A PARTICIPATORY PROSPECTIVE APPROACH FAILS TO IGNITE DEBATE ON THE FUTURE OF THE LIVESTOCK SECTOR IN BELGIUM

Antier C., Riera A., Baret P. V.

Abstract

Livestock systems are challenged because of their environmental impacts and in terms of animal welfare. A now classic vision of the transition of the agricultural sector is the substitution of conventional industrial systems by ecological or organic production systems. However, the benefits, difficulties and risks of such a massive substitution are not always evaluated and rationally discussed among actors.

We developed scenarios towards 2050 for the livestock sector in Belgium. The objective was to provide actors with a shared framework for discussing transition horizons and conditions and challenges for entering transition pathways. The study provided an analysis of the current diversity of production systems in each livestock sector. Three scenarios were then described: a. a business-as-usual scenario; b. a scenario based on extensive systems and relying on national cereals production for livestock feeding; and c. a scenario exclusively based on organic systems and feed from byproducts. This research was funded by an environmental NGO. While the most alternative scenario (c) was chosen in compliance with the NGO's guidelines, the study also offered a reference scenario (a) and an intermediary scenario (b). The consequences of each scenario were assessed in

terms of environmental aspects, production, export capacities and required changes in food habits. The study was rolled out with a participatory process: actors contributed to the data collection and then had the opportunity to collectively discuss the scenarios and their consequences. A peer-review was implemented in order to strengthen the reliability of the results. Finally, a public presentation of the study was organized and gathered about sixty participants.

The responses of farmers' unions to the release of this study can be analyzed and provide insights on the understanding of such prospective approaches by actors. Several aspects were identified as critical for ensuring acceptance of the study as a relevant framework: 1. proactively offering transparency on the data and the process; 2. maintaining a clear separation between the NGO's position and the research work; 3. participatory and iterative data collection ensuring a fine-tuned consistency with local context, and 4. having several scenarios presented (not a normative approach based on a single proposition). In spite of those aspects, farmers' unions reactions to the scenarios publication were mostly defensive and focused on supporting the current situation. This questions the possibility of building-up long-term environmental objectives and related policies and operational strategies. In addition, feedbacks were different in the two regions of Belgium, corresponding to two visions of the livestock sector challenging the development of a shared vision at the national level.

Keywords: livestock, planet boundaries, climate change, biodiversity, prospective scenarios, participatory approach, farmers' union.

This working paper is intended for publication in a conference in 2021.

Introduction

At the worldwide scale, the livestock sector has been massively growing over the last fifty years. From 1970 to 2017, milk production almost doubled, from 359 million tons to 675 million tons. Cattle meat went from 38 million tons to 66 million tons, while eggs production grew from 19 million tons to 80 million tons, chicken meat from 13 million tons to 109 million tons and pig meat from 36 million tons to 120 million tons (FAO statistics). Meanwhile, the center of gravity of livestock production was moving South, with a few developing countries in Asia, Africa and South America emerging as powerful new players on the global scene. While a large part of the worldwide animal-based production was located in Europe in 1970 (43% of the egg production, 37% of cattle meat production, 37% of chicken meat production and 50% of pig meat production), in 2017, Europe accounted for only 14% of worldwide eggs production, 16% of cattle meat production, 17% of chicken meat production and 24% of pig meat production.

This growth is not inconsequential and the livestock sector has been strongly challenged regarding its environmental impacts. International reports such as FAO's *Livestock's Long Shadow* (Steinfield et al. 2006), which titled « Livestock as a major player in global environmental issues », have highlighted the significant importance of livestock activities in greenhouse gas (GHG) emissions, water depletion and pollution, loss of biodiversity and unsustainable land use. In particular, the

report evaluated that livestock are responsible for 18% of greenhouse gas emissions[1]. In a context in which IPCC reports call for limiting emissions[2] and FAO states that « this sector growth needs to be accommodated in a context of finite natural resources, contribute to livelihoods and long-term food security, and respond to climate change » (FAO, n.d.)., it is of concern that livestock production – and GHG emissions – continues its rapid growth. In EU27, the contribution of livestock to GHG emissions accounts for between 12% and 17 % of the region's GHG emissions (Bellarby et al. 2012).

