ICAR 2023
TOLEDOSPAIN
22nd to 26th May 2023

Livestock Environment Opendata

A.I.A.

UNIVERSITÀ CATTOLICA del Sacro Cuore

Estimation of enteric methane emission in Italian dairy herds: application of IPCC equations using DHI data.

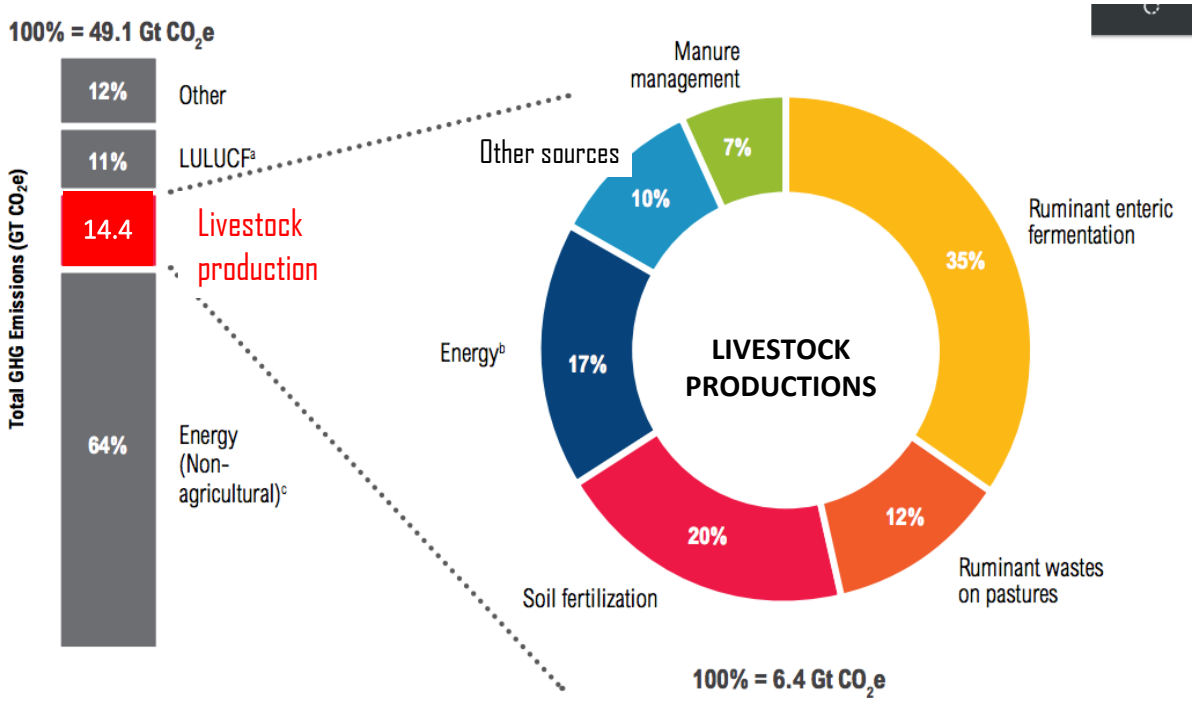
Riccardo Negrini
Italian Breeder Association

negrini.r@aia.it

together with:

Federica Luisi, Mesfin Mekonnen Moliso , Mauro Fioretti , Alessia Tondo

Carbon footprint source: the right perspective



[Flightradar24
https://www.flightradar24.com](https://www.flightradar24.com)

