IMPROVING AIR QUALITY TOGETHER
LIFE IP PrepAIR: project's achievements and main results

31st May 2022
Emilia-Romagna Region
Delegation to the EU

NEXT GEN EU

LIFE 15 IPE IT 013

prepAIR

30 Life 1992 – 2022

LIFE 15 IPE IT 013

EVALUATING EMISSIONS FROM LIVESTOCK: THE BAT-TOOL

Matteo Balboni, Region Emilia-Romagna
PREPAIR Pillar agricolture coodinator

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

THE PROJECT

Coordinator: Region Emilia-Romagna. Other major partecipants: Region Lombardy and Region Veneto.
Other partecipants: Regions Piedmont and Friuli Venezia Giulia, Autonomous Province of Trento (data sharing and participation to project meetings) + ARPAE and ARPA Veneto

Goals:

- Survey of existing local models to promote a homogeneous application of BATs in the Po Basin
- Common model to assess gases and odour emissions and nitrogen compounds releases from intensive farming activities into water (for the whole Po Basin)
- Common database
- Applicability of the model to single farms, or to a wider scale, to estimate the effectiveness of policies
- Training activities for farmers and operators
- 1 site visit (together with action C4)

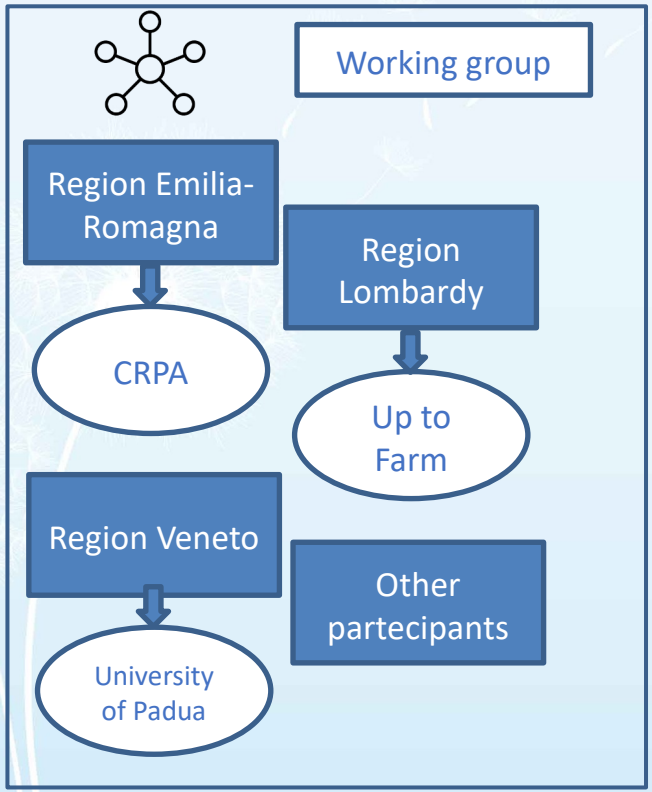
Budget: € 384.534,00

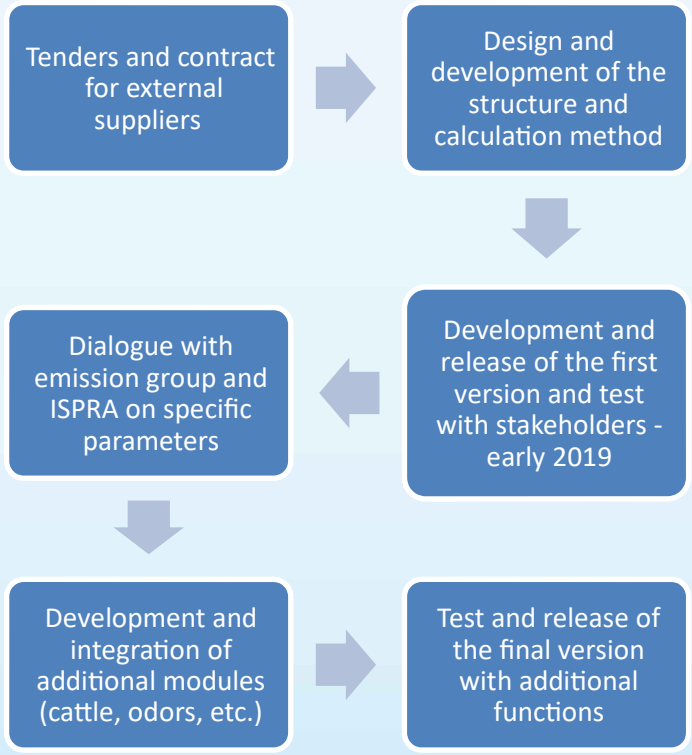
LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

MAIN DEVELOPMENT STEPS





LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

BAT-TOOL

May 2019 – December 2021

BAT-TOOL PLUS

BAT-Tool is freely available online at **https://bat-tools.datamb.eu/** after simple registration

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

Emissions of:

- Ammonia (NH_3);
- Nitrous oxide (N_2O);
- Methane (CH_4);
- Nitrates (NO_3^-);
- Carbon dioxide (CO_2).

from

- Cattle 
- Pigs 
- Poultry 

during

- Manure management («in farm») 
- Manure distribution («on field») 

"Integrated" approach: the model both considers **ammonia** and **greenhouse gases** emissions. in order to have a **global estimation** of all the environmental effects from the application of given techniques.