What are the options to ensure that the livestock sector is, at the worldwide scale, sustainable? There are two parallel approaches to tackle this challenge, which may not have yet been stated clearly enough in international and scientific arenas. The first one is the quantitative question: *how much* livestock production can be maintained under planet's environmental boundaries? The second one is the qualitative approach: *how* to produce sustainably, with which types of livestock systems that are respectful of the environment? Finally, a third question should be asked: is it possible to implement those quantitative and qualitative strategies, that is: can scientific recommendations regarding *how much* and *how* to produce sustainably be endorsed by public policies institutions at the international, regional and national levels and implemented by private actors of the food chain?

This international context reflects in different ways across countries. In Belgium, meat topics have been quite on the agenda in the medias. However, a complete debate taking into account all the challenges related to this question, which could lead to the establishment of a consensus and concerted political decisions, has not yet been conducted. In this context, and with funding from an environmental NGO, we developed a prospective study with three scenarios towards 2050 for the livestock sector. The central objective of this study is to provide actors with a shared framework for discussing transition horizons and conditions for entering transition pathways.

In this article, we present the participatory approach that was mobilized along the elaboration of the scenarios, and analyze the responses of farmers' union to the scenarios publication.

Context: the livestock sector in Belgium, its environmental aspects and farmer's unions

Livestock productions

Belgium is a small player in the worldwide livestock sector: it provides less than 1% of the eggs, cattle meat, chicken meat and pig meat (FAO stats 2017). However, at the national level, the presence of the livestock sector is noteworthy as the country's production largely overpasses consumption levels, a large share of the production being exported. Self-sufficiency ratios are 109% in the eggs production (i.e. the national production level reaches 109% of the apparent consumption), 135% in the milk production, 158% in the bovine and poultry meat, and 261% in the pork production sector.

[1] A more recent study revised the estimate of anthropogenic greenhouse gas emissions due to livestock to 14.5% (Gerber et al. 2013).

[2] « With clear benefits to people and natural ecosystems, limiting global warming to 1.5°C compared to 2°C could go hand in hand with ensuring a more sustainable and equitable society » (IPCC 2018).

Belgium has two main agricultural regions: Flanders and Wallonia. Poultry and pigs' livestock activities are mainly located in Flanders: respectively 94%, 84% and 85% of pigs' population, broilers and laying hens are located in that region. Dairy and bovine cattle raising are more spread across the two regions of Belgium: Wallonia hosts 61% of suckler cows and 40% of dairy cows while Flanders hosts 39% of suckler cows and 60% of dairy cows. Livestock systems tend to be more intensive in Flanders comparatively to Wallonia[3] (Riera, Antier, and Baret 2018) (Table 1).

Table 1: Livestock populations, production and self-sufficiency ratio of meat products in 2015 in Belgium.

	Livestock population	Share in Flanders	Share in Wallonia	Main product	Production	Net consumption [b]	Self-sufficiency ratio [c]
	in number of animals	%	%		Tons of product [a]	Tons of product [a]	%
Pigs	6,364,164	94%	6%	Pork	1,140,326	437,632	261%
Broilers	23,838,182	84%	16%	Poultry meat	369,590	233,832	158%
Laying hens	8,109,466	85%	15%	Eggs	165,269	151,116	109%
Suckler cows	393,595	39%	61%	Bovine meat	261,639	166,083	158%
Dairy cows	507,390	60%	40%	Milk	1,275,496	943,162	135%

Notes:
[a] For bovine, pork and poultry meat, values are expressed in tons of carcass weight. For eggs, data is from 2013 (last available data) and values are in tons of eggs and are estimated from number of eggs, assuming that one egg weights 60g. Finally, for milk, data is from 2012 (last available data) and values are in tons of fresh liquid dairy products.
[b] Net = Production + Imports – Exports and can be associated with apparent consumption.
[c] self-sufficiency ratio = Prod/Net, which gives an indication on how much the national production contributes to the national consumption.
Source: (Riera, Antier, and Baret 2018).

Environmental aspects: GHG emissions

The degree of environmental impact of livestock systems was assessed through four indicators: emission of greenhouse gases, nitrogen emissions, biodiversity score[4], pesticides uses for feed crops and pastures. Those indicators cover three of the twelve midpoint impact categories[5] identified in Life Cycle Assessments (LCA) applied to livestock products (McLelland et al. 2018)[6]. In addition, a

[3] For example, in the eggs production sector, 91% of laying hens are in more intensive in-cage and indoor systems and only 9% of laying hens are in more extensive free-range and organic systems, while in Wallonia, 68% of laying hens are in more intensive in-cage and indoor systems and only 32% of laying hens are in more extensive free-range and organic systems.

