UNIVERSITÀ DEGLI STUDI DI BRESCIA

B-LabNet

Approccio multiscala alla valutazione degli impatti ambientali dell'alimentazione

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TEMA: Valutazione del Rischio

AGROFOOD LAB

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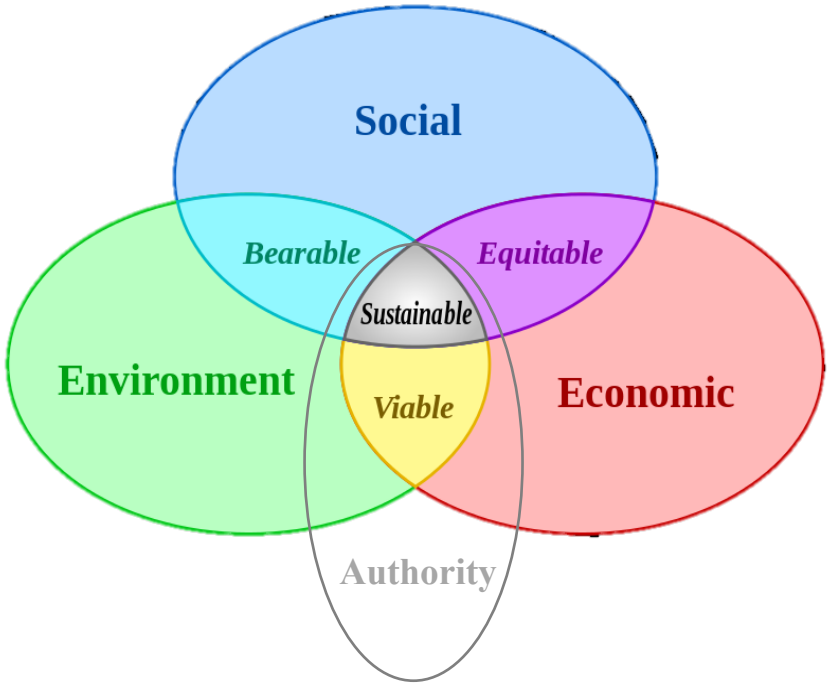

Piattaforma SaRA
Sustainability and Risk Assessment
Analisi del Rischio e della Sostenibilità

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Piattaforma SaRA: principi fondanti

VALUTAZIONE

COMPETENZE

- Biologi, ecologi, entomologi
- Statistici, matematici
- Economisti, ingegneri
- Risk assessors
- Medici, veterinari, nutrizionisti

TOOLS

- Modelli statistici e biomatematici
- Modelli di controllo e decisione
- Basi di dati
- Sistemi a supporto di decisioni

INTERLOCUTORI

- Mondo produttivo
- Amministrazioni territoriali e policy maker
- Agenzie internazionali
- ONG
- Enti di ricerca

Piattaforma SaRA: 3 Linee di Ricerca

IMPLEMENTAZIONE

Valutazione e gestione della sostenibilità in agricoltura

Analisi dei rischi e della qualità del cibo

Sviluppo sostenibile in Paesi a risorse limitate

Valutazione e gestione della sostenibilità in agricoltura

- Monitoraggio di **sistemi agro-ecologici**
- Valutazione della **biodiversità funzionale** (es. fauna del suolo) in agro-ecosistemi e dei servizi degli ecosistemi (es. impollinazione)
- Stime dalla **produzione vegetale e animale**
- Sistemi a supporto della **difesa integrata** dai parassiti delle piante
- Valutazione delle **impronte** e degli **impatti** ambientali della produzione vegetale e animale
- Valutazione del rischio associato alle **specie invasive**
- Valutazione **degli impatti del cambiamento** climatico in agricoltura e sistemi di **adattamento** al climate change

Analisi dei rischi e della qualità del cibo

- Analizzare i **rischi** da **contaminanti** nella filiera agro-alimentare
- Valutare i **rischi** per la salute legati ai **comportamenti alimentari** (es. obesità, sindrome metabolica)
- Valutare i **rischi** per la salute legati alla **qualità ambientale e agli stili di vita** (attività fisica e alimentazione)