For instance, some **best practices** aimed at reducing nitrogen percolation into groundwater **might not be effective** in reducing atmospheric emissions and vice versa.

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

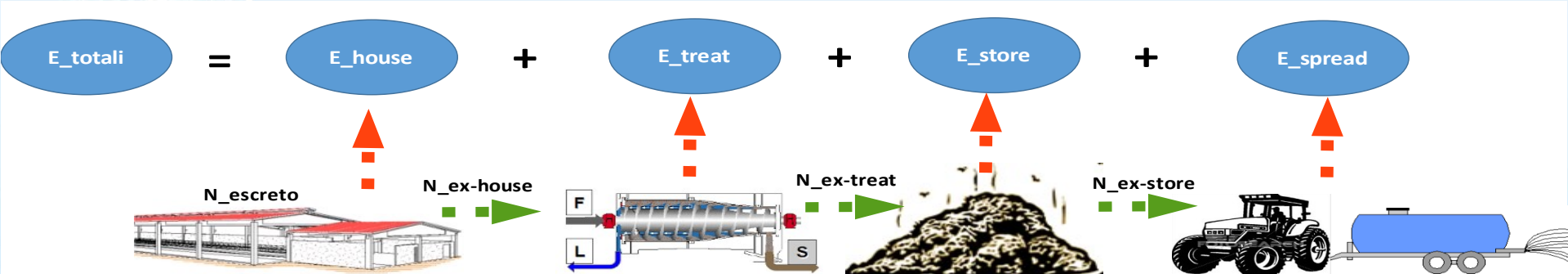
prepAIR Po Regions Engaged to Policies of Air

Nitrogen cycle

“Whole farm" approach: it estimates the overall emissions produced during in the farm during the different stages of production and management (nutrition, housing, storage, manure treatment and spreading)

Organic carbon cycle

The emission reduction techniques are applied to the associated emission phase, reducing the amount but increasing the nitrogen that passes to the next phase with a «mass flow» approach.



Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

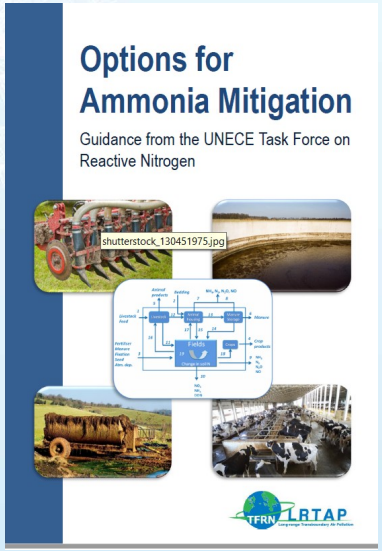
Key elements:

- Ease of use and limited number of input data
- Transparency in the parameters and factors used
- Modularity to allow the insertion of additional calculation applications
- Consistency with zootechnical categories and excreted nitrogen values used for application of nitrates directive
- Consistency with the techniques envisaged by the BAT Conclusions for pigs and poultry
- Coordination with other existing tools of the working group (MAREA Veneto model for cattle techniques and Region Veneto - UniPD for the calculation of the excreted nitrogen)

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air



REFERENCES for emission factors:

- DM 25/02/16 on manure management
- Emilia-Romagna Regional Regulation n.3, 15/12/2017 on manure management
- BAT Conclusions published on the Official Journal of EU, 21/02/2017
- Options for Ammonia Mitigation Guidance, UNECE
- EMEP/EEA Air pollutant emission inventory Guidebook, 2019
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Agriculture, Forestry and Other Land Use

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

https://bat-tools.datamb.eu

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

Data requested for calculation of farm emissions

Situazione attuale Ricovero e Alimentazione

	Specie	Categoria	Capi Pot.	Capi Med.	Peso Medio	N E
	Avicoli	Riproduttori polli da carne (broiler breeder)	60.000	54.000	3,70 kg/capo	329

Indici tecnici Vacche da Latte

Nessun dato presente.