[4] In order to characterize the biodiversity impacts of each system, the methodology developed by De Schryver et al. (2010) was used. The method is based on the impact of feed ingredients on biodiversity: a characterization factor (CF) which expresses the ecosystem damages of certain land-uses and agricultural areas, is attributed to each feed ingredient. The CF depends on land uses (arable land and grassland) and intensiveness of agricultural practices (organic vs. intensive). The indicator also varies with the duration of the crop and the occupied area (see step 1 below). The impact of each feed ingredient is then aggregated to determine the overall Damage Score (DS) associated to a certain production system (step 2). The higher the Damage Score, the higher the impact on biodiversity.

[5] In LCA, a midpoint category describes a proximate impact along the environmental chain that can be measured before the end- point impact is realized (e.g., GHG emissions are a midpoint indicator for average global temperature changes) (Jolliet et al., 2003).

[6] McLelland et al. completed a systematic review of the livestock LCA literature to better understand the impact categories included and the progress made towards more comprehensive LCAs. The authors' search of publications between 2000 and 2016 identified 173 relevant peer-reviewed papers and then categorized midpoint environmental impacts into 12 categories based on Jolliet et al. (2004). The twelve categories are: acidification; biodiversity; climate change (or global warming potential); ecotoxicity; eutrophication; human toxicity; ionizing radiation; land use or land occupation; ozone

qualitative assessment of livestock systems in terms of animal welfare was provided. In this article, we focus on greenhouse gases emissions.

Overall, annual GHG emissions due to the Belgian livestock sector were estimated being 13,850 kilotons of CO2e in 2015[7] (Riera, Antier, and Baret 2018). Those emissions come from feed (54%), enteric fermentation (32%) and manure management (15%). The bovine sector is responsible for 57% of total livestock sector's GHG emissions (with 34% from the dairy sector and 23% from the bovine meat sector), while the porcine sector accounts for 34% of livestock sector's GHG emissions, and broiler and laying hens sectors only 10% together. In Belgium's GHG national inventory, emissions attributed to the livestock sector are only enteric fermentation and manure management, that is 7,540 kilotons CO_2e, 7% of national emissions.

The Flemish Climate Policy Plan plans to the livestock sector a further reduction of 26% by 2030 compared to 2005 emissions (Vlaamse overheid 2018), while in Wallonia (the other region of Belgium), no specific objective was so far announced in the draft regional climate policy plan (Agence wallonne de l'Air et du Climat 2018).

The study showed that in each livestock sector, GHG emissions varies from one production system to another. As an example, in the pork production sector, four production systems were identified (Table 2), and it was estimated that the emissions are 3.16 kg of CO_2e per kg of live weight obtained in conventional systems, while it was 3.21 kg of CO_2e in differentiated systems[8] and 3.76 kg of CO_2e in organic systems.

Table 2. Characterization of production systems in the pork sector in Belgium.

	Conventional	Certified (Certus)	Differentiated	Organic
Final live weight (kg)	110	110	120	120
Feed consumption (kg feed/kg live wieght)	2,7	2,7	3,3	3,3
Use of phytopharmaceutical products	Yes	Yes	Yes	No
GHG emissions (kg CO_2e/kg live weight)	3,16	3,16	3,21	3,76
Share (% of slaughters)	73%	23%	4%	<1%
Total GHG emissions (kt CO_2e/year)		4,498	201	6

Source: (Riera, Antier, and Baret 2018).

Farmers' unions in Belgium

There are three main farmers' unions in Belgium. Boerenbond and FWA (Fédération wallonne de l'agriculture) are the main farmers' union, respectively in Flanders and in Wallonia. Boerenbond and FWA generally defend positions that can be classified under the conventional agriculture paradigm

depletion; particulate matter; photochemical ozone formation or photo-oxidant formation; and resource depletion (including biotic and abiotic resources; e.g., fossil fuel, electricity, water, etc.)

[7] This figure is obtained without taking into account possible carbon sequestration in pastures due to high data uncertainty.

