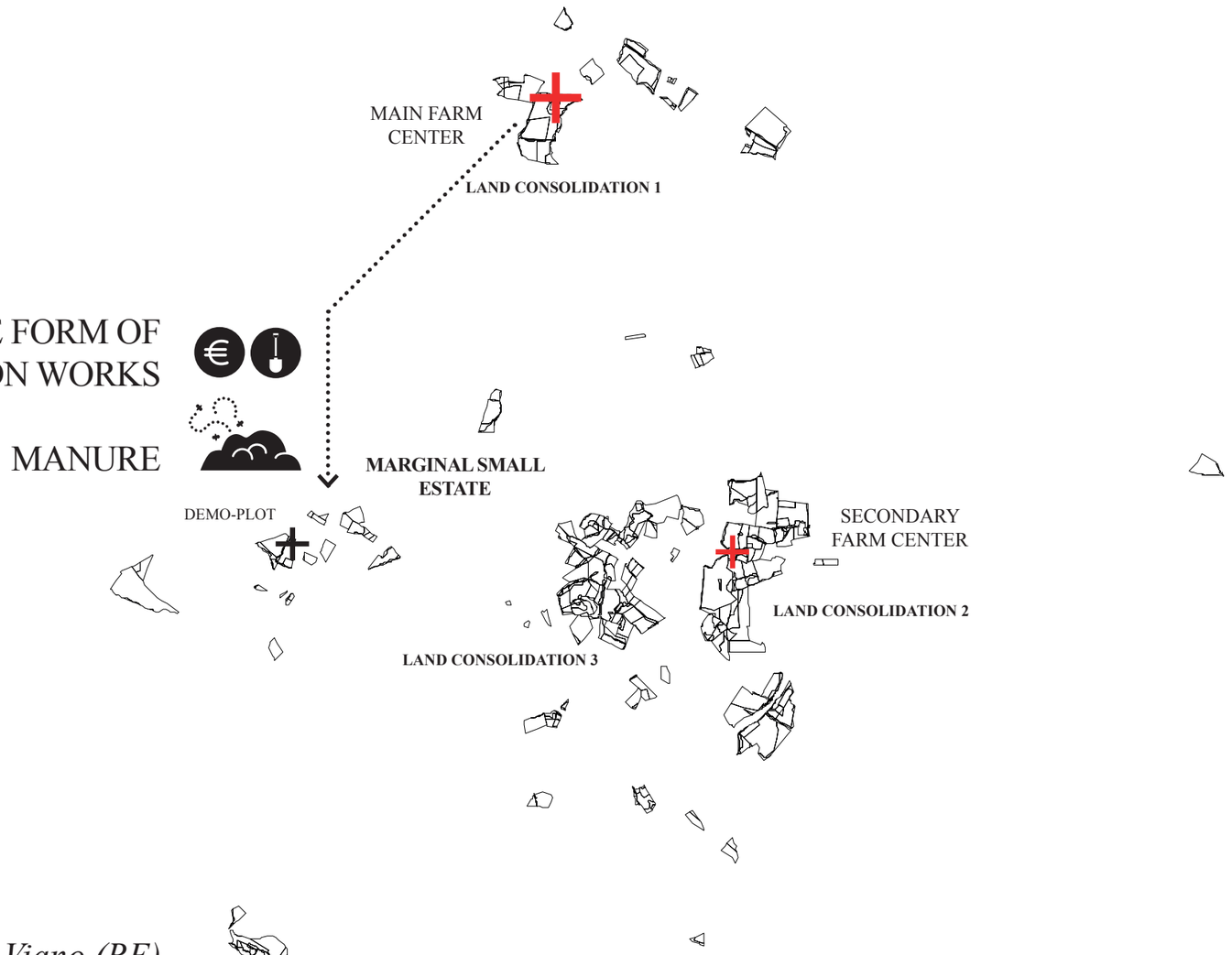
FARMS CONTRIBUTION
AMELIORATION WORKS + SOIL CONSERVATION STRATEGY

Azienda Agricola Begani Gianpaolo
Cooperativa Sociale Valle dei Cavalieri
Società Agricola La Fattoria di Tobia s.s.
Società Agricola Rossi Daniele e Figli
Azienda Agricola Le Capre della Selva Romanesca di Tonelli Donatella
Azienda Agricola Le Cornelle di Giuliano Gabrini
Azienda Agricola Castellari di Nicasio e Damiano S.S.
Azienda Agricola Lavacchielli Ermanno
Azienda Agricola I Casoni di Lelli Filippo
Grisanti e Spagnolo Società Agricola
Società Agricola Casa Minelli
Società Agricola Giavelli s.s.
Azienda Agricola La Fazenda di Bucciarelli Donato S.S.
Azienda Agricola Bonacorsi Gualtiero e Colombarini Dolores
Azienda Agricola L’Arcobaleno di Cavalletti Andrea

15 LIVESTOCK DEMO-FARMS



3.2 A RE-BALANCING STRATEGY OF MONEY AND CARBON



AZIENDA AGRICOLA GIAVELLI

Farm location: Cà de Gatti, Comune di Viano (RE)

Farm height: 150 m asl

3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.3 AMELIORATION WORKS: IN SEARCH FOR A NEW STABILITY

INFRASTRUCTURAL WORKS

UNDERGROUND AND SURFACE **DRAINAGES**

WELL MAINTAINED **DIRT ROADS** TO ACCESS THE FIELD OR THE FARM CENTER

PLATFORMS FOR THE MATURATION OF MANURE IN SAFE CONDITIONS

RATIONALIZATION WORKS

RATIONALIZATION 1:
SELECTIVE CUTTING TO CONTAIN INVASIVE VEGETATION ALONG THE PERIMETER OF THE FIELD

RATIONALIZATION 2:
REMOVAL OF BOULDERS LIMITING AGRICULTURAL ACTIVITIES

