Session 1
28th June 2022

Why and how permanent grassland and ruminants are a key component of the agroecological transition in Europe – findings from “Ten Years For Agroecology” scenario

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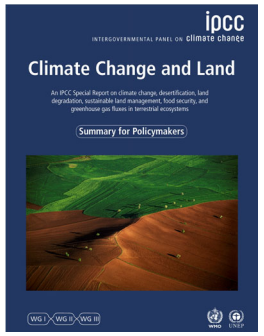
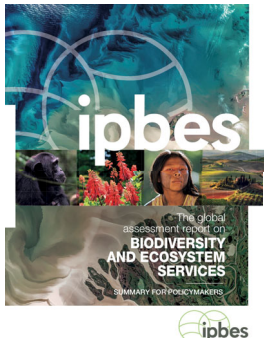
Introduction

The challenges of a sustainable food system

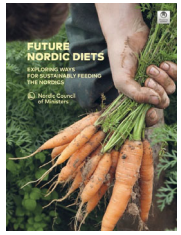
- Climate: mitigation, adaptation
- Biodiversity
- Natural resources: water, soils, air
- Health and junk food
- Economy and social justice

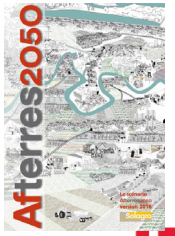




Increasing role of scenarios in framing debates and public policies

- A variety of challenges and approaches





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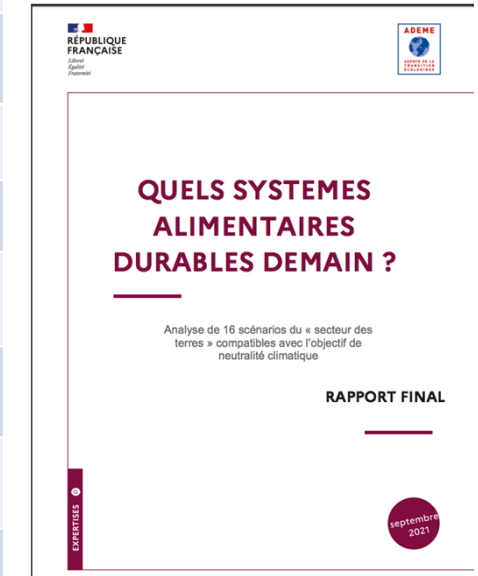
A variety of scenarios addressing sustainable agriculture

1	Achieving Net Zero	2019	Royaume Uni	National farmer's Union
2	Neutralité climatique en 2050	2017	Danemark	Danish Food and agricultural council
3	Future Nordic Diet	2017	Danemark, Suède, Norvège, Finlande	Karlsson et al.
4	Achieving Net Zero Farming's 2040 goal	2020	Royaume Uni	Haut conseil pour le climat
5	Pathways to Sustainable Land-Use and Food Systems	2019	17 territoires dont UE	FABLE Coalition/IIASA
6	Scénarios pour une transition écologique de l'agriculture wallonne	2019	Wallonie	Université Catholique de Louvain
7	TYFA	2018 / 2019	Union Européenne	IDDRI, AScA
8	Net Zero emissions in agriculture	2019	Union Européenne	IEEP/ECF
9	Long term strategy for Europe	2018	Union Européenne	IIASA (Globiom)
10	Vision 2050	2014	France	ADEME
11	Rapport spécial 1°5	2018	Monde	GIEC
12	Afterres	2011/2016	France	SOLAGRO



Main findings

- Most scenarios proposes a radical shift in diet, towards less animal products
- All proposes GHG reduced emissions, but by playing on different factors
- A lot of them does not consider PG as such and consists in further intensification and efficiency, regardless of land use and inputs
- Permanent grassland might be acknowledged, but ruminants are discarded
- Frequent blind spots on biodiversity, pesticides, use of synthetic N