Sviluppo sostenibile in Paesi a risorse limitate

- Valutazione multidimensionale della **sostenibilità di sistemi socio-ecologici** (es. agricoltura peri-urbana e sistemi agropastorali in Africa Sub-Sahariana)
- Disegno di schemi di sviluppo per una **agricoltura intensiva sostenibile** (es. analisi di scenario e simulazioni di dinamiche di sviluppo)
- Gestione integrata di **malattie trasmesse da vettori artropodi**
- Gestione integrata di **energia, acqua e cibo**
- Valutazione degli impatti delle **infrastrutture energetiche** sui sistemi agricoli

FOCUS ON:

Approccio multiscala alla valutazione degli impatti ambientali dell'alimentazione

Introduction: Problem (1)

Agricultural emissions from crops and livestock production
4.7 billions of tons of CO2eq in 2001
5.3 billions of tons of CO2eq in 2011
+14% (FAO, 2015)

The livestock sector contributes to
human-induced GHG emissions for **14.5%** (FAO, 2018)

In 2015 **11% (1.5 billion ha)** of the globe's land surface (13.4 billion ha) was used in crop production (FAO 2015)

Water use grew at almost twice the rate of population increase in the last century. On average, agriculture accounts for **70%** of global freshwater withdrawals (FAO, 2017)

The agri-food chain accounts for around **30%** of the world's total energy demand, out of which about 70% is beyond the farm gate. (FAO, 2018)

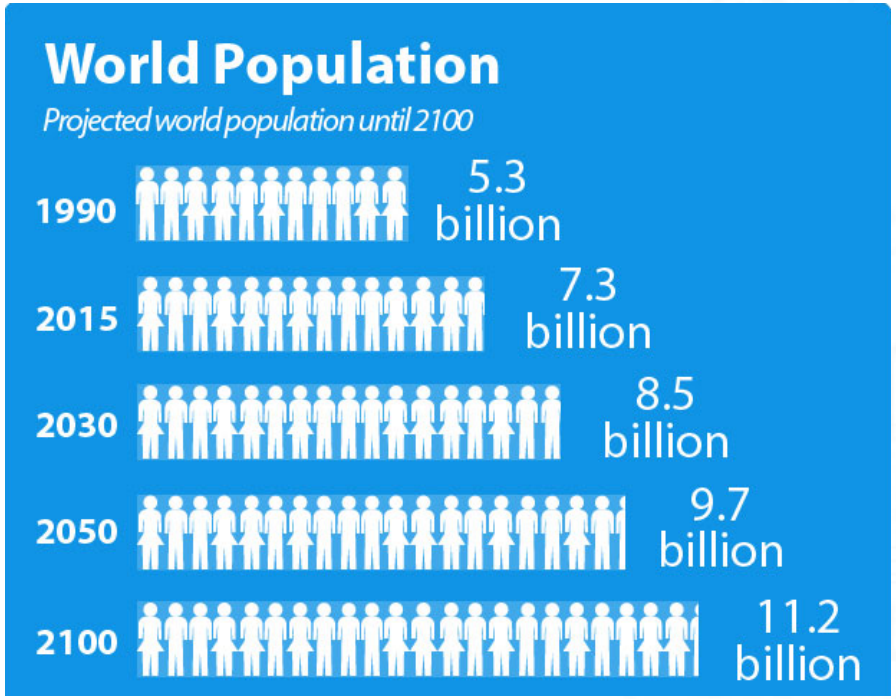
Introduction: Problem (2)

The current world population of 7.6 billion is expected to reach **8.5** billion in 2030 (UN, 2017)

Demand for food and other agricultural products is projected to increase by **50%** between 2012 and 2050. (FAO, 2017)

$$D_t = \mathrm{d}_i * N$$

$$I_t = \mathrm{I}_i * \mathrm{d}_i * N$$



United Nations Departement of Economic and Social Affairs
Division, World Population Prospects:
The 2015 Revison Population