[8] Differentiated systems differs from conventional systems as they guarantee specific raising conditions (non-GMO feed, specific breed, animal welfare considerations, etc.)

and are members of COPA-COGECA[9]. FUGEA is a smaller farmers' union located in Wallonia, which defines itself as *a peasant movement that develops and supports agricultural policies in favor of a multifunctional sustainable agriculture [taking into account the aspects of] rural employment, respect of the environment, quality of the products and the satisfaction of the consumers.*

Methodology: scenarios as an intermediary tool in a participatory approach

Participatory approach

The study was rolled out with a participatory approach involving the diversity of livestock sector's actors: farmers' unions, representative of upstream (feed suppliers) and downstream industries (slaughterhouses, commercial intermediaries). Actors were involved similarly to the method presented in (Antier, Petel, and Baret 2018) (Figure 1). First, actors contributed to the data collection through individual semi-directed interviews for the characterization of the current situation. Here, the method relies on a specific participatory process: the 'informed participatory research' (IPR) approach developed by (Van Damme, Dumont, and Baret 2016). The IPR approach combines the classic elements of participatory research and a specific, comprehensive and multi-dimensional assessment of the diversity of farming systems that is discussed with actors in an iterative process. Second, actors had the opportunity to collectively discuss the scenarios and their consequences. Third, a peer-review was implemented in order to strengthen the reliability of the results. Finally, a public presentation of the study was organized and gathered about sixty participants. The final presentation of the study was followed by a significant number of press articles.

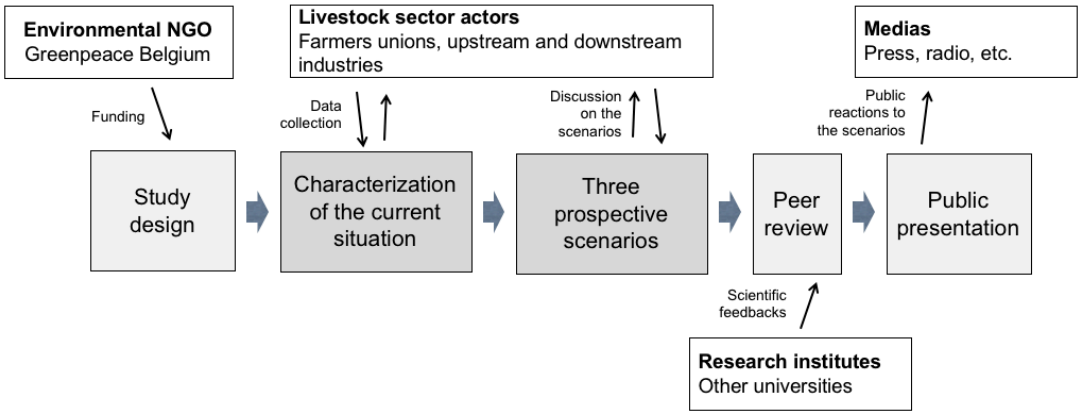

Figure 1. Steps of the study and interaction with actors along the participatory process.

[9] COPA is the Committee of Professional Agricultural Organisations, and COGECA is the General Committee for Agricultural Cooperation in the European Union.

Three scenarios: a tool for fostering discussion on the sector's productive orientation

« Given the unsustainability of the food system, and the uncertainty of how it may evolve, scenario analysis can be a useful tool for imagining plausible futures as an aid to unlocking business-as-usual thinking » (Benton 2019). Prospective approaches can help to build visions of desirable futures, to develop collective strategies and highlight relevant actions and, consequently, to improve the quality of the decisions to be made (Destatte and Durance 2009).

The authors of *Prospective et Société. Problèmes de Méthodes, Thèmes de Recherche* distinguishes three stages of the prospective approach: a. the analytical phase, based on the data and facts collection and the analysis of a current situation; b. the time for identifying "possible futures" (exploratory phase); and c. the confrontation of possible futures with the desirable choices, according to an explicit system of values, that then allow to return to the present in order to redefine it according to the desired future (normative phase) (Datar 1972).

In our case, an analytical phase was implemented through a series of key facts about the livestock sector in Belgium and the inventory of existing livestock systems. The study provides an analysis of the current diversity of production systems, highlighted through a typology of production systems within each of the five main livestock sectors (poultry meat, eggs, pork, dairy and bovine meat production).

Three scenarios at the national level were then described (exploratory phase): a. a business-as-usual scenario; b. a scenario based on extensive systems and relying on national cereals production; and c. a scenario based exclusively on organic systems and feed from byproducts. Each scenario implies choices in terms of: a. the respective importance of each sector (in number of animals and in production volume); b. the livestock systems themselves (from the current diversity of systems to a focus on extensive and organic systems); and c. practices (type of feed, etc.) (Table 3).