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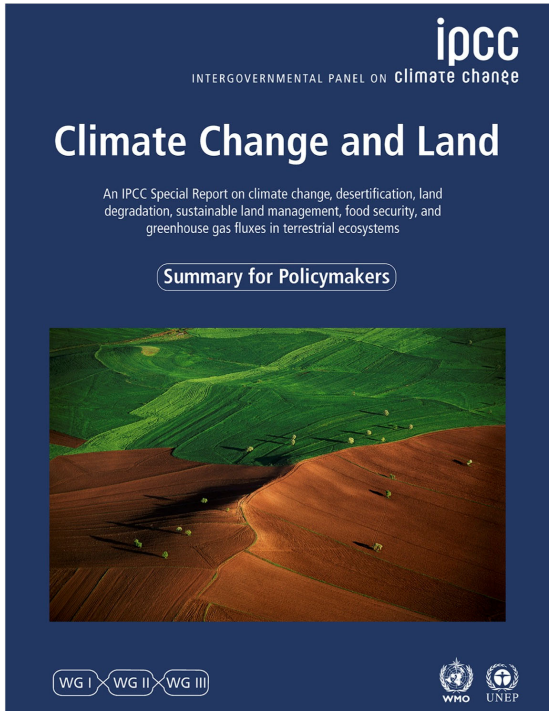
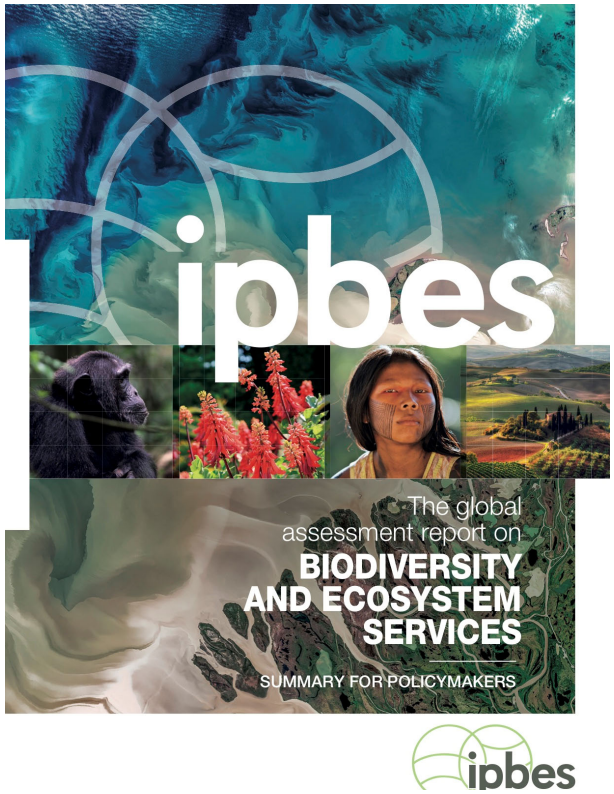
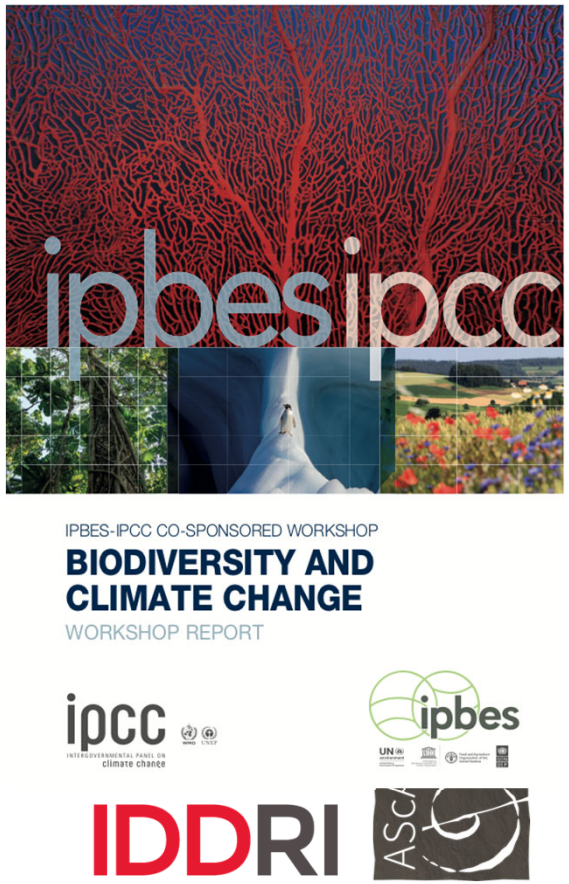
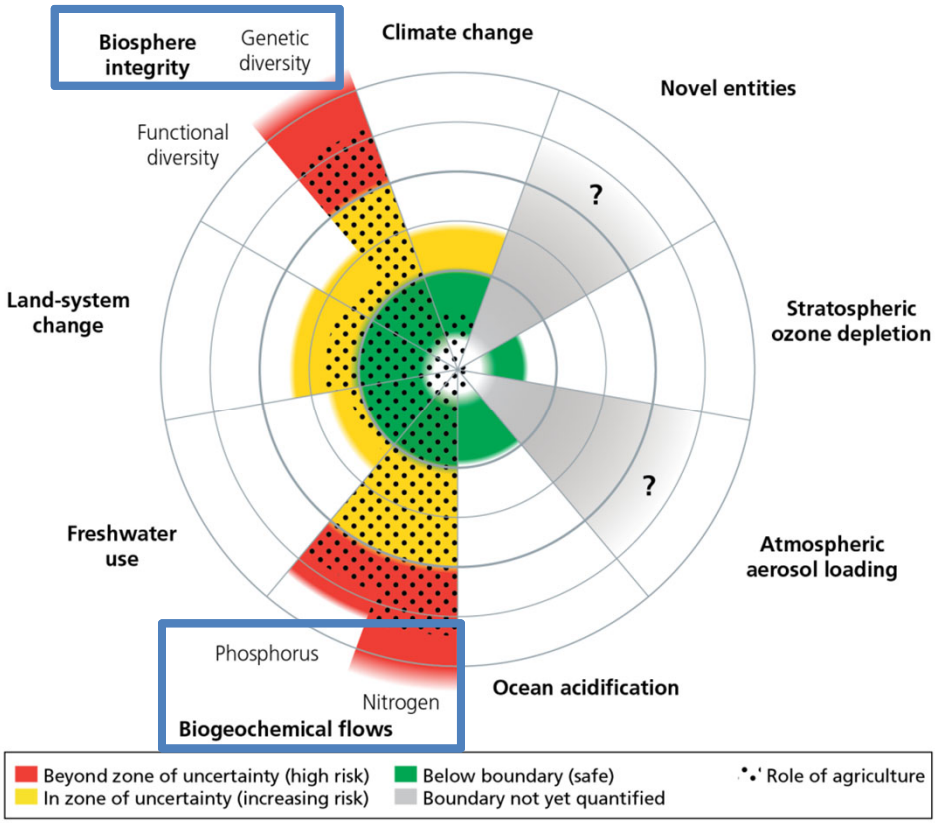
Introduction: the climate-biodiversity nexus