Introduction: Solution

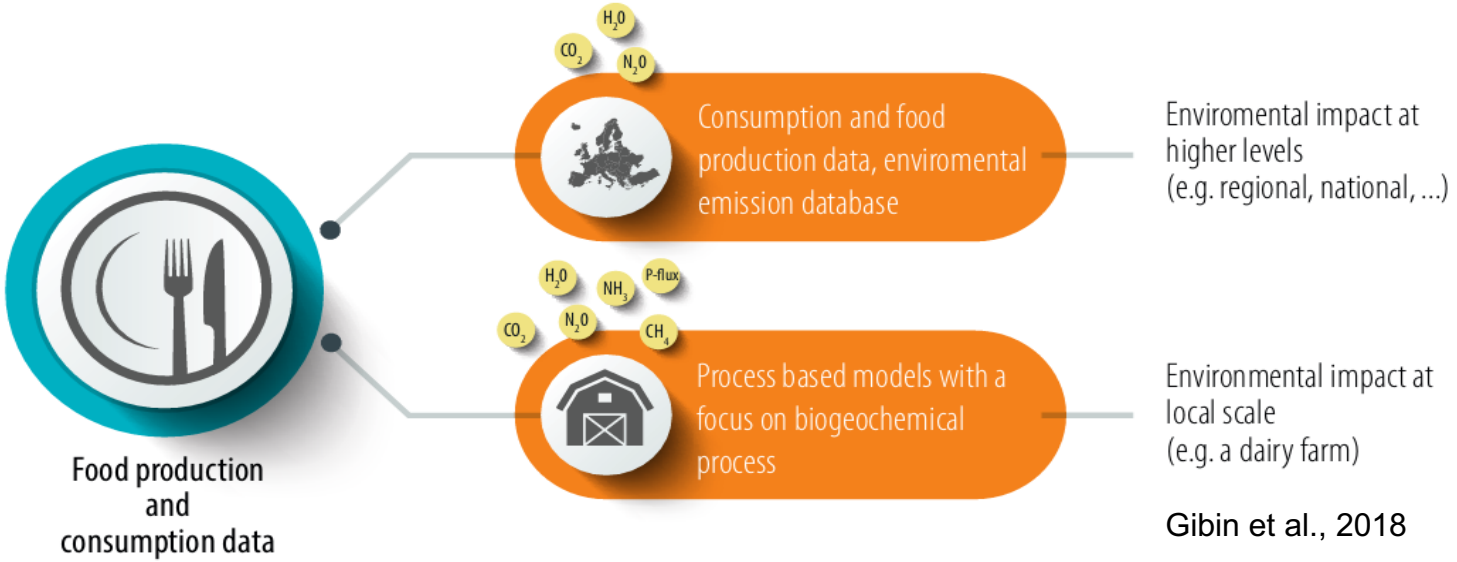
If global population and food consumption trends continue,
by 2050 the world will need 50% more food than is available today.
Because arable land is limited, most of this additional production will have to come from

sustainable agricultural intensification

SUSTAINABLE DEVELOPMENT GOALS

Methodological Framework

A comprehensive methodological framework for the assessment of environmental pollution and demand for natural resources related to food production and consumption is proposed. The framework is based on the use of different data sources and modelling tools.



Gibin et al., 2018

The sources of information include databases on: i) food production, ii) food consumption, iii) water footprint, iv) carbon footprint.

The modelling tools: input-output models based on national/global databases, mechanistic models based on biogeochemical processes, soil and climate local characteristics (e.g. Manure DNDC).

DATABASES TO CALCULATE NATIONAL IMPACT BASED ON CONSUMPTION

- European food consumption database (EFSA)
- Carbon footprint: database derived from Clune, 2017
- Water footprint: databse of (Mekonnen, and Hoekstra , 2010) . https://waterfootprint.org/en/
- Ecological footprint: National footprint Account (2014) http://data.footprintnetwork.org
- Nitrogen footprint: database built from Leach and Galloway http://www.n-print.org/

Methodological Framework: MACRO LEVEL

COUNTRY BASED ASSESSMENT

The heat map shows the environmental impact (carbon emissions and water footprints) related to the daily consumption of meat and meat product categories in Europe.

