The multiple values of European grass-based farms along pedoclimatic and stocking density gradients

Bertrand Dumont, Marc Benoit, Juliette Bloor, Michael S. Corson, Frédéric Joly, Hayo van Der Werf

Food and Agriculture Organization of the United Nations

GLOBAL AGENDA FOR SUSTAINABLE LIVESTOCK

The multiple values of European grass-based farms along pedoclimatic and stocking density gradients

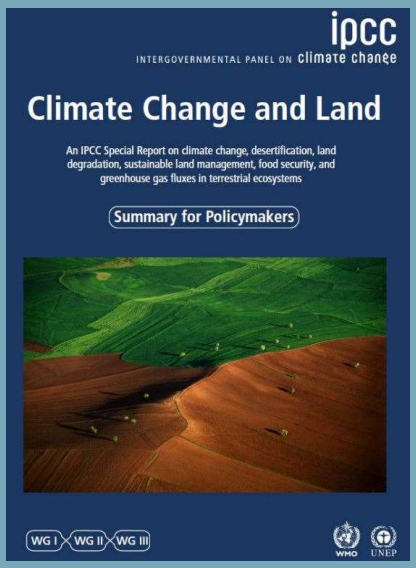
Bertrand DUMONT, Marc BENOIT, Juliette BLOOR, Michael CORSON, Frédéric JOLY, Hayo M.G. VAN DER WERF

Multifunctionality of livestock grazing systems, a lever to envision its possible futures, Montpellier, April 19th 2024

INRAE L'INSTITUT agro Rennes Angers

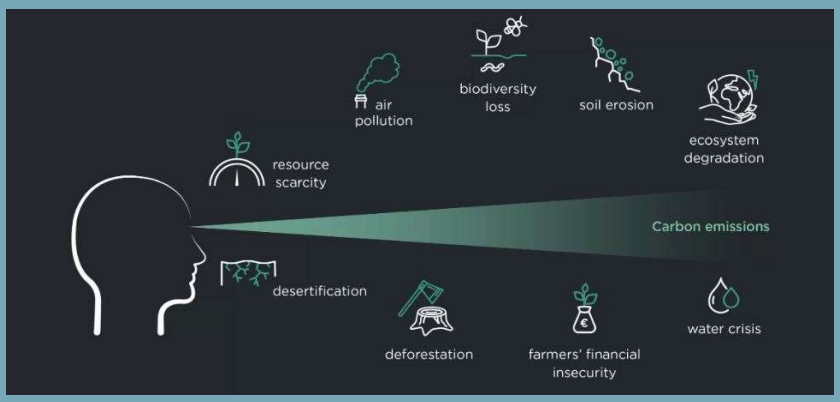
As the result of the increasing demand for meat and milk at a global scale, livestock farming faces strong pressures to alleviate its negative impacts on the environment

APS deliver a number of benefits to society (biodiversity), and have positive feedbacks on cropland production (manure)



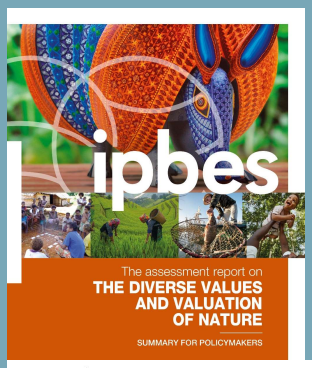
➔ Need to account for both impacts and services

Reducing carbon emissions is undeniably important. But becoming overly fixated on this one metric can lead to carbon tunnel vision — in which organizations become overly fixated on one goal