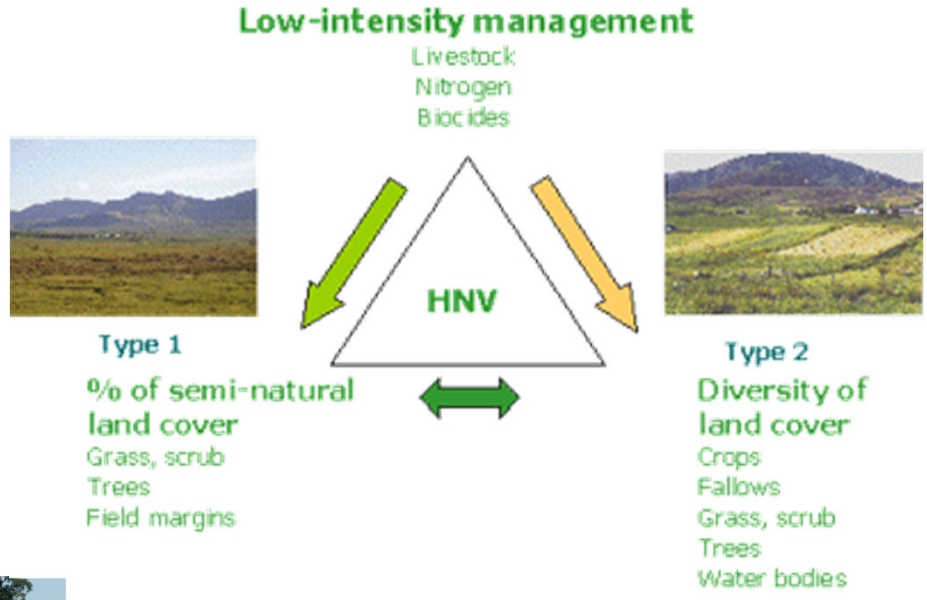




The environmental challenges of agriculture



High Nature Value farming in Europe
the central role of semi-natural vegetation



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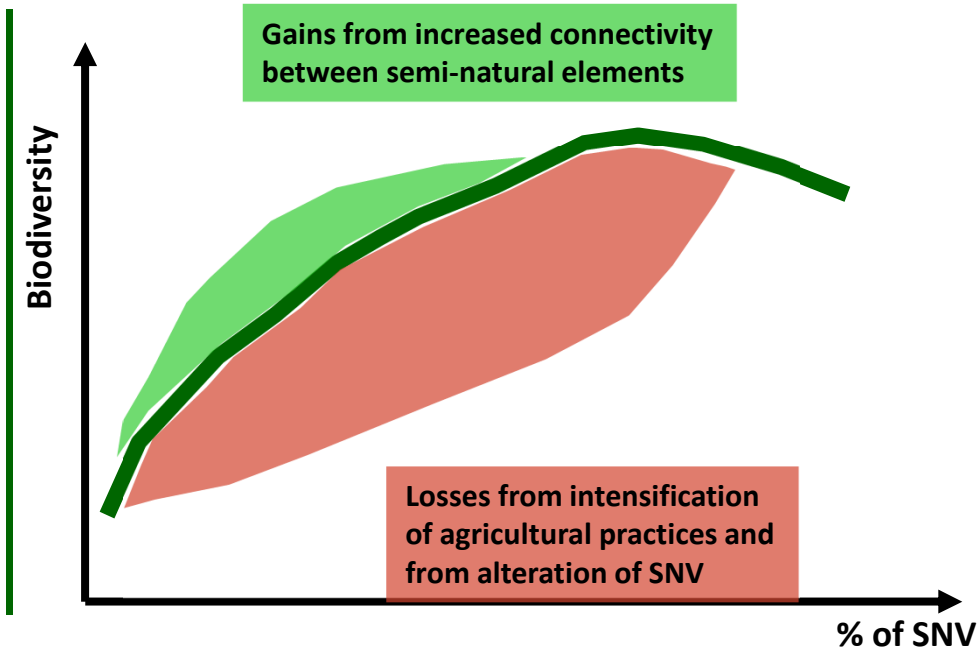
The central role of SNV for biodiversity
The High Nature Farming corpus



- Most of semi-natural habitats consist in extensive permanent grassland
- And a great share of other SNV are found in systems with extensive PG

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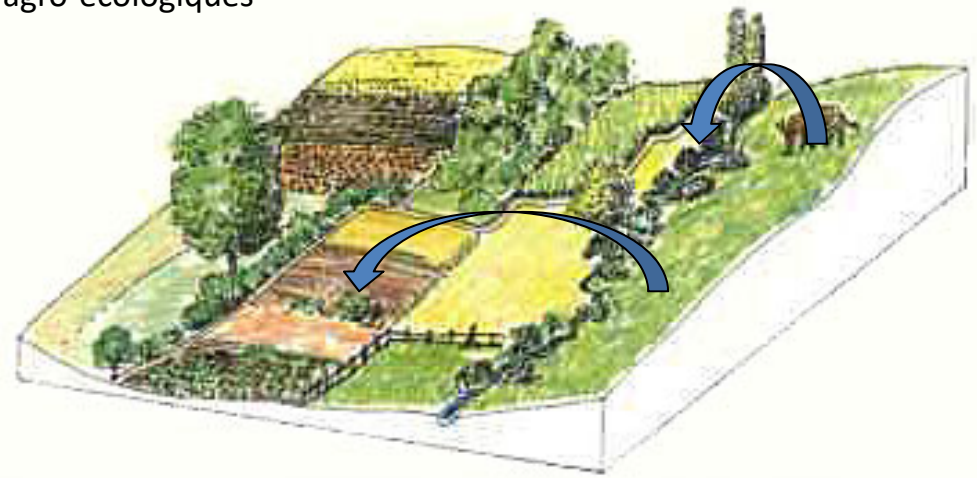
- Un paysage riche en biodiversité est souvent composite et combine des zones intensives et extensives
- Mais une fraction minimale de zone extensive est nécessaire : la prairie seule ne suffit pas
- Et ne pas fertiliser maximise la fixation symbiotique