Gibin et al., 2018

EFSA consumption database

EUROSTAT database (import export)

FAOSTAT database (production and consumption)

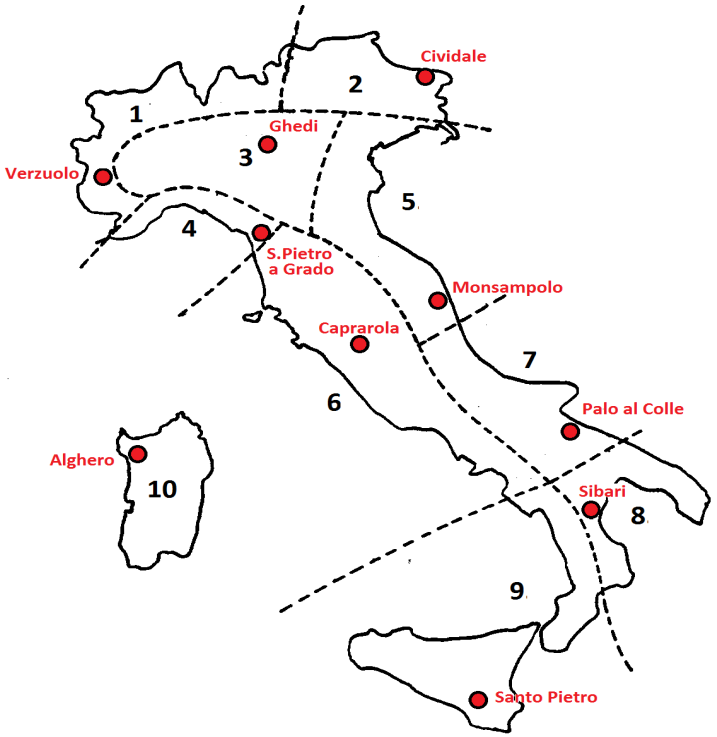
OECD database (import export)

MODELS TO PERFORM ANALYSIS AT THE FARM LEVEL

- Global Livestock Environmental Assessment Model – Gleam (FAO)
- Manure DNDC (USDA)
- FeedPrint (Wageningen Livestock Research) http://webapplicaties.wur.nl/software/feedprintNL/index.asp
- Livestock Environmental Assessment and Performance Partnership – LEAP (FAO)
- Cool Farm Tool https://coolfarmtool.org/