➔ Need to account for multiple dimensions

Diverse understandings of the relations between humans and biodiversity/nature



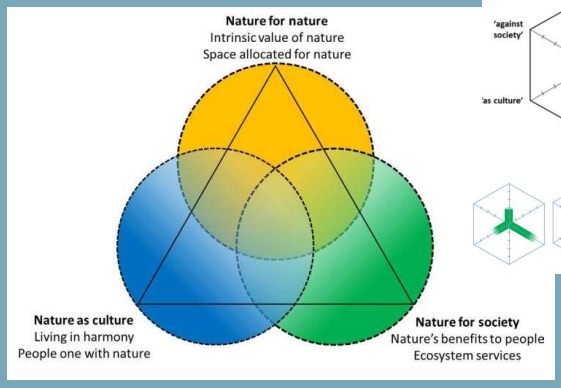
Perspective | Published: 25 March 2021

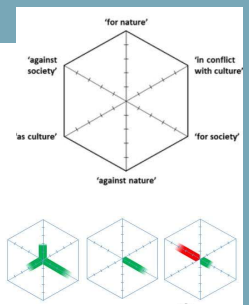
Biodiversity and the challenge of pluralism

Unai Pascual, William M. Adams, Sandra Díaz, Sharachchandra Lele, Georgina M. Mace & Esther Turnhout

Nature Sustainability **4**, 567–572 (2021) | Cite this article

The Nature Futures Framework *(Pascual et al. 2017)* analyse the plural value dimensions of human-nature interactions





Lliso et al. 2022
Oostvogels et al. subm.

➔ Need for a more pluralistic perspective: account for multiple « biodiversities »

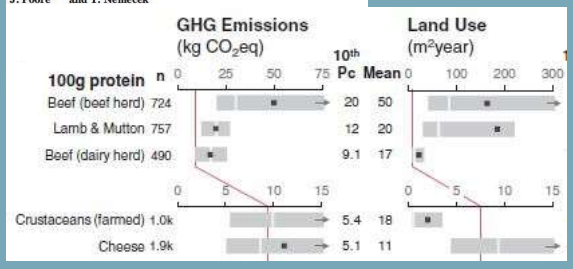
Huge management effects on the environmental benefits/impacts of APS

RESEARCH

SUSTAINABILITY

Reducing food's environmental impacts through producers and consumers

J. Poore[1,2]* and T. Nemecek[3]



Available online at www.sciencedirect.com

ScienceDirect

Toward a sustainable grazing management based on biodiversity and ecosystem multifunctionality in drylands

Ruiyang Zhang[1], Jinsong Wang[1] and Shuli Niu[1,2]

Review

Grazing vs. mowing: A meta-analysis of biodiversity benefits for grassland management

Malin Tälle[a], Balázs Deák[b], Peter Poschlod[c], Orsolya Valkó[d], Lars Westerberg[a], Per Milberg[a,*]

Current Opinion in Environmental Sustainability

Agriculture, Ecosystems and Environment 241 (2017) 1–10

Contents lists available at ScienceDirect

Agriculture, Ecosystems and Environment

journal homepage: www.elsevier.com/locate/agee

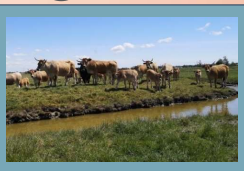
A biodiversity-friendly rotational grazing system enhancing flower-visiting insect assemblages while maintaining animal and grassland productivity

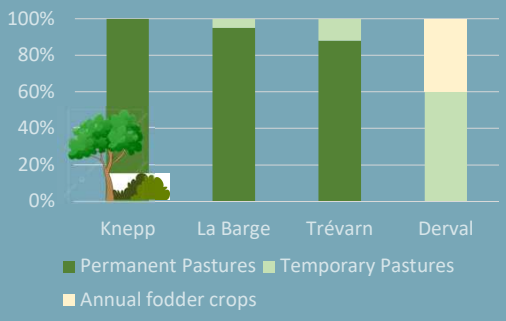
Simone Ravetto Enri[a], Massimiliano Probo[a], Anne Farruggia[b,*], Laurent Lanore[b], André Blanchetete[c], Bertrand Dumont[b]

B. Dumont - The multiple values of European grass-based farms along pedoclimatic and stocking density gradients, 19 April 2024 - Montpellier

Among the promising « how? », we analyse options for sustainable APS along two gradients: an intensification gradient for cattle in western lowlands