Prendre en compte les transferts de fertilité entre unités agro-écologiques



TYFA: *Ten Years For Agroecology*

- A scenario exercise envisaging a transition towards an European (EU28) food system centred on biodiversity conservation and multifunctionality…
- … while considering Climate Change issues: mitigation and adaptation
- A specific modelling exercise in order to test the structural changes of agroecology and their consequences on production, land use, nitrogen cycle management and GHG emissions
- Based on assumptions on changes in diet (≈EAT Lancet)
- A founding modelling exercise issued in Sept. 2018

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An agroecological Europe: main hypotheses

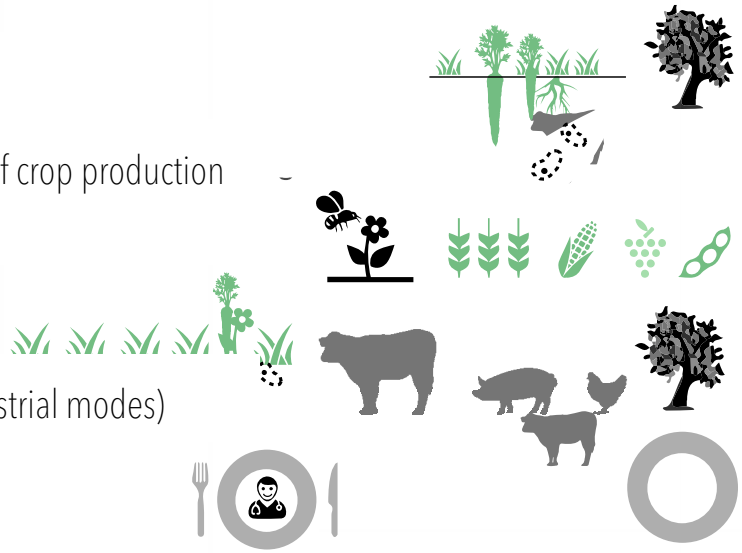
1 Fertility management at the territorial level

2 Pesticide-free farming and extensification of crop production
Organic farming as a reference model

3 Redeployment of permanent grassland

4 Livestock extensification (phase-out of industrial modes)

5 Healthy and sustainable diets



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TYFA's model - TYFA*m*

Input variables:
- Cropping systems
- Livestock systems
- Diets
- Waste and losses
- Non food-uses