.....that fortunately sometime changes

2006

2021

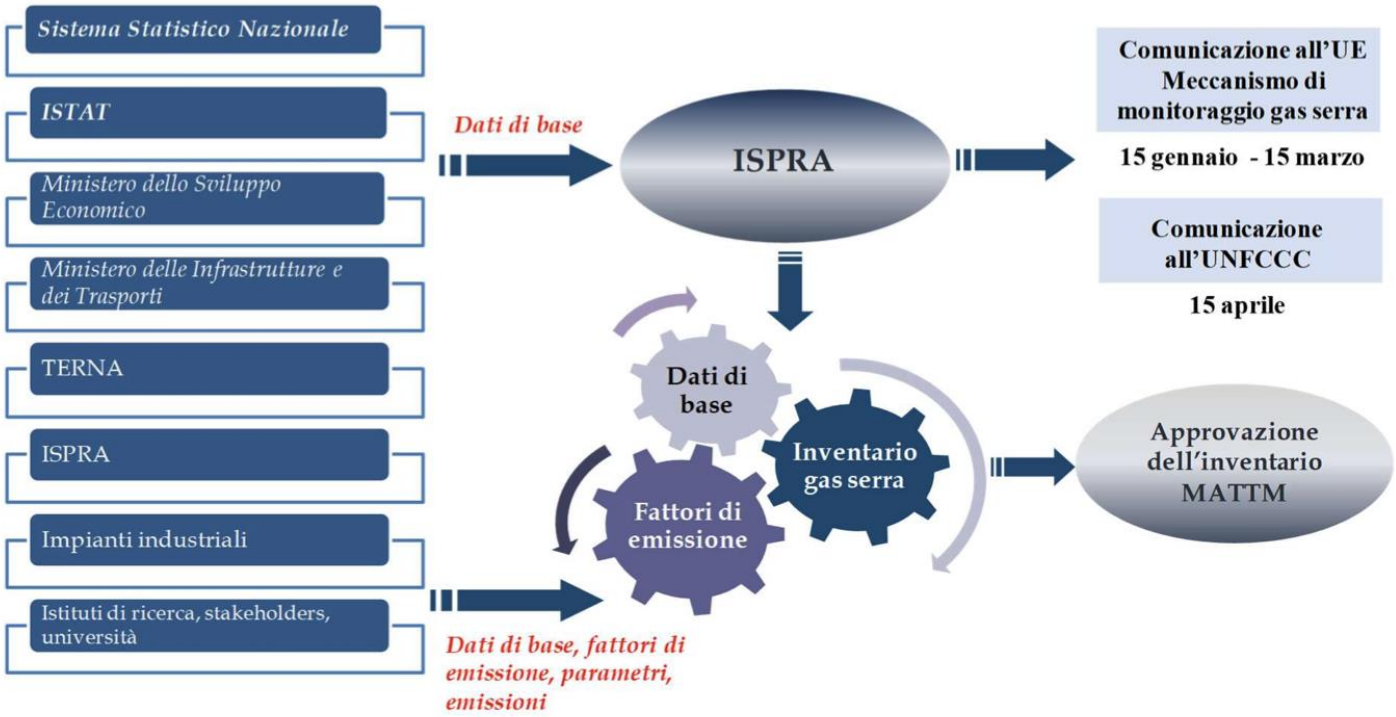
2023

National estimation in Italy

ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

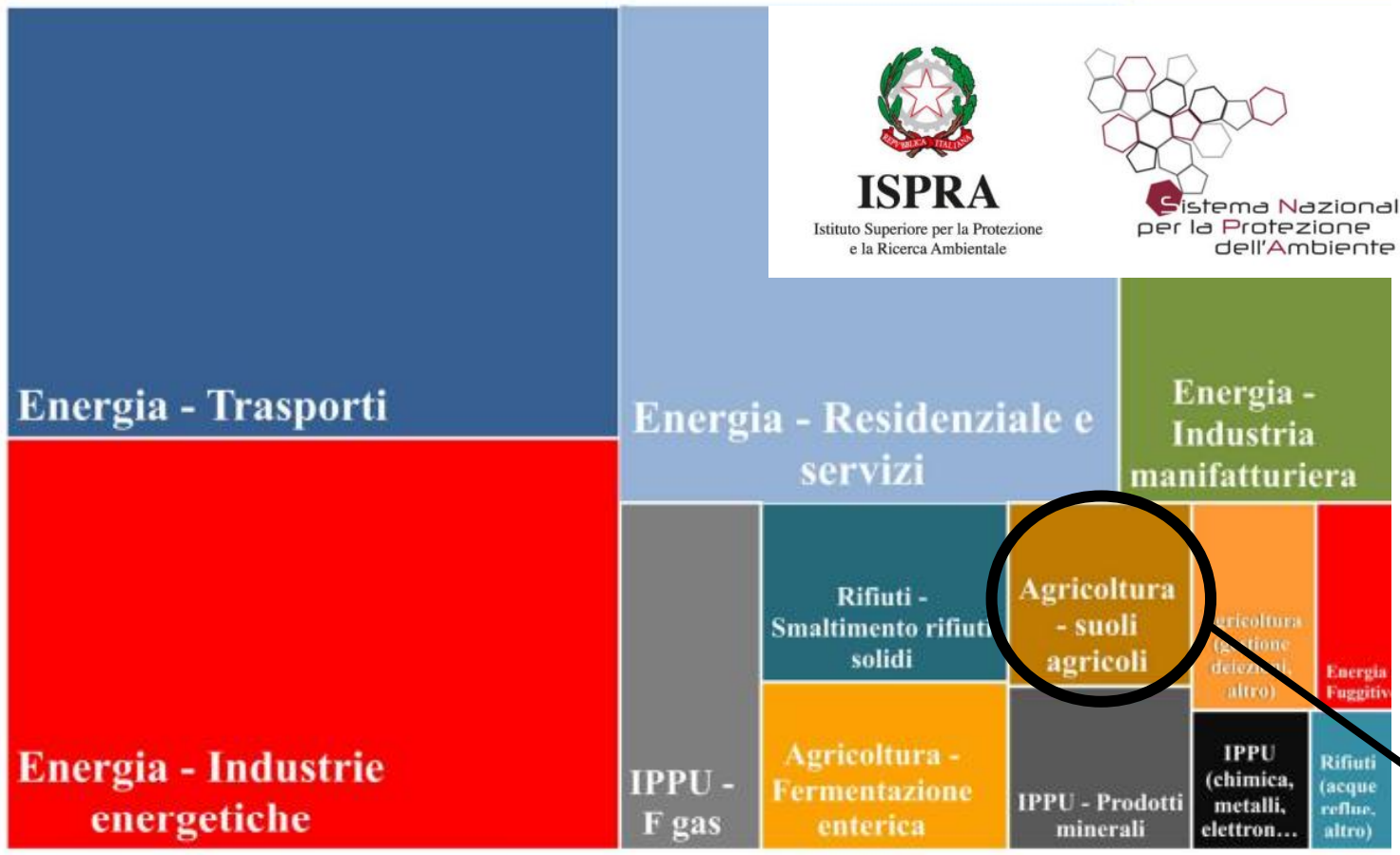
Istituto Superiore per la Protezione e la Ricerca Ambientale