④ Knepp (rewilding) ③ La Barge (Beef cattle) ② Trévarn (Dairy cattle) ① Derval (Conventional) (Dairy cattle)





Agricultural Systems 213 (2024) 103798

Contents lists available at ScienceDirect

Agricultural Systems

journal homepage: www.elsevier.com/locate/agsy

Trade-offs between higher productivity and lower environmental impacts for biodiversity-friendly and conventional cattle-oriented systems

Aymeric Mondière[a], Michael S. Corson[a,*], Julie Auberger[a], Daphné Durant[b], Sylvain Foray[c], Jean-Francois Glinec[d], Penny Green[e], Sandra Novak[f], Frédéric Signoret[g], Hayo M.G. van der Werf[a]

① bis: Sustainable intensification
Same total milk yield as ② with farm ① production efficiency
➔ Area returned to nature

B. Dumont - The multiple values of European grass-based farms along pedoclimatic and stocking density gradients, 19 April 2024 - Montpellier

LCA allowed calculating environmental impacts in the five APS

Options for animal production	Agricultural Rewilding (Knepp)	Paysans de Nature (La Barge)	Agroecological (Trévarn)	Sustainable Intensification	Conventional (Derval)
Human edible protein kg/ha.yr	5.0	11.0	110.6	124.5*	238.6
Gross climate change $kgCO_2eq/ha.yr$	562	2553	4488	4671	8949
Soil C sequestration					
C stored in woody biomass					
Net climate change $kgCO_2eq/ha.yr$					

* 238.8 kg / ha.yr in the agricultural area of SI farm (42%)

Dumont et al. in prep.

LCA allowed calculating environmental impacts in the five APS

Options for animal production	Agricultural Rewilding (Knepp)	Paysans de Nature (La Barge)	Agroecological (Trévarn)	Sustainable Intensification	Conventional (Derval)
Human edible protein kg/ha.yr	5.0	11.0	110.6	124.5*	238.6
Gross climate change $kgCO_2eq/ha.yr$	562	2553	4488	4671	8949
Soil C sequestration	-3615	-2780	-2087	-2168	-654
C stored in woody biomass	-3056	0	0	-2268**	0
Net climate change $kgCO_2eq/ha.yr$					

* 238.8 kg / ha.yr in the agricultural area of SI farm (42%)
** in the area returned to nature

Dumont et al. in prep.

LCA allowed calculating environmental impacts in the five APS

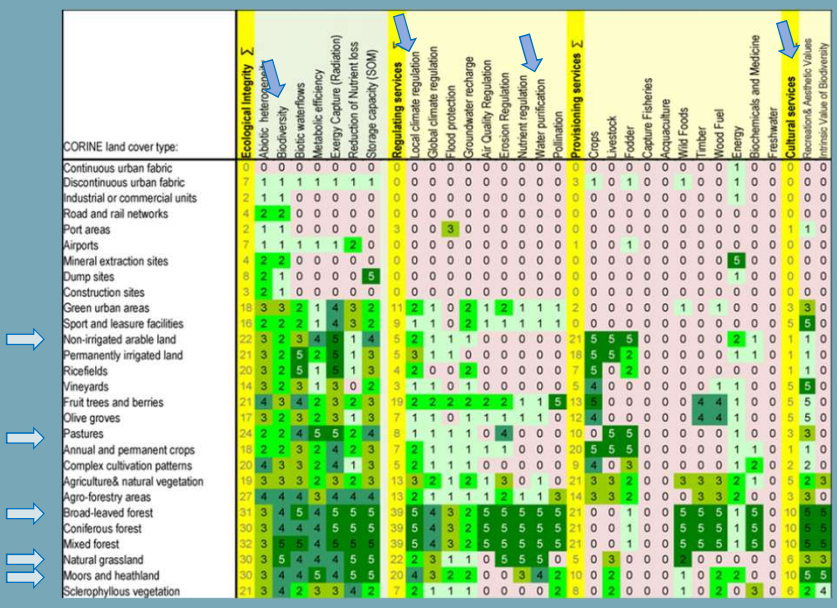
Options for animal production	Agricultural Rewilding (Knepp)	Paysans de Nature (La Barge)	Agroecological (Trévarn)	Sustainable Intensification	Conventional (Derval)
Human edible protein kg/ha.yr	5.0	11.0	110.6	124.5*	238.6
Gross climate change $kgCO_2eq/ha.yr$	562	2553	4488	4671	8949
Soil C sequestration	-3615	-2780	-2087	-2168	-654
C stored in woody biomass	-3056	0	0	-2268**	0
Net climate change $kgCO_2eq/ha.yr$	-6109	-227	2401	234	8295