Situazione attuale Effluenti e biomasse importate

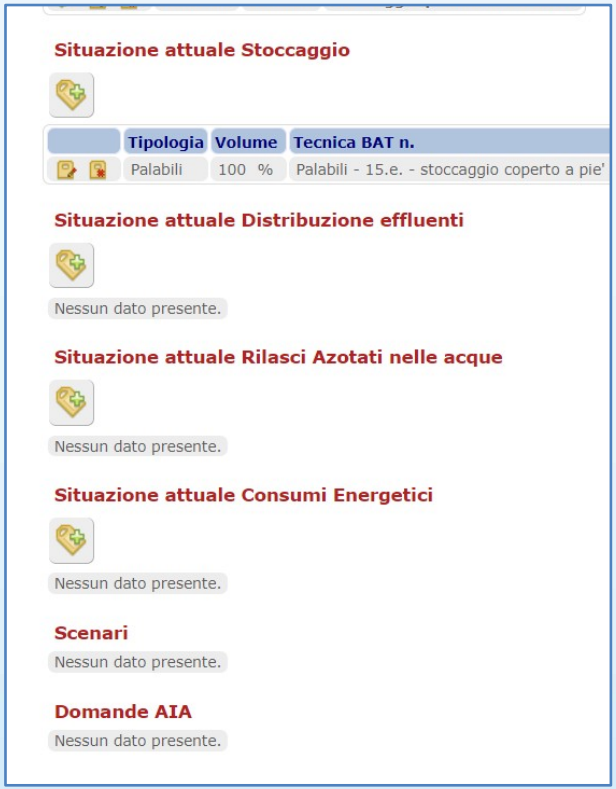
Nessun dato presente.

Situazione attuale Trattamenti

Nessun dato presente.

Situazione attuale Gestione Effluenti (per calcolo Gas Serra)

	Tipologia	Volume	Tecnica
	Palabili	100 %	stoccaggio palabili in cumulo



Situazione attuale Stoccaggio

	Tipologia	Volume	Tecnica BAT n.
	Palabili	100 %	Palabili - 15.e. - stoccaggio coperto a pie'

Situazione attuale Distribuzione effluenti

Nessun dato presente.

Situazione attuale Rilasci Azotati nelle acque

Nessun dato presente.

Situazione attuale Consumi Energetici

Nessun dato presente.

Scenari

Nessun dato presente.

Domande AIA

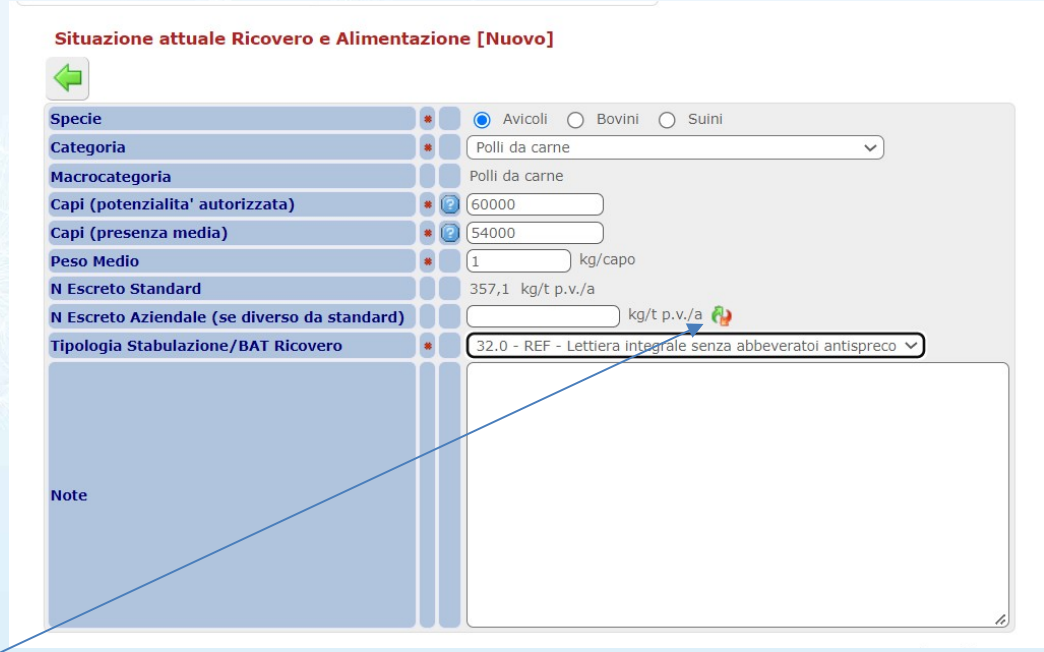
Nessun dato presente.

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

Input example: number of animals, excreted nitrogen and applied housing tecniques



It’s possible to insert a tailored value of the excreted nitrogen or to calculate the excreted nitrogen using a calculation form based on the nitrogen introduced with the diet.