Finally, the consequences of each scenario were assessed in terms of environmental impacts (through related indicators), production volumes, export capacities and required changes in food habits (Table 4). The business as usual scenario shows no radical change in the livestock population, and the volume of animal based products remain similar. Self-sufficiency ratio is 228%, exports remain a major strategy for the livestock sector. Organic production grows but remain very minor. GHG emissions could decrease of -13%, mainly due to technical optimization. The conditions of transition 1 scenario (T1) listed above implies a significant decrease in livestock populations. As a consequence, meat production would significantly decrease (296 kt vs 740 kt in 2015), leaving no export capacity. The national production would cover national consumption if food diets evolve towards less meat, slightly more than accordingly to current trends. GHG emissions would be halved due to decrease in livestock population and technical optimization. In scenario T2, the conditions set implies an even stronger decrease in livestock populations. Meat production would also strongly decrease (125 kt vs 740 kt in 2015), leaving no export capacity and covering national demand only if food diets radically change (27 g of meat vs 87 g meat/cap/day in 2015). GHG emissions would be more than halved (-58%) due to decrease in livestock population and technical optimization.

The comparison of scenarios shows that:

- the reduction of GHGs that can be obtained through technical optimization is limited to -13% (BAU scenario). More ambitious targets of GHG emissions reduction would imply a reduction of the herds (T1 and T2 scenarios);
- the livestock systems that are the most efficient on one parameter (GHG per unit produced) are the least efficient on other parameters (biodiversity, pesticides, animal welfare) (the results are provided as an example in the pork sector in Table 2).
- It is possible to feed the Belgian population by significantly reducing the number of herds. Scenario T2 requires a real shift in consumption patterns while scenario T1 is very close to food diets trends.

Table 3: Description of the scenarios.

	Business-as-usual scenario	Transition 1: the intermediary scenario	Transition 2: a radical shift
Production systems in the scenarios	The scenario continues the trends from the past 10 years	organic and extensive systems	Only organic systems
Feed		Cereals feed: using only national (BE) resources	No cereal feed. Only regional (EU) coproducts for animal feed
Pastures area	427.551 ha (-23% vs 2015)	556.845 ha (no change vs 2015)	556.845 ha (no change vs 2015)
Bovine systems	Dairy Meat	Mixed dairy systems	Mixed dairy systems

Table 4: Consequences of the scenarios.

	Business-as-usual scenario	**Transition 1: the intermediary scenario**	**Transition 2: a radical shift**
Livestock population (in million livestock units)	no major change: - bovine cattle: 0.23 (-26%) - dairy cattle: 0.49 (-4%) - laying hens: 1.38 (+20%) - broilers: 0.11 (+0%) - porcine: 3.61 (+1% vs 2015)	significant decrease: - mixed cattle: 0.61 (-26%) - laying hens: 0.36 (-69%) - broilers: 0.05 (-55%) - porcine: 1.37 (-62%)	very strong decrease: - mixed cattle: 0.69 (-16%) - laying hens: 0.09 (-92%) - broilers: 0.01 (-91%) - porcine: 0.34 (-90%)
Respective importance of each sector (in % of livestock units)	- bovine cattle: 4% - dairy cattle: 8% - laying hens: 24% - broilers: 2% - porcine: 62%	- mixed cattle: 26% - laying hens: 15% - broilers: 2% - porcine: 30%	- mixed cattle: 61% - laying hens: 8% - broilers: 1% - porcine: 30%
Organic production	<6%in each sector	+30%in each sector	+100% in each sector
GHG emissions	-13% vs 2015 mainly due to technical optimization	-48% due to decrease in livestock population + technical optimization	-58% due to decrease in livestock population + technical optimization
Meat production	743 kt similar to 2015	296 kt versus 740 kt in 2015	125kt versus 740 kt in 2015

Meat consumption	70g meat/cap/day versus 87g meat/ cap/day in 2015 (trend)	64g meat/cap/day versus 87g meat/cap/day in 2015	27g meat/cap/day versus 87g meat/cap/day in 2015
Self-sufficiency of meat	228% versus 209% in 2015	100% (no export capacity)	Based on a shift in diets no export capacity

Methodology for analyzing actors' reactions

The responses of actors at the regional and national level to the release of this study can be analyzed and provide insights on the understanding and conditions for the appropriation of such prospective approaches by actors. As shown by (Bengtsson and Tillmann 2004), it is useful to analyze how actors define, and relate to, problems and interpret the risks and benefits of different options in order to understand the nature of a controversy and what need to be address for allowing progress in this controversy.