Output variables:
- Production
- Land use
- GHG emissions
- Biodiversity

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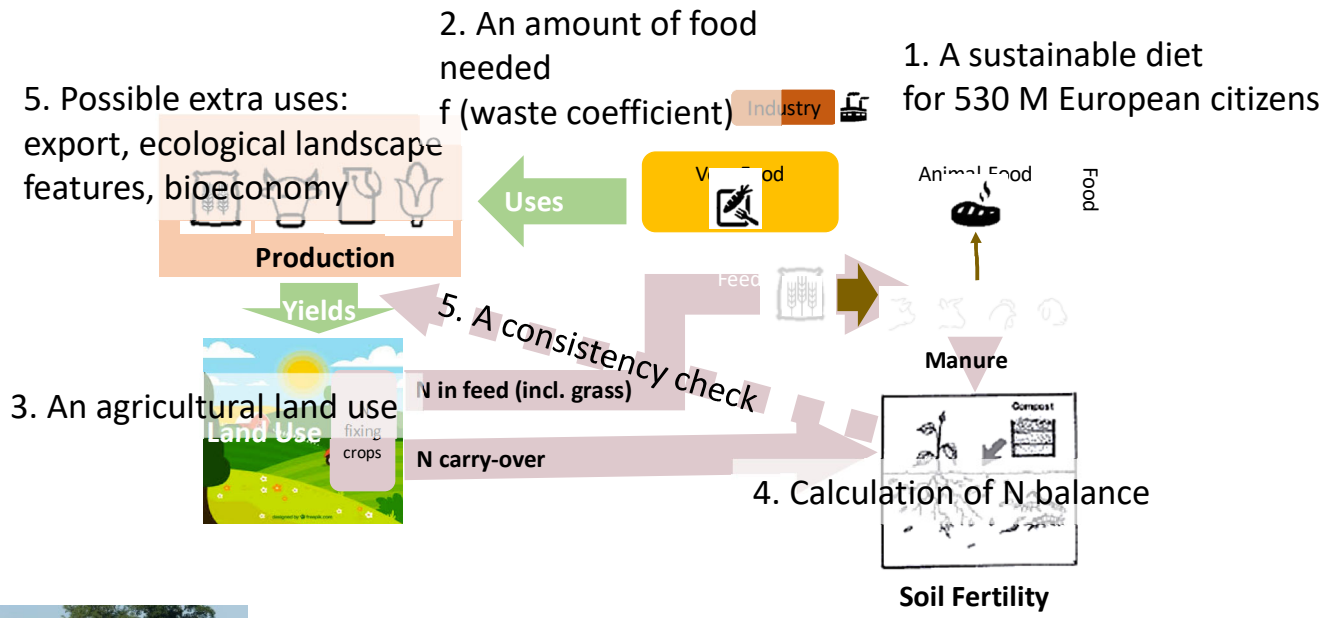
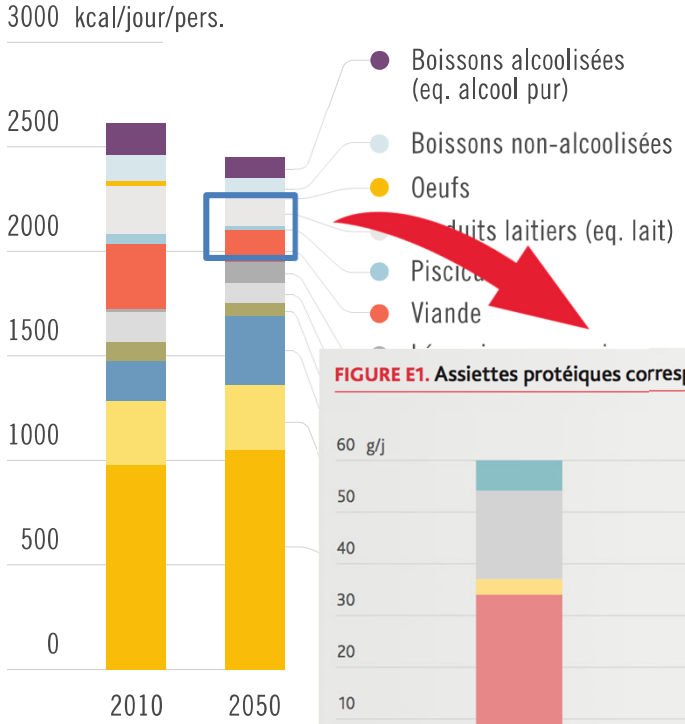
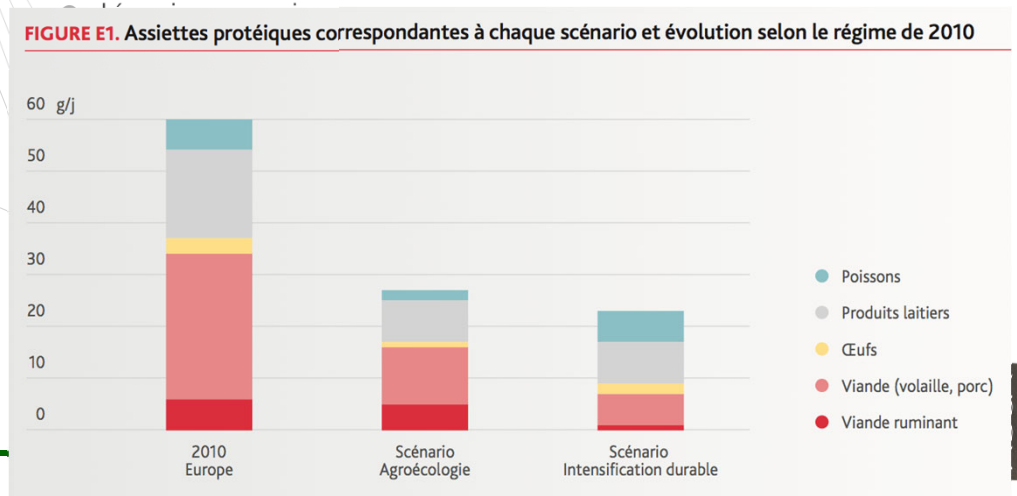
A biomass model
An iterative calibration