RATIONALIZATION 3:
CLEANING AND REMODELING OF **DRAINAGE DITCHES**

3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.4 CARBON FARMING STRATEGIES FOR FODDER PRODUCTION

CURRENT LAND USE

TOWARDS PERMANENT SYSTEMS

ASSISTED EVOLUTION OF **ALFALFA MEADOWS** ON A LONGER CYCLE (10 YEARS)

strategies:

- *no-till insertion of quality polyphite forages*
- *superficial application of manure*
- *control of weeds through early cutting*
- *integration of annual forage crops in the rotation*

ASSISTED EVOLUTION OF **PERMANENT MEADOWS**

strategies:

- *overseeding of polyphite forages*
- *superficial application of manure*
- *control of weeds through early cutting*

ASSISTED EVOLUTION OF **SEMI-NATURAL PASTURES**

strategies:

- *overseeding of polyphite forages*
- *control of weeds through grazing and superficial harrowing*

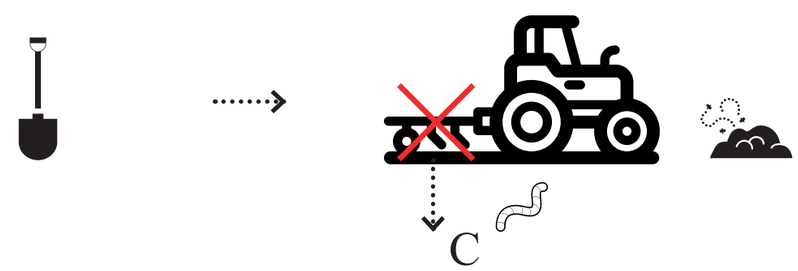
3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.5 MITIGATION STRATEGY

SOIL

AMELIORATION WORKS (DRAINAGES, ETC.)

CARBON FARMING STRATEGIES



PRESERVING EXISTING SOIL CARBON STOCK

BASELINE:
75’648 TONS OF SOC SEQUESTERED
(OVER 838 HA OF AGRICULTURAL LAND)

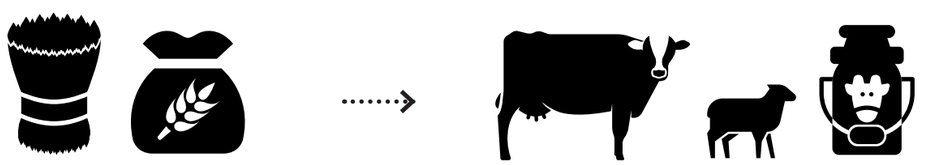
INCREASING SOIL CARBON SEQUESTRATION

C

LIVESTOCK

BETTER FODDER QUALITY + INCREASED FOOD SELF SUFFICIENCY OF THE HERD

INCREASED MILK PRODUCTIVITY



DECREASING GLOBAL WARM POTENTIAL OF MILK PRODUCTION

BASELINE:
12’515 TONS OF CO2 EQUIVALENT / YEAR
(OVER 8’316 TONS OF MILK / YEAR)