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

Input example: storage techniques

	Fase	Macroategoria	Tipologia	Nome	Riduzione	Cessione	Forma
▷	Stoccaggio		Liquami	Liquami - 16.b.3 - crostone naturale	40 %	No	
▷	Stoccaggio		Liquami	Liquami - 16.b.3 - materiali leggeri alla rinfusa (es. LECA)	50 %	No	
▷	Stoccaggio		Liquami	Liquami - 16.b.3 - paglia	40 %	No	
▷	Stoccaggio		Liquami	Liquami - 16.b.3 - piastrelle geometriche galleggianti	50 %	No	
▷	Stoccaggio		Liquami	Liquami - 16.b.3 - sfere plastica galleggianti	50 %	No	
▷	Stoccaggio		Palabili	Palabili - REF: cumulo scoperto	0 %	No	
▷	Stoccaggio		Palabili	Palabili - ceduto a terzi senza stoccaggio	100 %	Si	
▷	Stoccaggio		Palabili	Palabili - stoccaggio compost	90 %	No	
▷	Stoccaggio		Palabili	Palabili - stoccaggio pollina da tunnnel essiccazione	80 %	No	
▷	Stoccaggio		Palabili	Palabili - 14.a. - ridurre rapporto superficie/volume	10 %	No	
▷	Stoccaggio		Palabili	Palabili - 14.b. - coprire il cumulo in concimaia	40 %	No	
▷	Stoccaggio		Palabili	Palabili - 14.c. - stoccare effluenti in capannone	40 %	No	
▷	Stoccaggio		Liquami	stoccaggio in vasca scoperta di fango da flottazione, assimilato a REF	0 %	-	

Choose from the dropdown list corresponding to BAT conclusions where applicable

BAT 14. In order to reduce ammonia emissions to air from the storage of solid manure, BAT is to use one or a combination of the techniques given below.

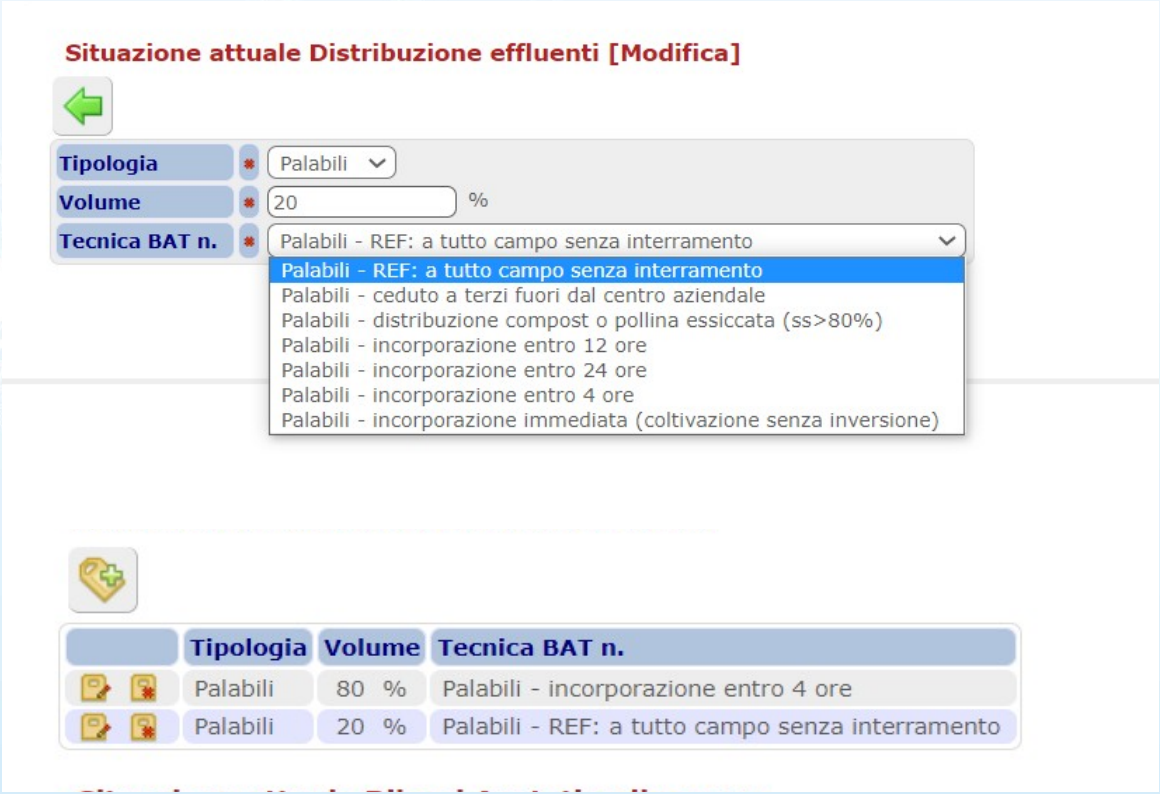
	Technique (1)	Applicability
a	Reduce the ratio between the emitting surface area and the volume of the solid manure heap.	Generally applicable.
b	Cover solid manure heaps.	Generally applicable when solid manure is dried or pre-dried in animal housing. May not be applicable to not dried solid manure in case of frequent addition to the heap.