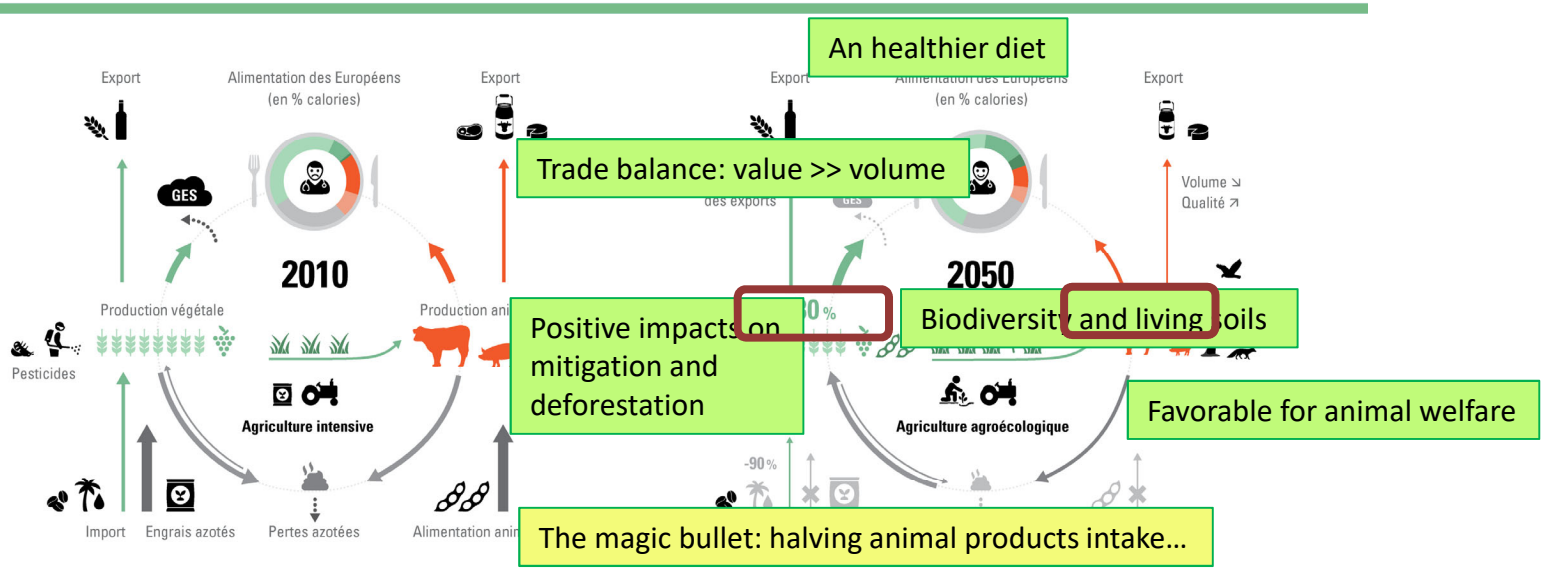


The starting point: a sustainable diet (average for EU 27)





TYFA : UN SCÉNARIO POUR UNE EUROPE AGROÉCOLOGIQUE EN 2050



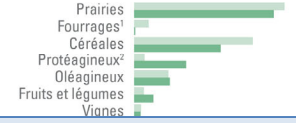
Productions

- Céréales et féculents
- Fruits et légumes
- Protéagineux (pois, lentilles…)
- Viandes, œufs et poissons
- Produits laitiers
- Autres

Prairies

Le scénario TYFA (Ten Years for Agroecology) repose sur l'abandon des pesticides et des fertilisants de synthèse, le redéploiement des prairies naturelles et l'extension des infrastructures agroécologiques (haies, arbres, mares, habitats pierreux). Il envisage également la généralisation de régimes alimentaires plus sains, moins riches en produits animaux et faisant une plus grande place aux fruits et légumes. Malgré une baisse de la production de 35 % par rapport à 2010 (en kcal), ce scénario satisfait aux besoins alimentaires des Européens tout en conservant une capacité d'exportation sur les céréales, les produits laitiers et le vin. Il permet une réduction des émissions de gaz à effet de serre (GES) du secteur agricole de 40 % par rapport à 2010, une reconquête de la biodiversité et la conservation des ressources naturelles (vie biologique des sols, qualité de l'eau, reco

Usage des sols 2010 2050



… but little prospects for bioeconomy
(except uses of biomass from ecological features)

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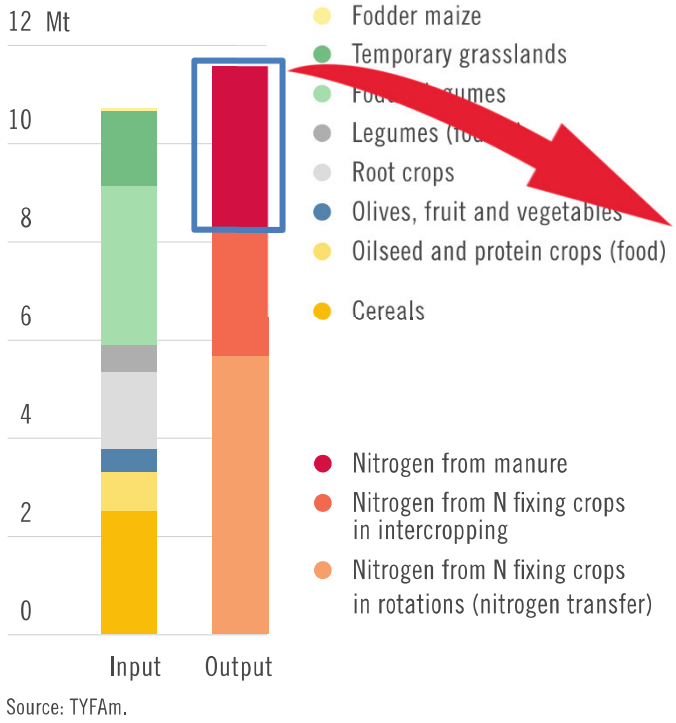
High
spontaneous
N fixation

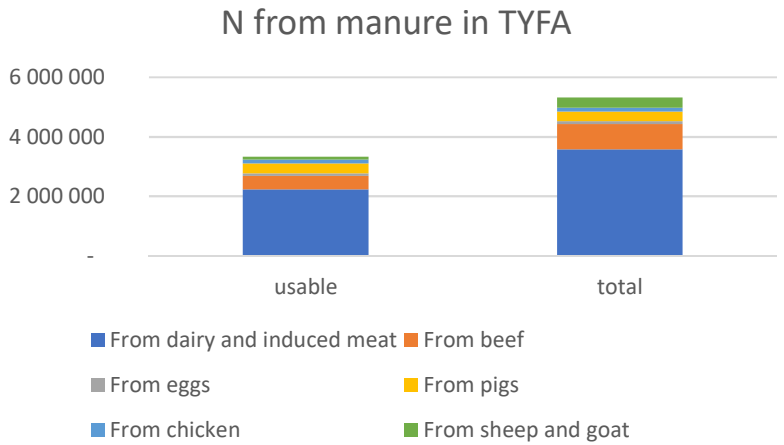
0 mineral N

Extensive permanent grassland

The N reading and the role of permanent grassland



Source: TYFAm.