ECONOMIC REVENUE FROM HIGHER PRODUCTIVITY AND EFFICIENCY

3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.6 RESULTS 1: SOIL ORGANIC MATTER (0-30 CM) IN THE 15 DEMO-PLOTS

average value ex ante: 3.4%

average value ex post: 4.1%

EX ANTE: 2.9 %
EX POST: 3.1 %
+

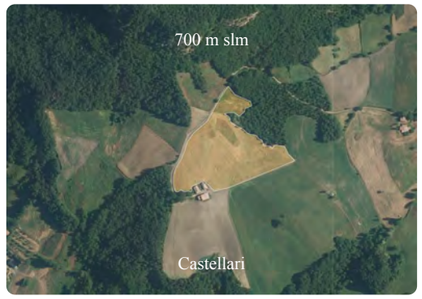
EX ANTE: 2.4 %
EX POST: 3.2 %
+

EX ANTE: 3.5 %
EX POST: 3.9 %
+

EX ANTE: 2.5 %
EX POST: 3.6 %
+

EX ANTE: 4.4 %
EX POST: 5.4 %
+

EX ANTE: 2.2 %
EX POST: 2.7 %
+

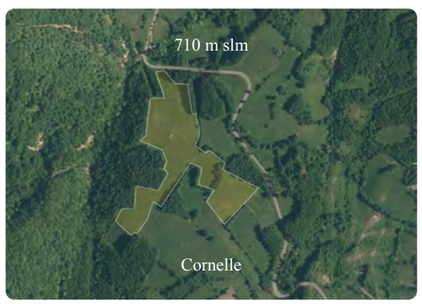


EX ANTE: 2.4 %
EX POST: 2.2 %
-

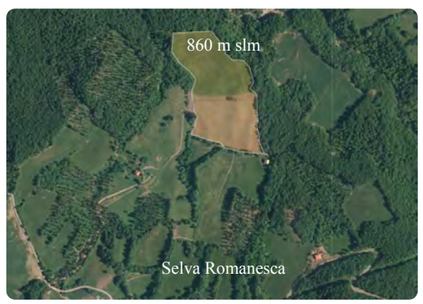
EX ANTE: 3.1 %
EX POST: 3.7 %
+

EX ANTE: 3.9 %
EX POST: 4.0 %
+

EX ANTE: 5.1 %
EX POST: 5.9 %
+



EX ANTE: 3.4 %
EX POST: 4.5 %
+



EX ANTE: 4.8 %
EX POST: 5.5 %
+

EX ANTE: 4.3 %
EX POST: 5.2 %
+

EX ANTE: 3.4 %
EX POST: 5.4 %
+

EX ANTE: 3.1 %
EX POST: 2.5 %
-

3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.6 RESULTS 2: CLIMATIC EFFICIENCY OF THE NEW FODDER PRODUCTION

NEW FODDER INTRODUCED BY THE PROJECT
SUITABLE WITH NO-TILL
(EX: WHEAT FORAGE, RYEGRASS, MIX LOF LEGUMES)

IN MANY CASE, HIGHER
QUANTITATIVE PRODUCTION

MONITORING OF THE QUALITY
OF THE NEW FORAGES

HIGHER QUALITATIVE
PRODUCTION

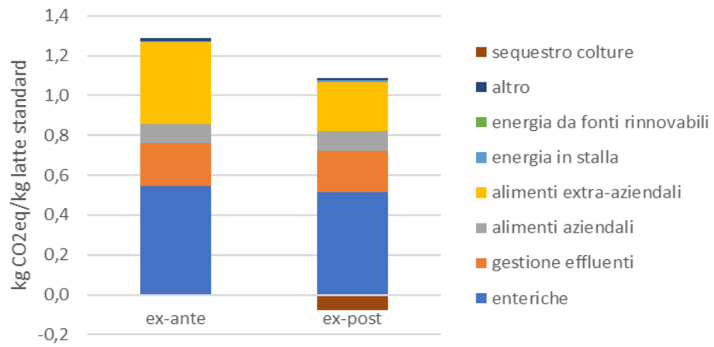
MONITORING OF THE
RESULTS IN ANIMALS
PRODUCTIVITY AND
CLIMATIC EFFICINECY

HIGHER PRODUCTIVE AND
CLIMATIC PERFORMANCES

A sample of the results of the monitoring activity of the herd feeding (Azienda Agricola Castellari)