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

Input example: solid manure spreading techniques

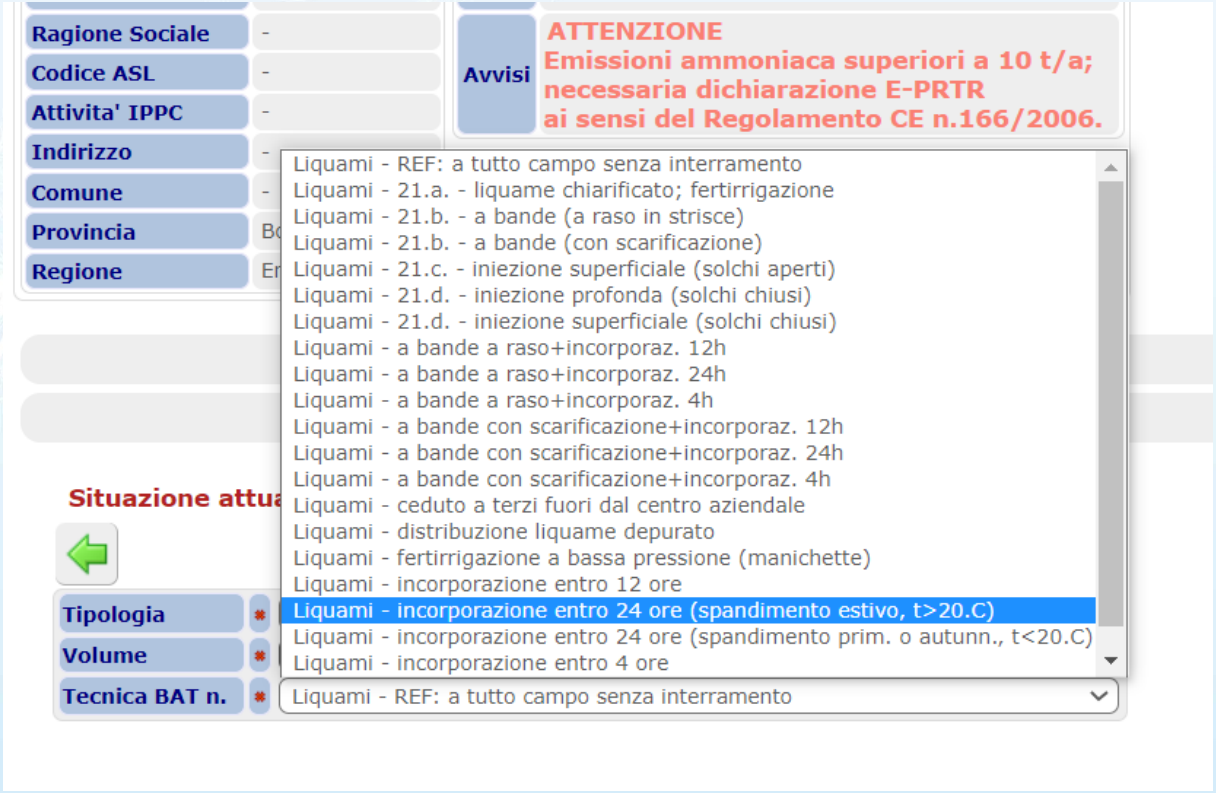


LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

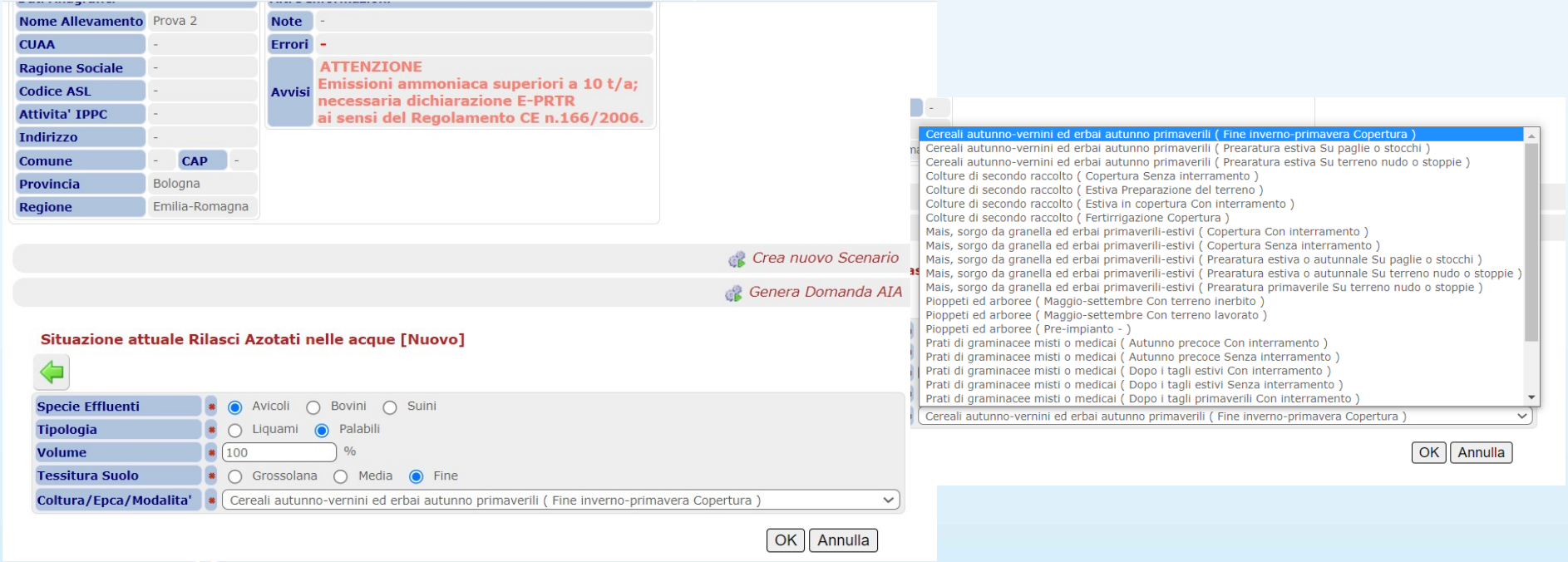
Input example: liquid manure spreading techniques



LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

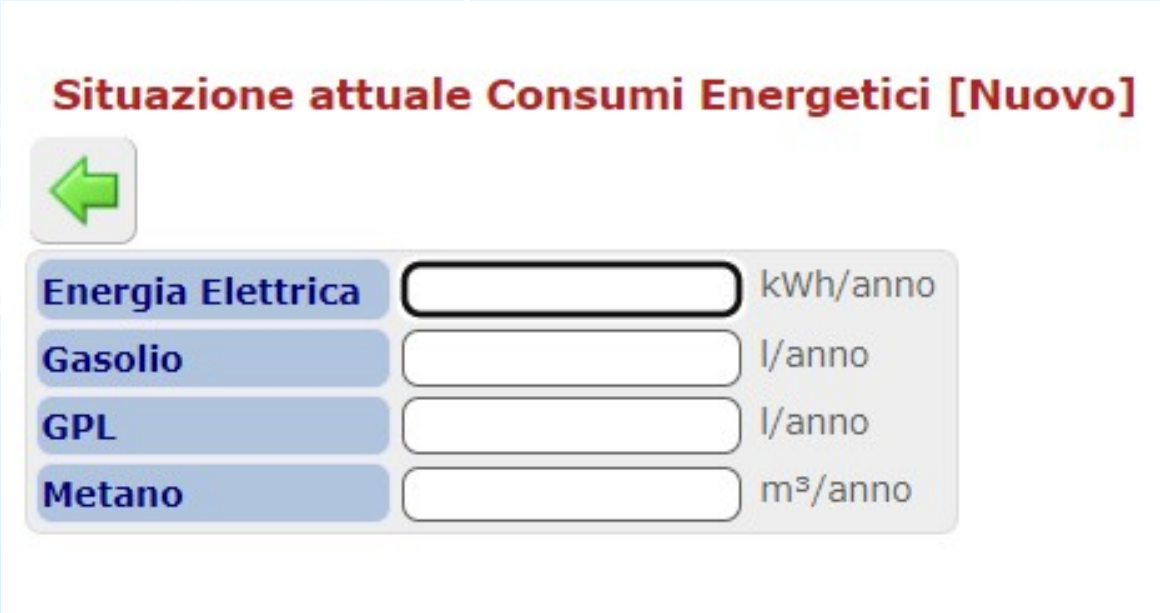
Input example: nitrates release



LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

Input example: energy consumption



LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

Output example

Emissioni (Capi Potenzialita' Massima)

Emissioni NH3 REF		Emissioni NH3 Situazione attuale		Riduzione NH3 rispetto a REF			Emissioni Gas Serra							
Totali	58.063 kg/a	Totali	39.158 kg/a	Totali	18.905 kg/a	32,6 %	Totali	CH4	4.807 kg/a	N2O	2.274 kg/a	CO2-eq	924.463 kg/a
Ricovero	24.803 kg/a	Ricovero	18.602 kg/a	Ricovero	6.201 kg/a	25 %	Emissioni Enteriche	CH4	0 kg/a	N2O	0 kg/a	CO2-eq	0 kg/a
Trattamento	0 kg/a	Trattamento	0 kg/a	Trattamento	0 kg/a	- %	Gestione Effluenti	CH4	4.807 kg/a	N2O	1.057 kg/a	CO2-eq	435.161 kg/a
Stoccaggio	8.291 kg/a	Stoccaggio	5.458 kg/a	Stoccaggio	2.833 kg/a	34,2 %	Distribuzione Agronomica	CH4	0 kg/a	N2O	1.217 kg/a	CO2-eq	362.666 kg/a
Distribuzione effluenti	24.969 kg/a	Distribuzione effluenti	15.098 kg/a	Distribuzione effluenti	9.871 kg/a	39,5 %	Consumi Energetici		-		-	CO2-eq	126.636 kg/a