⇒ 18% of N balance comes from N fixed in Permanent grassland

⇒ A knowledge gap when it comes to N (and C) processes in extensive PG

⇒ Ongoing work on possible N transfer

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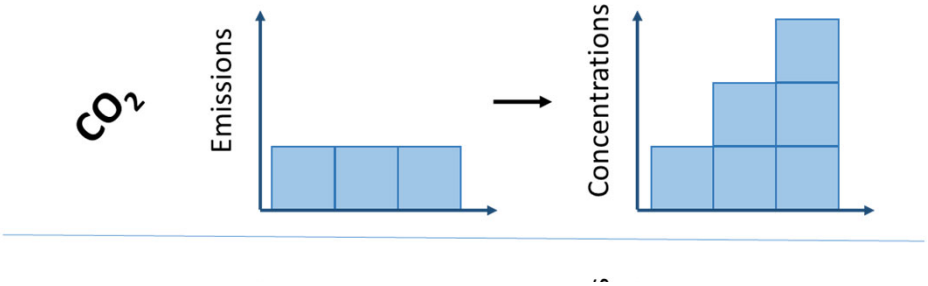
Better understanding the methane/ruminants debate



CO_2: long lifetime means it accumulates in the atmosphere. Any emission above zero increases the amount in the atmosphere indefinitely.

CH_4: 12 years lifetime means stable emissions lead to stable amount in the atmosphere, as the sources balance the sinks.

N_2O: >300 years lifetime means it behaves more similar to CO_2 on timescales of less than a century.

Figure from Lynch, J. (2019). Agricultural methane and its role as a greenhouse gas. Food Climate Research Network, University of Oxford: https://foodsource.org.uk/building-blocks/agricultural-methane-and-its-role-greenhouse-gas

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Better understanding the methane/ruminants debate

The
of n

npj | Climate and Atmospheric Science

www.nature.com/npjclimatsci

ARTICLE OPEN

A solution to the misrepresentations of CO_2-equivalent emissions of short-lived climate pollutants under ambitious mitigation

Myles R. Allen[1,2], Keith P. Shine[3], Jan S. Fuglestvedt[4], Richard J. Millar[1], Michelle Cain[1,5], David J. Frame[6] and Adrian H. Macey[7]

While cumulative carbon dioxide (CO_2) emissions dominate anthropogenic warming over centuries, temperatures over the coming decades are also strongly affected by short-lived climate pollutants (SLCPs), complicating the estimation of cumulative emission budgets for ambitious mitigation
equivalent" emissions misrepres
mitigation scenarios is determine
radiative forcing immediately pri
CO_2 forcing-equivalent (CO_2-fe) e
usage of GWP, denoted GWP*, w
accurately indicates the impact o
over a wide range of timescales,
implementing the Paris Agreeme
Expressing mitigation efforts in t
directly to contributions to future
in pursuit of ambitious global te

npj Climate and Atmospheric Science (2018)1:16 ; doi:10.1038/s41612-018-0026-8

The standard CO_2 eq. Metric GWP100 does not properly capture methane effects

Oxford's teams proposes an alternative GWP* metric much closer to actual impact

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Focus on climate change (emissions)

Conclusions before taking note of short life of methane / GWP* metric

		2010 Mt eq. CO_2	2050 Mt eq. CO_2	
ClimAgri calculations	Direct GHG emissions	583.5	401.0	-31%
	among which energy consumption	115.22	97.1	-16%
	among which agricultural soils	149.55	75.5	-49%
	among which enteric fermentation	229.69	188.8	-18%
	among which manure management	89.2	39.6	-56%
			.0	-74%
			.4	-42%
			0	-100%
			.4	-65%
	among which pesticides and biocontrol products fabrication	3.01	1.62	-46%
	among which agricultural machinery	16.85	18.34	9%
Authors' estimations	among which imported deforestation linked to soybean imports	40.00	0.00	-100%
Total GHG emissions (including the ones caused by soybean imports)		733.3	440.0	-40%
Total GHG emissions (excluding the ones caused by soybean imports)		693.3	440.0	-36%

A rather acceptable option for climate (while not the best one), a defendable trade-off between climate and biodiversity (the only explicit one as a matter of facts)

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Focus on climate change (emissions)

Conclusions **after** taking note of short life of methane / GWP* metric

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	among which enteric fermentation	229.69	188.8	-18%
	among which manure management	89.2	39.6	-56%
			39.0	-74%
			17.4	-42%
			0.00	-100%
	among which other fertilizer fabrication	4.37	1.54	-65%
Authors' estimations				
Total GHG emissions (including the ones caused by soybean imports)		733.3	440.0	-40%
Total GHG emissions (excluding the ones caused by soybean imports)		693.3	440.0	-36%

A rather defendable option for climate,
a win-win scenario between climate and biodiversity

Can we achieve a further CH4 reduction without trade-off for biodiversity?
Extensive ruminants => extensive permanent grassland

Take home messages

- An ambitious agroecological scenario is plausible and desirable for Europe
- It needs to be multifunctional: biodiversity and climate altogether
- Extensive permanent grassland and ruminants play a central role in this scenario
- Such fundamental findings pave the road for further analysis on socio-economic and policy issues
- And – fortunately – for research

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SciencesPo

STUDY

N°09/18 SEPTEMBRE 2018

Une Europe agroéco
une agriculture mult
pour une alimentatio

Enseignements d'une mo
alimentaire européen

Xavier Poux (AScA, Iddri), Pierre-M

Avec les contributions de Jonathan Saulnie
Treyer, William Loveluck, Élisabeth Hege, M

L'AGROÉCOLOGIE : UN PROJET AMBITIEU

Prendre en compte *conjointement* les
Européens, de préservation de la biodi
de lutte contre le changement climati
de notre système agricole et alimentair
l'abandon des pesticides et des engrais
prairies extensives et d'infrastructures
charge cohérente de ces enjeux.