Fieni	Ceneri [%SS]	Proteine [%SS]	NDF [%SS]	ADF [%SS]	ADL [%SS]	uNDF [%SS]	uNDF [%NDF]	ENL [Kcal/Kg SS]
Azienda Castellari prova alimentazione	8,94	11,94	52,80	38,92	6,31	22,34	43,36	1.215
Azienda Castellari fieni aziendali	8,05	11,62	54,20	37,08	5,52	33,19	59,71	1.280
Fieni - media agriColture	9,38	10,59	55,69	39,11	6,29	34,59	61,08	1.175

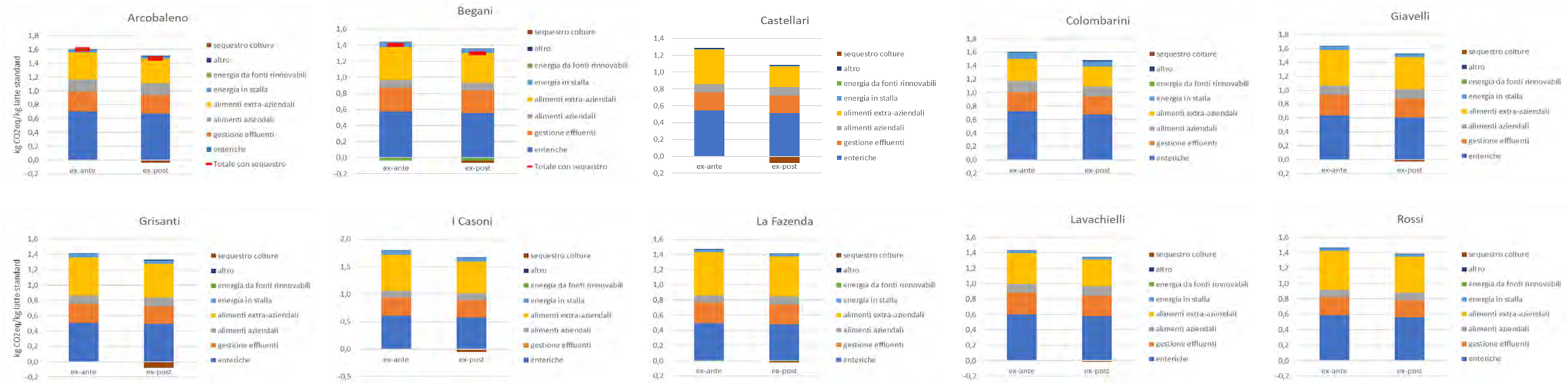
Decreasing of GWP related to the unit value (kg) of milk production (Azienda Agricola Castellari)



3. STRATEGIES FOR VALORIZING SOIL ORGANIC CARBON AND DECREASING GWP

3.7 RESULTS 2: CLIMATIC EFFICIENCY OF THE NEW FODDER PRODUCTION

GWP related to the unit value (kg) of milk production for the 10 farms breeding cows. Comparison between ex-ante (left) and ex-post (right) values