Emissioni (Capi Presenza Media)

Emissioni NH3 REF		Emissioni NH3 Situazione attuale		Riduzione NH3 rispetto a REF			Emissioni Gas Serra							
Totali	52.257 kg/a	Totali	35.242 kg/a	Totali	17.015 kg/a	32,6 %	Totali	CH4	4.327 kg/a	N2O	2.046 kg/a	CO2-eq	844.519 kg/a
Ricovero	22.322 kg/a	Ricovero	16.742 kg/a	Ricovero	5.580 kg/a	25 %	Emissioni Enteriche	CH4	0 kg/a	N2O	0 kg/a	CO2-eq	0 kg/a
Trattamento	0 kg/a	Trattamento	0 kg/a	Trattamento	0 kg/a	- %	Gestione Effluenti	CH4	4.327 kg/a	N2O	951 kg/a	CO2-eq	391.573 kg/a
Stoccaggio	7.462 kg/a	Stoccaggio	4.913 kg/a	Stoccaggio	2.549 kg/a	34,2 %	Distribuzione Agronomica	CH4	0 kg/a	N2O	1.095 kg/a	CO2-eq	326.310 kg/a
Distribuzione effluenti	22.472 kg/a	Distribuzione effluenti	13.588 kg/a	Distribuzione effluenti	8.884 kg/a	39,5 %	Consumi Energetici		-			CO2-	126.636 kg/a

- **Comparison of possible future scenarios**

- **Single stage emissions quantifications and emission reductions quantifications with respect to the reference system, expressed as an absolute value and as a percentage**

Rilasci Azotati
107.624,25 kg NO3/anno

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

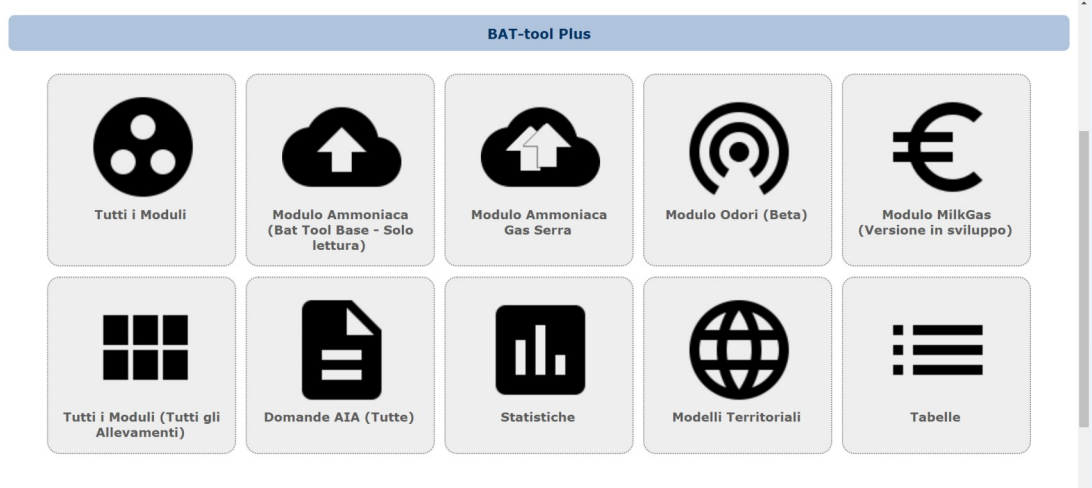
POSSIBLE APPLICATIONS

- Pollutant emissions calculation for IED directive authorizations (NH_3, N_2O, CH_4, nitrates, odours) and for European Pollutant Register (E-PRTR, NH_3, CH_4, N_2O) declarations
- Pollutant calculation for other authorization to atmospheric emissions
- Support for calls for agricultural enterprises (Rural Development Programme)
- Evaluation of the possible effectiveness of funding policies or environmental rules
- Estimation of emissions from an area or region based on the effectiveness of the techniques applied
- Support for air emissions inventories

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air



IN PERSPECTIVE

- The odour estimation module and the “economic” module for dairy cattle are still in a test phase and not available to the public, at the moment.

- BAT-Tool as a database to collect information on the techniques really used and to support the improvement of estimates on emissions from agriculture?