* 238.8 kg / ha.yr in the agricultural area of SI farm (42%)
** in the area returned to nature

Dumont et al. in prep.

➔ 2 climate neutral options: land sharing at low SR / land sparing once have grown

Land use matrices provide ecosystem services and biodiversity indicators



Ecosystem services in columns

- Ecological integrity
- Regulating services
- Cultural services

Does not account for land management

scale for assessing capacities:

0 = no relevant capacity
1 = low relevant capacity
2 = relevant capacity
3 = medium relevant capacity
4 = high relevant capacity
5 = very high relevant capacity

Burkhard et al. 2012, 2014

Land use matrices provide ecosystem services and biodiversity indicators

Options for animal production	Agricultural Rewilding (Knepp)	Paysans de Nature (La Barge)	Agroecological (Trévarn)	Sustainable Intensification	Conventional (Derval)
Local climate regulation	3.7	2.0	2.0	3.4	2.0
Water purification	3.7	2.9	2.6	2.4	0.0
Landscape aesthetics					
Natural heritage					
Biodiversity					

Dumont et al. in prep.

Land use matrices provide ecosystem services and biodiversity indicators

Options for animal production	Agricultural Rewilding (Knepp)	Paysans de Nature (La Barge)	Agroecological (Trévarn)	Sustainable Intensification	Conventional (Derval)
Local climate regulation	3.7	2.0	2.0	3.4	2.0
Water purification	3.7	2.9	2.6	2.4	0.0
Landscape aesthetics	4.3	3.9	3.6	2.9	1.0
Natural heritage	4.0	2.9	2.6	2.4	0.0
Biodiversity	4.3	4.9	4.6	3.0	2.0
Human edible protein kg/ha.yr	5.0	11.0	110.6	124.5*	238.6

Dumont et al. in prep.

➔ The agroecological option may represent a good compromise

Valuing the overall supply of ESs from contrasting human perspectives

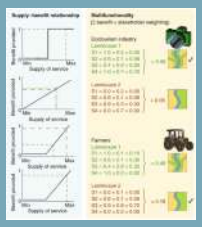
Weight given by stakeholders	Ecotourism sector	Environmental protec. agency	Farmers	Researchers
Edible proteins	0.00	0.00		
C sequestration	0.10	0.30		
Water purification	0.20	0.60		
Land aesthetics	0.50	0.00		
Biodiversity	0.20	0.10		

Perspective | Published: 16 February 2018

Redefining ecosystem multifunctionality

Peter Manning, Fons van der Plas, Santiago Soliveres, Eric Allan, Fernando T. Maestre, Mark J. Whittingham & Markus Fischer

Nature Ecology & Evolution 2, 427–436 (2018) | Cite this article



Valuing the overall supply of ESs from contrasting human perspectives

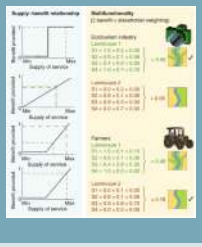
Weight given by stakeholders	Ecotourism sector	Environmental protec. agency	Farmers	Researchers
Edible proteins	0.00	0.00	0.70	
C sequestration	0.10	0.30	0.10	
Water purification	0.20	0.60	0.10	
Land aesthetics	0.50	0.00	0.00	
Biodiversity	0.20	0.10	0.10	