AVERAGE UNIT VALUE OF GWP EX ANTE (COW FARMS): 1,51

⇣

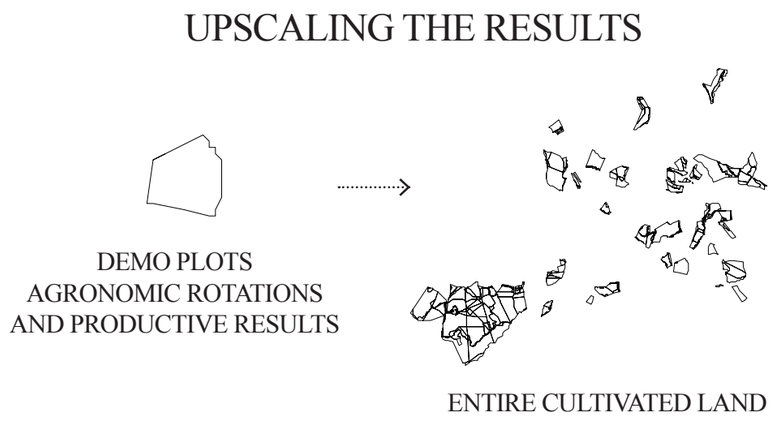
AVERAGE UNIT VALUE OF GWP EX POST (COW FARMS): 1,37

4. USING AND EVALUATING THE RESULTS AT FARM AND TERRITORIAL SCALE

4.1 SCENARIO 1: THE PARADOX OF INCREASING PRODUCTIVE EFFICIENCY

SCENARIO CONSTRUCTION METHODOLOGY:

1. Applying the rotation tested by the project a the demo scale to the entire farm cultivated land
2. Applying to this new scale the productive results monitored at the demo scale



SCENARIO 1

WHAT IF WE ASSUME OF KEEPING FIX THE NUMBER OF ANIMALS BREEDED BY DEMO-FARMS?

EMISSIONS WILL RAISE SINCE ANIMALS ARE MORE EFFICIENT BUT ALSO MORE PRODUCTIVE

EX ANTE (10 cow farms)		EX POST (10 cow farms)	
CO2	GWP: 14’167 TONS OF C02 EQ/YEAR	*CO2*	**GWP: 14’229 TONS OF C02 EQ/YEAR** +
	TO PRODUCE 8’316 TONS OF MILK/YEAR		**TO PRODUCE 9’163 TONS OF MILK/YEAR** +
	1727 COWS BREEDED		1727 COWS BREEDED =

4.2 SCENARIO 2: A SOFT PATHWAY TOWARDS TRANSITION

SCENARIO 2

WHAT IF WE ASSUME OF KEEPING FIX THE TOTAL ANNUAL MILK PRODUCED BY DEMO-FARMS, BY REDUCING THE NUMBER OF ANIMALS BREEDED?

EMISSIONS WILL DECREASE COMPARED TO THE EX ANTE SITUATION, AT FARM AND TERRITORIAL SCALE

REVENUES WILL INCREASE, ALTHOUGH IN A SLIGHTER WAY COMPARED TO SCENARIO 1, THANKS TO INCREASED FODDER SELF-SUFFICIENCY AND LOWER ENERGY COSTS

EX ANTE (10 cow farms)

CO2 GWP: 14’167 TONS OF C02 EQ/YEAR

TO PRODUCE 8’316 TONS OF MILK/YEAR

1727 COWS BREEDED

EX POST (10 cow farms)

CO2 **GWP: 12’913 TONS OF C02 EQ/YEAR** -

TO PRODUCE 8’316 TONS OF MILK/YEAR =

1300 COWS BREEDED -

4.3 SCENARIO 3: A PROACTIVE TRANSITION LEADED BY FARMERS' CHOICES

SCENARIO 3

WHAT IF WE ASSUME OF RE-INVESTING ALL THE REVENUES COMING FROM INCREASED PRODUCTIVE AND ENERGY EFFICIENCY IN A SLIGHT DEGROWTH (-10%) ORIENTED TO CC MITIGATION?

EMISSIONS WILL DECREAS IN A STRONGER WAY COMPARED TO THE EX ANTE SITUATION

REVENUES WILL REMAIN FIX BUT THE INVESTMENT IN CC MITIGATION COULD BE COMPENSATED BY PUBLIC SUBSIDIES, ALSO WITH THE SUPPORT OF THE PACT FOR SOIL CONTRACT

EX ANTE (10 cow farms)		EX POST (10 cow farms)	
CO2	GWP: 14'167 TONS OF C02 EQ/YEAR	*CO2* **GWP: 11'622 TONS OF C02 EQ/YEAR**	-
	TO PRODUCE 8'316 TONS OF MILK/YEAR	**TO PRODUCE 7'484 TONS OF MILK/YEAR**	-10%
	1727 COWS BREEDED	1400 COWS BREEDED	-10%