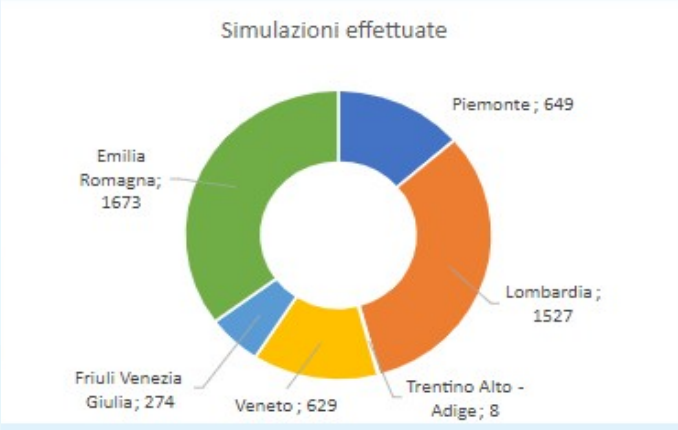
LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

SOME REAL APPLICATIONS DATA

- 824 users, some of which with more than 150 simulations
- 4943 farm simulations



The BAT-Tool is already indicated as emission estimation methodology in many official documents:

- Used in the Po basin for calculation of pollutant emissions in the revision of the IED permits: DGR Regione Lombardia n. 1926/2019 and ARPAE Guidelines Det-2020-337
- Used as calculation tool or methodology to support the presentation of the application for calls for environmental financing for agricultural enterprises (Region Veneto tenders PSR DGR n. 1688 e 1687 of 29/11/2021, Region Emilia-Romagna DGR 2283 of 27/12/2021)
- Used in Region Piemonte as methodology for the creation of the emission inventory and of ammonia reduction regional scenarios

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

COMUNICATIONS AND INFORMATIONS ACTIVITIES

- The model has been presented to the Associations Of operators and Environmental Agencies in 4 Regions, and to the national group form IED directive implementation – other initiatives are programmed
- Articles in specialized magazines
- At least 10 participations in conferences and seminars, also as networking in projects regarding agricultural emissions and air quality
- 1 site visit in a demonstrative farm (CERZOO) to see the application of BATs

LIFE 15 IPE IT 013

Action C5 - Implementation of a common model for evaluation of odours and gaseous emissions resulting from intensive rearing of cattle, pigs and poultry

prepAIR Po Regions Engaged to Policies of Air

NEXT STEPS

- Communication
- Test completion
- Maintenance and evolution planning

Action C4 – promoting low emissions fertilization

LIFE 15 IPE IT 013

Tabella 31 – Stima qualitativa della applicabilità delle buone pratiche di distribuzione dell'urea

Pratica	Applicabilità			
	cereali autunno-vernini		cereali estivi	
	in presemina /semina (1)	in copertura	in presemina /semina	in copertura
Interramento superficiale (circa 3 cm)	0	0	+++	+++
Iniezione di urea a solco chiuso	0	0/+	+	++
Irrigazione a seguito dell'applicazione	0	0/+	0	+++
Fertirrigazione in manichette superficiali	0	0	0	++
Fertirrigazione in manichette interrate	0	0	0	+
Inibitore ureasi	0	+++	++	+++
Urea a rilascio controllato	0	+++	++	+++
Sostituzione di urea con nitrato ammonico	0	+++/++++	++/+++	+++/++++
Agricoltura di precisione (rateo variabile)	0	+/++	+/++	+/++
Applicabilità	0	nessuna		
	+	bassa		
	++	media		
	+++	alta		
	++++	molto alta		

(1) si considera che l'urea nel caso dei cereali autunno vernini non sia il fertilizzante applicato in fase di pre-semina/semina

Action C4 – promoting low emissions fertilization

Scenari

- **SC_BAU:** (Business As Usual)
- **SC_NEC:** prescrizioni contenute nel NAPCP 2019, il Piano Nazionale di Riduzione dell'Inquinamento Atmosferico (interramento urea)
- **SC_EQU:** diffusione equilibrata delle buone pratiche
- **SC_BAN:** bando dell'urea

Regioni	REF	BAU	NEC	EQU	BAN
	Emissioni NH_3	Riduzione emissioni			
	(t NH_3/a)	(%)			
Piemonte	3245	-33%	-36%	-44%	-81%
Lombardia	8935	-36%	-39%	-44%	-82%
Veneto	5795	-31%	-34%	-44%	-81%
Friuli VG	2114	-38%	-40%	-45%	-83%
Emilia Romagna	7969	-22%	-26%	-43%	-79%
Regioni Padane	**28058**	**-31%**	**-34%**	**-44%**	**-81%**

LIFE 15 IPE IT 013

prepAIR
Po Regions Engaged to Policies of Air

www.lifeprepair.eu - info@lifeprepair.ue

Regione Emilia-Romagna
Regione del Veneto
Regione Lombardia
Regione Piemonte
Regione Autonoma Friuli Venezia Giulia
Provincia Autonoma di Trento
arpae agenzia prevenzione ambiente energia emilia-romagna
arpav Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto
Arpa Piemonte Agenzia Regionale per la Protezione Ambientale
ARPA Lombardia Agenzia Regionale per la Protezione dell'Ambiente
ARPA Valle d'Aosta
arpa FVG
ARSO Environment Slovenian Environment Agency
Comune di Bologna
Comune di Milano
Città di Torino
ART-ER Attrattività Ricerca Territorio
FLA Fondazione Lombardia per l'Ambiente