Catalogue of the emission sources ISPRA

- 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

National Total Emission (2021)



Energy: >78%

Agricolture: 8.6%

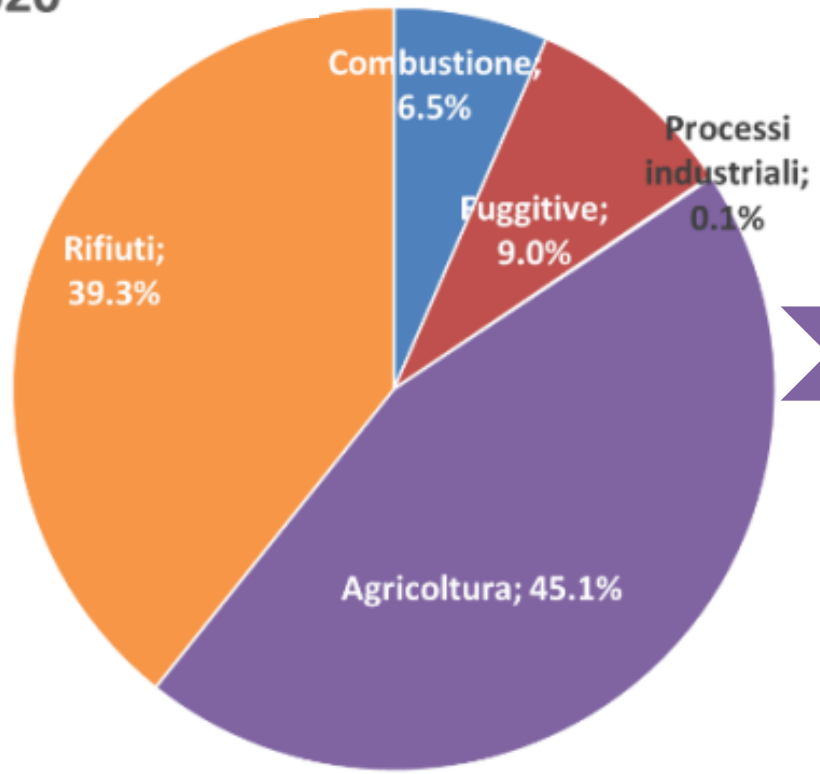
Industry: 8.1%

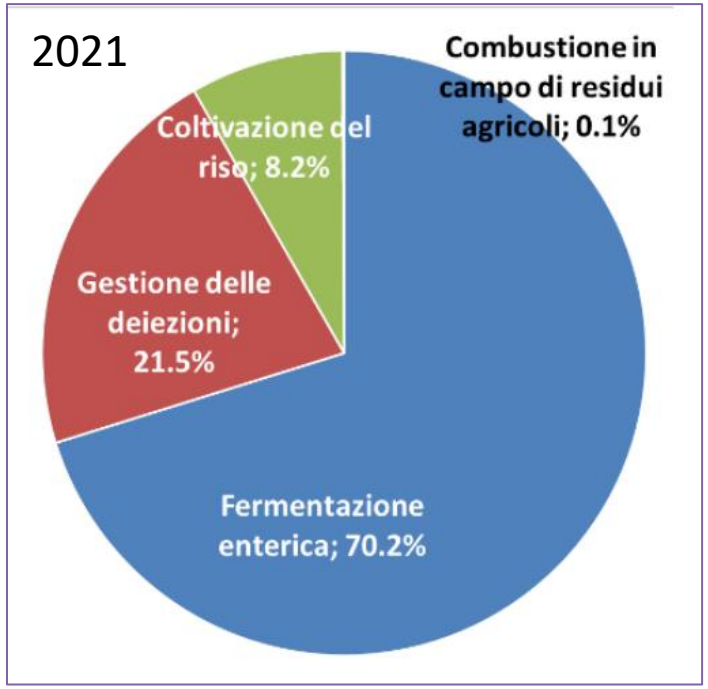
Waste: 4.9%

59.0% Methane (CH_4)
39.5% Nitric Oxid $(NO)_X$

Methane

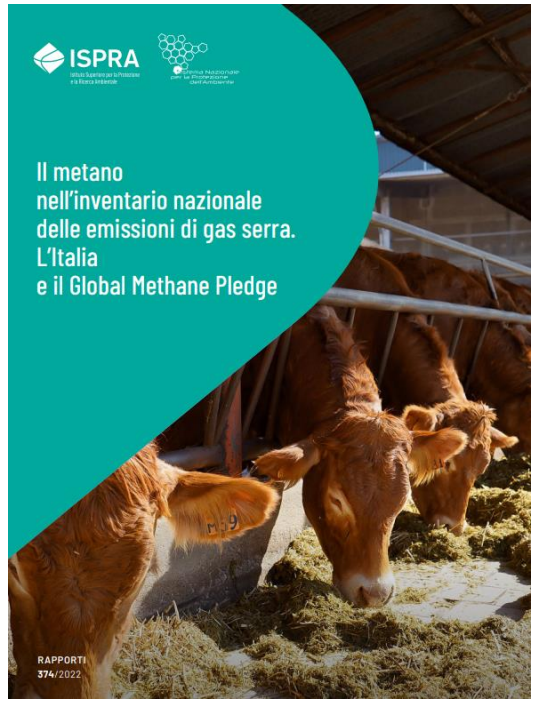
2020 2021





ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente



Estimation Hindrances

- Averaged data and default settings

Estimation relies on national surveys data or literature trials data

- Outputs by macro-clusters

- Energy
- Industrial process and product usage (IPPU)
- Agricolture
- Land Use and forestry
- Waste