In this perspective, the press release from each of the three farmers' unions was collected[10]. Arguments were listed in each publication and classified into three categories: arguments challenging the relevance of the study (R), arguments focusing on the current situation and its technical and economic constraints (C) and arguments about possible futures (F) discussing scenarios with their advantages and risks.

[10] *Rapport Greenpeace- la Fédération Wallonne de l'Agriculture réagit !* Available online: www.fwa.be/elevage/rapport-greenpeace-la-federation-wallonne-de-lagriculture-reagit-2

Le rapport de Greenpeace, opportunité ou massacre ? Available online: fugea.be/05-02-2019-le-rapport-de-greenpeace-opportunite-ou-massacre

Conclusies Greenpeace uit UCL-studie: eenzijdig en onvolledig. Available online: www.boerenbond.be/pers/opinie/conclusies-greenpeace-uit-ucl-studie-eenzijdig-en-onvolledig

Farmers' unions responses to the scenarios

There were 24 arguments across farmers' union press releases, mainly arguments challenging the relevance of the study (9 arguments) and discussing the current situation (13 arguments) while only two arguments were about the future (

Table 5).

Table 5: Some press releases and types of arguments

Code	Types of arguments	Number of arguments in farmers' unions press releases
R	Challenging the relevance of the study	43% (9 arguments)
C	Technical and economic aspects about the current situation	48% (13 arguments)
F	Scenarios and possibities for the future	10% (2 arguments)

Overall, farmers' unions (in both regions) interpreted the study's purpose as willing to denigrate farmers' activities (a purpose stated as « agribashing » by Fwa) and challenged the relevance of reducing meat production. Meanwhile, their press releases included very few comments on the comparison of the three scenarios. Similarly, typologies of production systems, which were the keystone for describing the current situation of livestock sectors and for the elaboration of the scenarios, were not mentioned in their press releases. Arguments are detailed below.

Arguments aimed at challenging the relevance of the study

The first argument (present in each of the farmers' unions press release) was that livestock only accounts for a small share of national GHG emissions, and that efforts should therefore rather be implemented in other sectors. Boerenbond underlines that « *livestock farming accounts for only a limited share [of climate impacts]. Today, livestock farming is responsible for barely 7% of greenhouse gas emissions in Belgium. This puts it in fifth place, after mobility, energy, households and industry* ». FWA reminds that the livestock in Wallonia accounts for « *only 4% of Belgium GHG emissions* ». Boerenbond then concludes that « *a reduction in livestock will only lead to a minimal reduction in total emissions. The reduction of our livestock is therefore not the solution for the climate problem!* ».

The second argument provided for challenging the prospective study relevance was the significant efforts already accomplished by the agriculture and livestock sector regarding environmental externalities. Boerenbond estimates that « *in the past 30 years, the sector has already achieved a 20% reduction [in GHG emissions]* »[11]. FWA also stated that « *our agriculture sector, aware of the importance of increasing its sustainability, has taken into account the needed changes in its farming practices* ». FUGEA considers that « *solutions already exist and are being implemented in our farming systems* ».

[11] This decline is, in fact, largely related to the evolution of livestock populations. At the Belgium level, between 1990 and 2018, the cattle herd decreased by 26% (Etat de l'Environnement wallon 2019). Emissions have fallen due to a decrease in emissions from enteric fermentation and decrease in the amount of nitrogen excreted on grazing land (Commission Nationale Climat, n.d.).

Finally, there were arguments against the study as farmers' unions perceived it as an attack towards farmers. Boerenbond considered that the study was seeking « *stigmatizing our Flemish livestock farmers* » while FUGEA considers that « *it is damaging to Walloon breeders to be included in a national inventory* » given that « *agricultural realities [between the two regions] are not comparable* ».

Arguments based on economic or technical aspects in the current situation

First, there were four arguments about the current livestock' sector economic context. Firstly, farmers' union argued that the integration of their sector into international trade rules and competition limit the relevance of prospective approaches at a national level. Boerenbond reminded that « *meat imports [...] cannot be prevented* » while FUGEA regretted that the study « *presents Belgium as an island, whose only mission is to feed its population* ». Second, the unions highlighted the economic challenges already faced by the farmers. Boerenbond proposes that a priority should be given to « *stop the outflow from the sector* » [12] while FWA asked « *to support the farming sector and to increase farmers' revenues* ». Third, it was underlined that consumers' food diets evolution may not go along with the transition scenarios. Boerenbond challenged: « *The study assumes - also somewhat naively - that Belgian consumers will not consume more than 23 grams of meat per day, spontaneously consume only Belgian meat from the (more expensive) organic chain and ignore other (foreign) meat* ». Finally, the orientation of subsidies towards sustainable practices was underlined as FWA reminded « the current CAP already includes 30% of the aid budget for greening approaches », suggesting that no further economic support could be obtained for undertaking a more significant or rapid transition pathway.