Perspective | Published: 16 February 2018

Redefining ecosystem multifunctionality

Peter Manning, Fons van der Plas, Santiago Soliveres, Eric Allan, Fernando T. Maestre, Mark J. Whittingham & Markus Fischer

Nature Ecology & Evolution 2, 427–436 (2018) | Cite this article



B. Dumont - The multiple values of European grass-based farms along pedoclimatic and stocking density gradients, 19 April 2024 - Montpellier

Valuing the overall supply of ESs from contrasting human perspectives

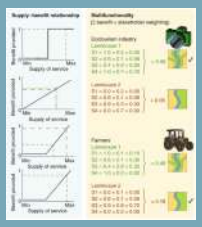
Weight given by stakeholders	Ecotourism sector	Environmental protec. agency	Farmers	Researchers
Edible proteins	0.00	0.00	0.70	0.32
C sequestration	0.10	0.30	0.10	0.19
Water purification	0.20	0.60	0.10	0.10
Land aesthetics	0.50	0.00	0.00	0.16
Biodiversity	0.20	0.10	0.10	0.23

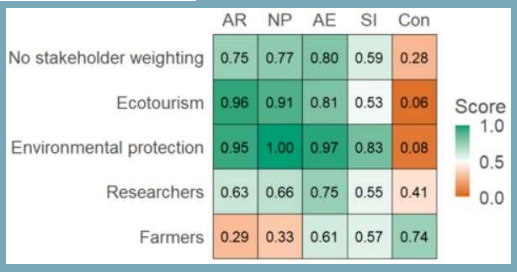

Perspective | Published: 16 February 2018

Redefining ecosystem multifunctionality

Peter Manning, Fons van der Plas, Santiago Soliveres, Eric Allan, Fernando T. Maestre, Mark J. Whittingham & Markus Fischer

Nature Ecology & Evolution 2, 427–436 (2018) | Cite this article





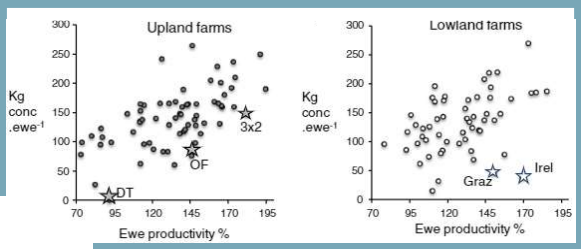
Efficient lamb production systems under contrasting pedoclimatic conditions

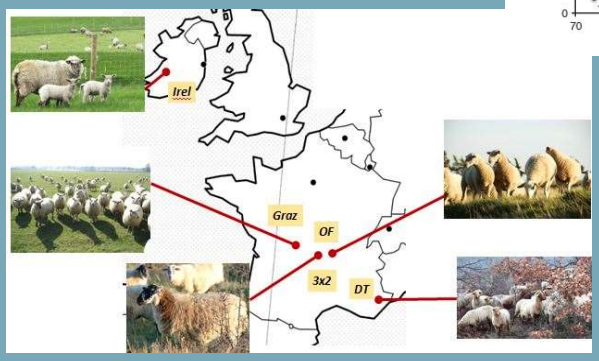

Agronomy for Sustainable Development (2019) 39:40
https://doi.org/10.1007/s13593-019-0588-9

RESEARCH ARTICLE

Optimising economic and environmental performances of sheep-meat farms does not fully fit with the meat industry demands

Marc Benoit[1] · Rodolphe Sabatier[2] · Jacques Lasseur[3] · Philip Creighton[4] · Bertrand Dumont[1]