Just few examples

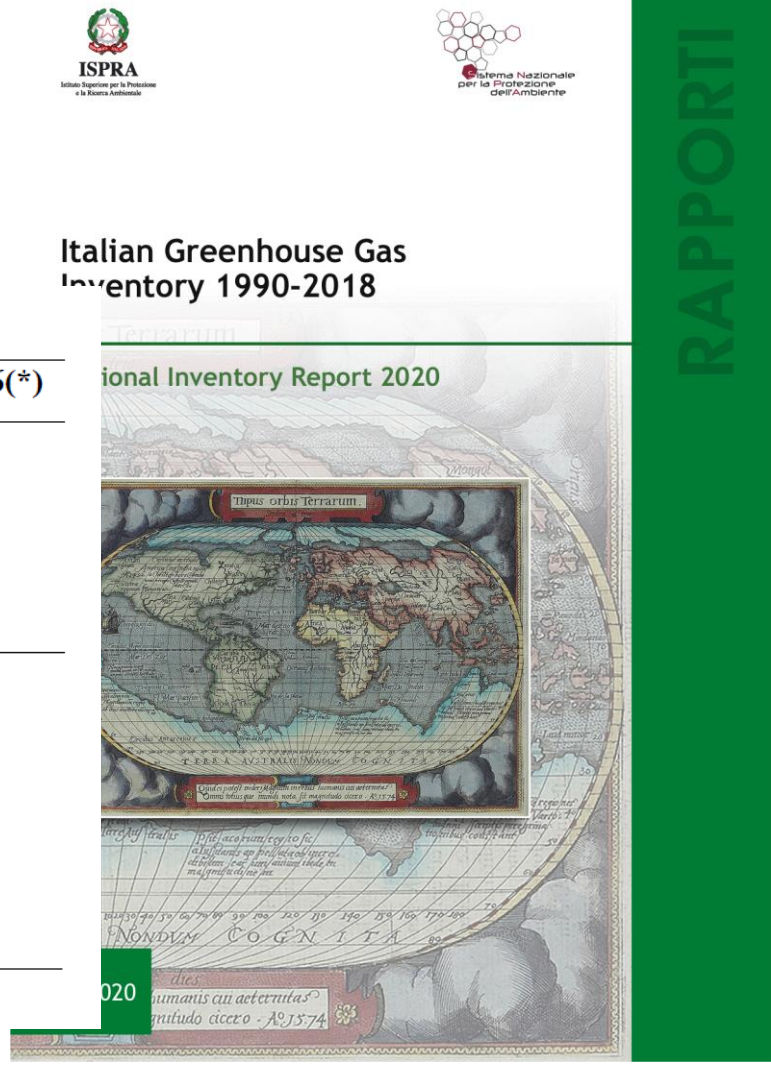
- *5.2.2 Methodological issues*

Dairy cows Tier2 (data and info related to the geographic location)

Table 5.6 Parameters for the calculation of dairy cattle emission factors from enteric fermentation

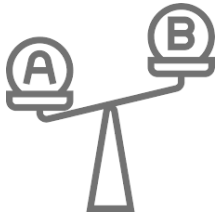
Parameter	Value	Reference	IPCC 2006(*)
Average weight (kg)	602.7	CRPA, 2006[a]	600
Coefficient NE_m (lactating cows)	0.386	NRC, 2001; IPCC, 2006	0.386
Pasture (%)	5	CRPA, 2006[a]; ISTAT, 2003	0(**)
Weight gain (kg day^{-1})	0.051	CRPA, 2006[a]; CRPA, 2004[b]	0
Milk fat content (%)	3.59-3.71	ISTAT, several years[a], [b], [d], [e], [h]	
Hours of work per day	0	CRPA, 2006[a]	0
Portion of cows giving birth	0.97-0.91	AIA, several years[a]	0.9
Milk production (kg $head^{-1}$ day^{-1})	11.5-22.2	CRPA, 2006[a]; OSSLATTE/ISMEA, 2003; ISTAT, several years[a], [b], [c], [d], [e], [f], [h]; OSSLATTE, 2001	16.4
Digestibility of feed (%)	65	CRPA, 2006[a]; CRPA, 2005; IPCC, 2006	65
Methane conversion factor (%)	6.5	CRPA, 2006[a]; IPCC, 2006	6.5
Energy content of methane (MJ/kg methane)	55.65	IPCC, 2006	55.65

(*) Data for estimating tier 1 enteric fermentation CH_4 emission factors for dairy cows (Western Europe); (**) Stall fed (feeding situation)



Our mission

Foster the adoption of in-farm mitigation strategies



Provide farmers a mitigation monitoring tools easy to use

Monitoring trends regularly, assess progress toward carbon neutrality and provide robust reports and forecast

Our plan

Exploting DHI longitudinal data and other information sources (LEO open-data project) to fine tune IPCC/ISPRA CH_4 estimations (from TIER 2 to TIER 3)

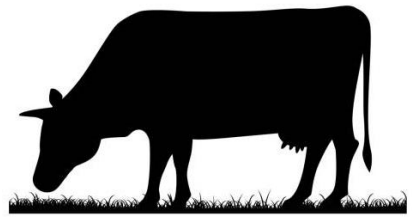
Estimating methane emission *«at animal and farm-level»*

Turn the outcomes in functional units (e.g. milk yeld, dry matter, protein content, serving size etc)