There were also two arguments on current livestock systems themselves. Farmers' union tented to underline the performance and the positive aspects of current systems. FWA talked about « *family farms* » which are « *far from the industrial farms described by Greenpeace* ». Boerenbond reminded that « *conventional farming systems score better in terms of climate than extensive farming systems* ».

However, none of the actors explicitely talked about the typologies of production systems. Specifically, discussions on environmental aspects were focused on GHG emissions while the other aspects (nitrogen emissions, biodiversity score, use of pesticides) were not mentioned, and the relative impacts of intensive and extensive/organic systems in terms of GHG emissions and biodiversity impact were little discussed.

Arguments related to scenarios and possibities for the future

Across the press releases, there were two arguments – provided by Boerenbond only – related to the scenarios themselves. The first argument is that a business-as-usual scenario with stronger reduction in GHG emissions can be achieved: « *The Flemish Climate Policy Plan imposes a further reduction of 26% by 2030. Ambitious, but the sector is willing to commit to this. However, this reduction does not necessarily - contrary to what Greenpeace proposes - lead to a reduction in livestock, but can also be achieved through*

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technology and innovation (adapted feed ration, management, etc.) ». However, no strategies and technical innovation were explicitely presented as solutions for reaching this ambitious objective. The second argument is that socio-economic aspects should be in first line of scenarios' design, instead of engaging into a reduction of the livestock populations. Boerenbond regretted that « *the socio-economic impact [of the possible scenarios] is completely disregarded* » while « *declining the stock of livestock [is seen] as a miracle solution* ».

Discussion: factors that limited the emergence of a debate on the scenarios

One of the objective of such a prospective approach and participatory process is to facilitate the emergence of a debate based on relevant arguments.

Several aspects were identified as critical for ensuring acceptance of the study as a relevant framework: 1. proactively offering transparency on the data and the process[13]; 2. maintaining a clear separation between the funding body (an environmental NGO) political position and the research work; 3. participatory and iterative data collection ensuring a fine-tuned consistency with local context, and 4. having several scenarios presented (not a normative approach based on a single proposition).

In spite of those aspects, when analyzing farmers' unions responses to the scenarios' publication, it appears that their arguments were mostly defensive of the current situation, as the analysis of their press releases show: 9 arguments challenging the relevance of the study, 13 arguments discussing the current situation and only two arguments were about the future (see above). This questions the possibility of building-up and implementing shared long-term environmental objectives at the national level. We discuss below some factors that contributed to limit the emergence of a debate on the scenarios themselves.

A specific context: an object with a high symbolic value already under crisis

This prospective study was applied to an object (meat and animal-based products in general) that is already under crisis. Different topics are included in this crisis such as the environmental consequences, health issues related to food diets, economic viability of farms, and ethical issues of meat consumption. The question of meat consumption levels and associated ethical and environmental dimensions has been especially high in the media over the last years, with the opposition of vegan principles to farmers' and traditional food culture. In our context, this focus was at the expense of the debate about livestock systems themselves and their respective impacts that the study could have brought up. Indeed, the debate partly moved out of the political arena in which it would have supported the elaboration of policy decisions based on consensus, and shifted to the individual sphere of consumer responsibility. Meat consumption has, in general, a high degree of

[13] The transparency measures included online communication, individual meetings on demand and actors group discussion in which information was provided regarding funding sources, study objectives and process, methodology and limits.

cultural elaboration (Fischler 1991; Fiddes 1991). The symbolic value of meat in the sector and in the Belgian society in general may have strengthened the difficulty of entering a strategic discussion about the sector and its production levels.

Actors attitude: extreme positions rather than compromise.

The choice of providing typologies of production systems (beyond a simple opposition of conventional vs organic systems, see Table 2) and presenting three scenarios (not only one, or two) was made in order to facilitate the emergence of an educated and open discussion.