Methodological Framework: MICRO LEVEL

LOCAL ASSESSMENT



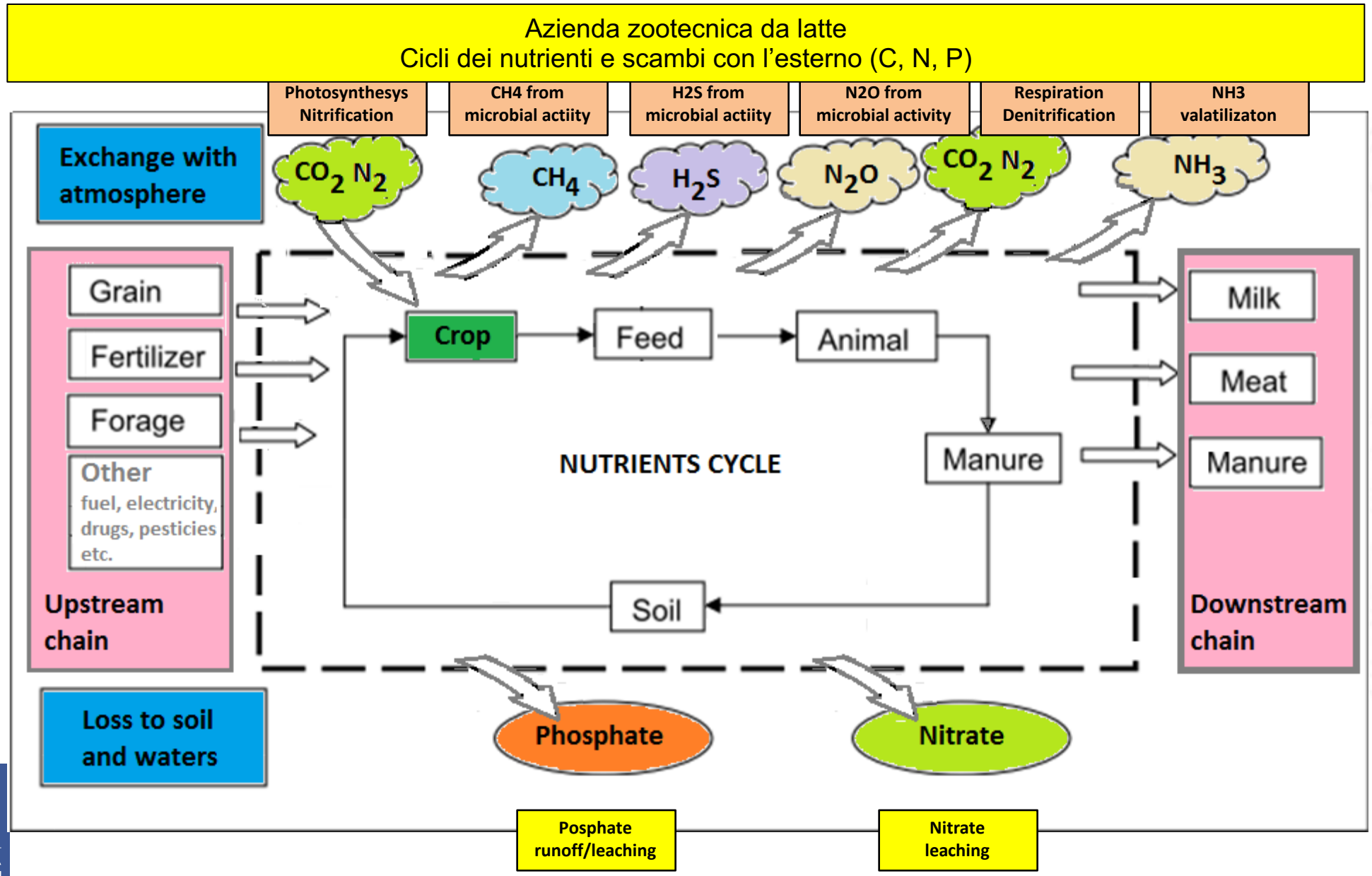
Mariani et al, 2014

n	Zona di Rosini	Stazione di rifermento	alt	acro
1	Alpi Centro-occidentali	Verzuolo	420	**VERZ**
2	Alpi Orientali	Cividale	130	**CIVI**
3	Pianura Padana	Ghedi	102	**GHED**
4	Golfo Ligure-Alto Tirreno	San PIetro a Grado	3	**SPIG**
5	Alto Adriatico	Monsampolo	43	**MSPL**
6	Tirreno Centrale	Caprarola	650	**CROL**
7	Basso Adriatico	Palo del Colle	191	**PDCO**
8	Ionio	Sibari	10	**SIBA**
9	Basso Tirreno e Sicilia	Santo Pietro	313	**SPIE**
10	Sardegna	Alghero	23	**ALGH**

	Yearly emissions and demand for resources						
Farm	N of animals	CO_2 (t C)	CH_4 (t C)	N_2O (t N)	H_2O (m3)	NH_3 (t N)	P (t)
Livestock farm (Po Valley)	1250	4085	155.6	4.8	17,238.3	63.3	79

Gibin et al., 2018

Methodological Framework: MICRO LEVEL



Swift, 2006 (modified)

EXPECTED RESULTS

- Support policy makers and advisors to better define and monitor new policies in the context of the revision of the national emission ceilings (e.g. NEC Directive)
- Assess the environmental impact of dietary shift, also due to the introduction of new ingredients as substitutes or supplements to existing diets (e.g. novel foods)
- Assess the reduction of environmental impact due to use of different technology/best practice (especially in the livestock sector)