DHI national longitudinal data

Collected regularly by technicians

average 9 time/year



On single head/farm

1.5 milion dairy cows, 30 milion data year, 14.000 farms

ICAR 2023

Livestock Environment Opendata

in figures

Livestock Genetics from Spain

Animals : More than 20 M

Farm: More than 19.000

Traits: about 70 novel parameters in large-scale routine collection

Lab: About 90M milk lab analysis

Dataflow: more than 40M / year

LEO open database (10.25 AM May 16th): more than 4 x 10^9 triplets (date-id-measure)

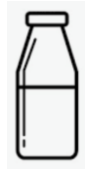
www.leo-italy.eu

FEASR
PSRN
mipaaf ministero delle politiche agricole alimentari e forestali

Including data informative for CH_4 robust estimation

CH_4 emission per farm, cows, milk yeld

ipcc
INTERGOVERNMENTAL PANEL ON climate change



Milk yeald and composition

Feeding plan

Herd composition

Manure management

Livestock Environment Opendata

Information exploited

- True and updated herd composition
- Weighted milk per cow
- Measured milk composition (including urea)
- Recorded reproductive performance per caw
- Herds feeding plan and diet composition
- Herd manure data

- Upgrade ENERGY estimations
- Refine ISPRA conversion factor

An easy to read report by farm issued monthly

Entheric CH4 estimation

Sostenibilita' ambientale razza : Frisona Italiana

Parametri aziendali alla data CF	
Peso Vivo Medio	700
Media EVM Latte (kg)	10.665
Media EVM Grasso Medio (kg)	466
Latte EVM corretto grasso al 4% (kg)	11.258
Urea Media (mg/dl)	27

Consistenza media del periodo	
Mandria	278
Vacche	236
In lattazione	121
In asciutta	15
Manze	141
Tori	0
Torelli	0

Produzione media del periodo	
Produzione media a capo (kg/giorno)	30,5
Numero medio parti per vacca	0,8503

Stime	
Valori Medi per Vacca (kg/capo/anno escreto da ERM)	
Azoto	87,9071
Fosfato	40,3740
Fosforo	17,6306
Valori Medi per kg Latte prodotto	
Azoto	0,0078
Fosfato	0,0016

Stima Metano enterico per categoria (kg Anno)		A capo/giorno	A kg latte/giorno
Mandria	30.284,7700	0,2974	0,0225
Vacche	22.067,5342	0,4434	
In lattazione	21.208,5049	0,4801	0,0157
In asciutta	859,0292	0,1536	0,0006
Manze	8.179,1899	0,1580	
Tori	0,0000	0,0000	
Torelli	38,0459	0,1247	

Stima Metano enterico per categoria (kg Anno)		A capo/giorno	A kg latte/giorno
Mandria	30.284,7700	0,2974	0,0225
Vacche	22.067,5342	0,4434	
In lattazione	21.208,5049	0,4801	0,0157
In asciutta	859,0292	0,1536	0,0006
Manze	8.179,1899	0,1580	
Tori	0,0000	0,0000	
Torelli	38,0459	0,1247	

The report is already delivered monthly to the farmer trough our software and app for free