However, in spite of the presentation of several scenarios, actors were generally publicly denouncing the study or defending the feasibility of the business-as-usual scenario. While the most alternative scenario was chosen in compliance with the NGO's guidelines, none of the actor talked about the intermediary scenario which could have been seen as a consensus. We link this to the logic of advocacy in which actors are involved, which makes it difficult to incorporate facts and to be involved in a debate based on its real terms.

Difficulty to encompass multi-dimensional scenarios

Most of the arguments in the debate (both from farmers' union and other actors) were focusing on a specific dimension (farms' viability, employment, food accessibility, etc.). They did take into account other dimensions such as environmental aspects only separately from production levels arguments. In addition, entire aspects of the debate, such as the relevance of an increased share of organic production, were entirely missed. This shows a difficulty of the actors to encompass multi-dimensional scenarios, while they focus on defending their interests in the current situation. This may be linked to the fact that, in Belgium, due to education programs design and content, farmers tend to develop a shared vision about farming mainly based on intensification, growth and high investments in equipment (De Herde, Maréchal, and Baret 2019). Consequently, and as "pedagogy underlies all food system change, especially for forming cultural legitimacy of emergent spaces" (Hsu 2019), pedagogy is likely to be a crucial aspects for successfully bringing such prospective, multi-dimensional approach into the public arena.

Although a complete debate on the desirable futures and relevant transition pathways of the livestock sector in Belgium was not directly generated by the study, the extent of the reactions in the media tends to suggest that an agenda effect has still occurred. This is supported by the fact that the scenarios have been regularly mentioned in later debates.

Synthesis: two opposed ideologies

Underlying the above discussion is the question of ideologies. We provide in Table 6 a synthesis of the differences of views identified between the farmers' unions and the funding NGO. This could be further linked to different *agrarian ideologies* (as studied by (Beus and Dunlap 1994)) or different *cognitive framings* (as defined per (Surel 2000)) of the livestock's future controversy across the Belgian society.

Table 6: Compared views of farmers' unions and the environmental NGO who funded the study.

Topic	Farmers' union views	NGO views
The Belgium livestock sector should change, in accordance with worldwide livestock' sustainability challenges	A small country like Belgium has little influence on the worldwide trajectories.	A shrink-and-share approach[14] is needed, for achieving a balanced amount of animal protein among the poorer peoples in the world will inevitably require drastic cuts in the richer sections of societies.
Agriculture functionality	Economic viability first	Multi-dimensional
The livestock sector is responsible for 7% of national GHG emissions.	The livestock sector contribution to national GHG emissions is small.	The livestock sector contribution to national GHG emissions is significant.
Objective for livestock sector GHG emissions reduction	The definition of a GHG reduction objective is not necessary for the livestock sector in Wallonia. There already are objectives defined in Flanders (-26% in 2030).	An ambitious GHG reduction objective should be defined for the livestock sector in Belgium (about -70% in 2050).
Production systems	Current production systems are acceptable	Current production systems are not acceptable in terms of biodiversity impact, pesticides use, animal welfare. Only organic, extensive systems should be maintained on the long term.

Conclusion

The publication of those scenarios on the future of livestock in Belgium offer an interesting experience on the potential of prospective studies as a tool for facilitating the emergence of an educated debate, but also on the importance of differences in cognitive frames that affect an effective debate. In spite of the presentation of several scenarios, farmers' unions were generally publicly denouncing the study or defending the feasibility of the business-as-usual scenario. Although a complete debate on the desirable horizons and relevant transition pathways of the livestock sector in Belgium was not directly generated by the study, the publication of this study led to a cycle of encounters of farmers' unions and the national environmental NGOs. This permits to confront arguments from both sides and to highlight central differences in their worldviews and priorities. In addition, the study allowed to raise key topics for transition pathways (such as the potential of alternative, vegetal proteins in the country; the relevance of choosing which production systems to develop; etc.). Although this article focuses specifically on the responses of farmers' unions, the study was more broadly addressed to actors, including education and policy actors. The understanding and appropriation of the scenarios by those actors could be further investigated. The limits of the scenarios, widely recalled by the farmers' unions, call for a deepening of this kind of prospective study by including the economic consequences of the scenarios.

[14] The reduction in the global consumption of meat should be achieved with regional considerations on equity, i.e. a common global objective but differentiated responsibilities (Tirado 2019). In Greenpeace' s vision, the global consumption of meat should be reduced to 24 kg of meat per capita per year in 2030 (16 kg in 2050) and this should be achieved through a massive reduction in the consumption in the more developed countries and a limited increase in the consumption in the less developed countries (Africa, India).

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