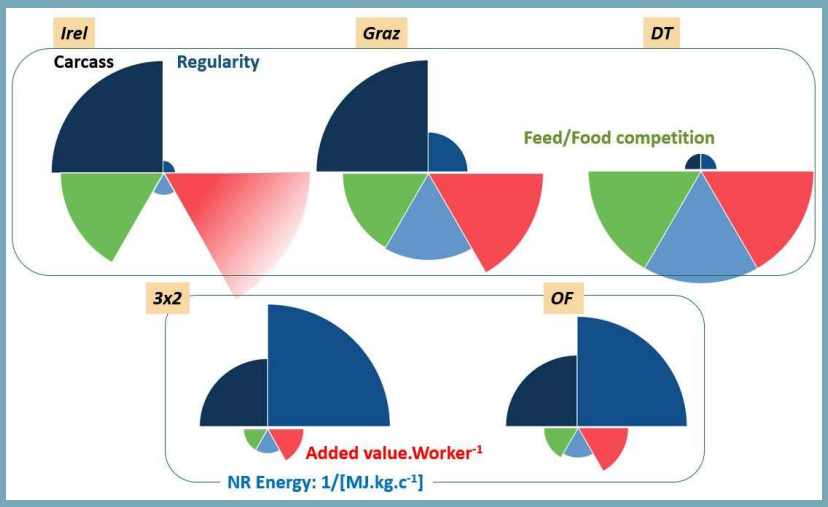


Performance assessed through 2 key variables

- ✓ Concentrate feeds / ewe.yr (64% of costs)
- ✓ Ewe annual productivity (correlated with net income)

⇨ Rangelands, vineyard inter-rows

Five synthetic indicators to assess overall performance

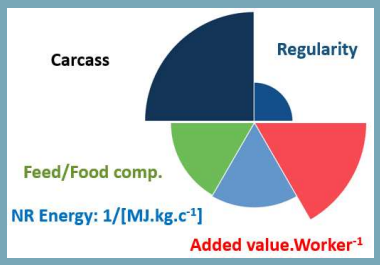


- Grassland-based farms had the best economic and environmental performance, while limiting feed-food competition
- Optimizing economic and environmental performance doesn't fit with meat industry demand for a regular production

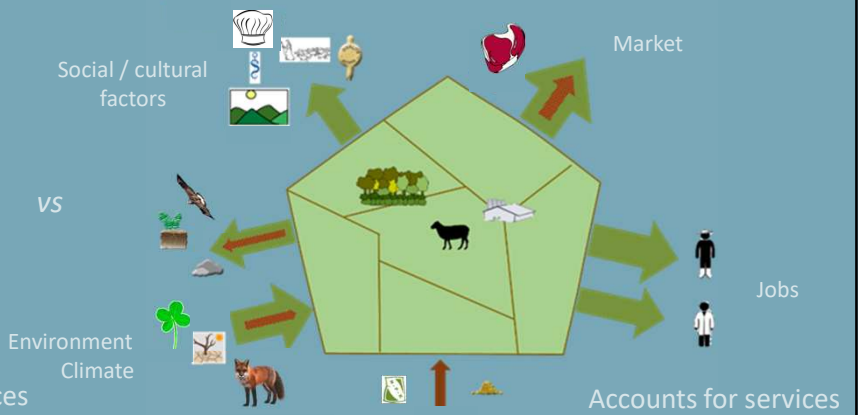
Benoit et al. 2019

An integrated graphical approaches for explicitly representing the whole range of services and impacts *(Ryschawy et al. 2019)*

Graz system



Accounts for dimensions that are often neglected *(Plieninger et al. 2013)*



Accounts for disservices (summer drought, predation risk)

Accounts for services beyond ES (jobs)

The framework was developed as a serious game to facilitate dialogue on APS

- Representing the current situation, then a sustainable future for the area
- Each player responsible for one interface
- Participants share their knowledge and collectively exercise their analytical skills by learning to position their own vision relative to that of others
- A safe environment to express contrasted and sometimes antagonist perceptions and values among players *(Dernat et al. 2022, 2023)*

- We reach out people who are traditionally excluded from scientific knowledge *(Sterling et al. 2017)*

Take home messages

- Monocriteria assessments only reveal a small part of the story and do not help to think about a sustainable future for APS
- Valuing impacts and services from contrasting human perpectives (contrasts in farmer narratives in groups that may be perceived as homogeneous)
- Tools for participants to share their knowledge and values, and collectively exercise their analytical skills

Thank you for your attention!

@bdumontAE

@bdumontae.bsky.social