UNE MODÉLISATION ORIGINALE DU SYST

Le projet TYFA explore la possibilité
à l'échelle européenne en analysant le
agricole, actuelle et future. Un modèle
en relation systémique la production
l'usage des terres, permet d'analyser ré
système alimentaire européen et de qu
2050 en testant les implications de diffé

PERSPECTIVES POUR UN SYSTÈME AGR

Les régimes alimentaires européens,
riches, notamment en produits anima
l'obésité, du diabète et des maladies ca
agriculture intensive, fortement dépen
de synthèse – aux conséquences sanit
(ii) des importations de protéines vég
faisant de l'Europe un importateur ne
de régime alimentaire moins riche e
perspectives pour une transition vers u

UNE ALIMENTATION DURABLE POUR 350

Le scénario TYFA s'appuie sur la génér
des importation de protéines végétales
plus sains à l'horizon 2050. Malgré une
par rapport à 2010 (en Kcal), ce scénari
– nourrit sainement les Européens
d'exportation ;
– réduit l'empreinte alimentaire mondi
– conduit à une réduction des émission
– permet de reconquérir la biodiver
naturelles.

Des travaux complémentaires sont à
économiques et politiques du scénario T

XAVIER POUX ET PIERRE-MARIE AUBERT

AVEC LA PARTICIPATION DE MARIELLE COURT

DEMAIN, UNE EUROPE AGROÉCOLOGIQUE

SE NOURRIR SANS PESTICIDES, FAIRE REVIVRE LA BIODIVERSITÉ

PRÉFACE D'OLIVIER DE SCHUTTER

IDDRI 20 YEARS 2001-2021

POLICYBRIEF

N° 6
JULY
2021

INRAE

SciencesPo

Reaching the Farm to Fork objectives and beyond: Impacts of an agroecological Europe on land use, trade and global food security

Michele Schiavo (IDDRI), Chantal Le Mouël (INRAE), Xavier Poux (IDDRI-ASCA), Pierre-Marie Aubert (IDDRI)

The joint publication in May 2020 of the Farm to Fork (F2F) and Biodiversity strategies, part of the European Green Deal, paved the road for an ambitious and systemic transition of the EU food system. The strategies set ambitious and unquestionable targets that have to be reached by 2030 if we are to keep our food system within planetary boundaries. Since their publication, however, the strategies have been under criticism from most economic actors, according to whom their implementation would lead EU farmers and food processors to be crushed by their competitors and put world food security at risk. Yet, the only impact assessment currently available is the one published in December 2020 by the Economic Research Service (ERS) of the United States Department of Agriculture (USDA)[1]–which suffers from several methodological flaws. In particular, it focuses on the consequences of implementing new constraints on production without considering the changes in demand that would result from the strategies' other objectives.

Against this backdrop, this *Policy Brief* presents the key results of a study that analysed the implications of an ambitious agroecological[2] transition across Europe, following the TYFA scenario.[3] While this scenario was published three years ago, what it proposes by 2050 is fully aligned with the objectives that the strategies aim to achieve by 2030, in particular regarding the decrease in pesticides, nitrogen, and antibiotics on the supply side, and the transition towards more plant-based diets on the demand side. Using a world biomass balance model (GlobAgri-AgT[4]), the impact of the TYFA scenario in the EU on world land use, the EU physical trade balance, the provision of calories and global food security was analyzed in addition to key policy levers to spur the transition.

1 Beckman, J., Ivanic, M., Jelliffe, J. L., Baquedano, F. G., & Scott, S. G. (2020). Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies (No. 1473-2020-1039).

2 We define agroecology as the combination of the principles of organic agriculture with the redeployment of natural grasslands and the extension of agroecological infrastructures (hedges, trees, ponds and stony habitats)

3 Poux, X., & Aubert, P. M. (2018). An agroecological Europe in 2050: multifunctional agriculture for healthy eating. Findings from the Ten Years For Agroecology (TYFA) modelling exercise, Iddri-AScA, Study, (09/18).

4 Le Mouël C, de Lattre-Gasquet M, Mora O editors. Land Use and Food Security in 2050: A Narrow Road. Agrimonde-Terra. Quae Edition; 2018.

KEY MESSAGES

Because of the reduction in the consumption of animal protein and the relocation of plant protein production, an agroecological EU outperforms today's system in providing nutrients/calories to the rest of the world, and becomes a net exporter of calories by 12% of what it consumes. Indeed, while today the EU is a major exporter in value terms thanks to high value commodities (ex. spirits, wine, cheese, cigarettes and other high processed commodities) that are not part and parcel of global food security, it is a net importer of calories and proteins by 11% and 26% of what it consumes, respectively.

No sustainable agroecological transition can happen in the EU without strong policies that:

- Support a great dietary transition towards healthier and less calorie-dense diets with less animal and ultra-processed food products;
- Maintain EU price and non-price competitiveness in the domestic and foreign markets through agronomic research, a better coordination between actors and a market segmentation for EU "ecologically intensive" agricultural commodities;
- Change current market conditions to improve EU protein autonomy through the reintegration of legumes in rotations.