Si@LLEvA
Associazione Italiana Allevatori

Download on the App Store

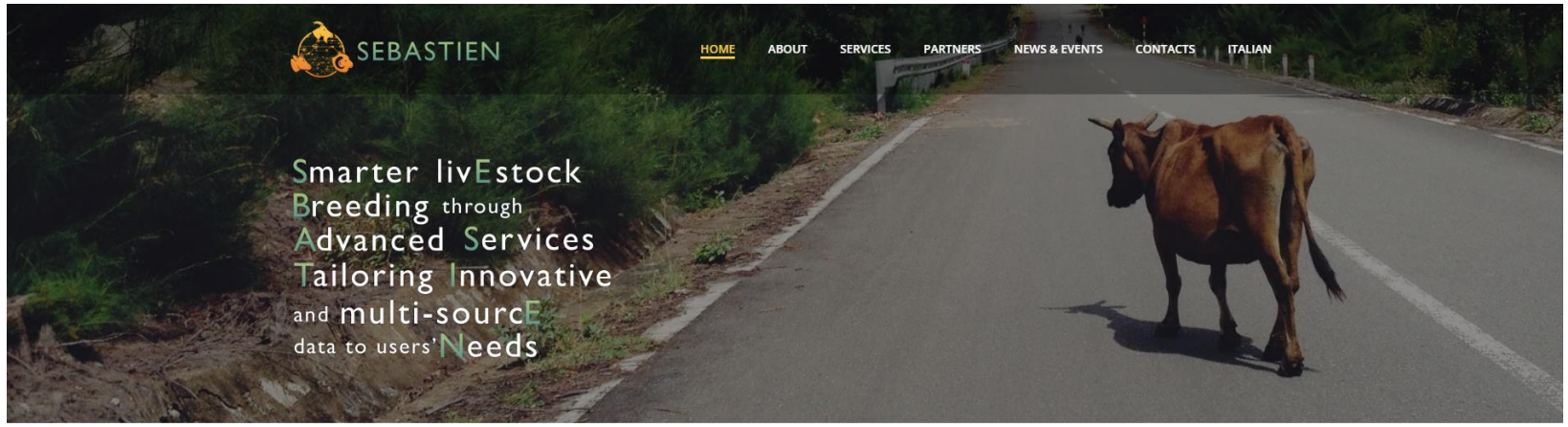
GET IT ON Google Play

- Extend, consolidate and simplify feeding data recording (portable NIR)
- Integrate methane direct measures (portable Sniffer)
- Develop indexes, produce trends, set up tresholds
- Exploit scientific research and EU running prejects outcomes
- Improve the report with other information (e.g N escretion, estimation by FU etc)
- Disseminate to farmers (including advises on effective mitigation strategies)

ICAR 2023

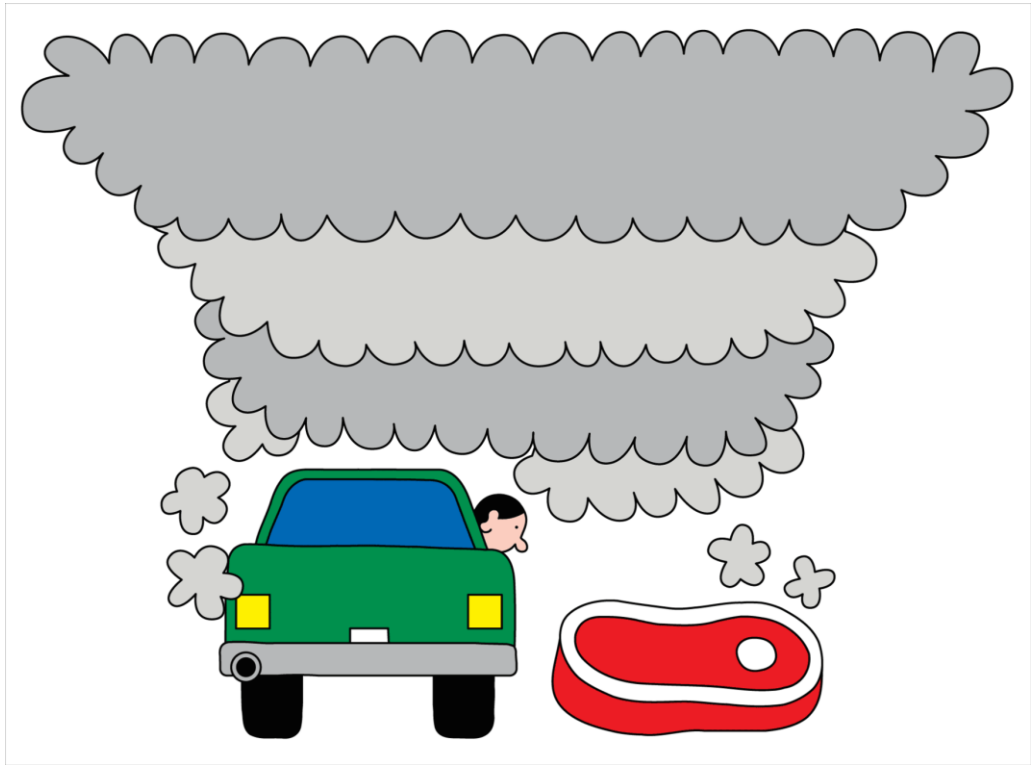
SEBASTIEN

The main goal of the **project SEBASTIEN** is to deliver a **Decision Support System (DSS)** for a more efficient and (economically and environmentally) **sustainable management**, and consequent valuing, of the livestock sector in Italy and in particular cattle, sheep and goat breeding.



www.sebastien-project.eu/

Thanks for your attention



A.I.A.

Le

Livestock Environment Opendata

UNIVERSITÀ CATTOLICA del Sacro Cuore