
The Safe Operating Space of livestock, Rise report

Panel discussion at Launch event on Sept. 13th, 2018, Brussels

Background of the speech by Jean-Louis Peyraud, President of ATF

Sept. 13th 2018

The RISE Report has been released on Sept. 13th, 2018. Jean-Louis Peyraud had commented the Interim report. He has been invited as a panellist during the release on Sept. 13th. The report and programme of the conference are available [here](#).

This paper is the background paper used by Jean-Louis Peyraud during his speech. It only reflects a part of his talk.

Many of the issues raised in this paper are also discussed during ATF events this year:

- ATF-EAAP Special Session in Dubrovnik, Aug. 28th, 2018 – report available [here](#)
- ATF Seminar in Brussels, Nov. 7th, 2018 – programme available [here](#).

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I would like to thank the RISE Foundation for inviting me to this panel of experts. The report is a nice piece of work. It is well-documented and makes information available in a quite objective way, with a clear distinction between impacts of livestock farming, its more positive contributions for human wellbeing and the remaining uncertainties. It strives to overcome many of the limits of previous studies. In this respect, the RISE report rebalances the debate in objectivity, even if it does not go far enough in the analysis. I will come back on this in my comments.

What is the most pressing challenge that the livestock sector faces?

There are challenges that are not questionable and for which livestock farming has to make huge improvements on the short term: like reducing emissions to the environment, but also animal welfare...

- **It is first important to remember the basic ecological role of livestock:** As humans are not able to eat more than 20-25% of plant materials they produce. 75% of the terrestrial agricultural biomass is not edible and animals are very useful to use this part to produce edible food. In addition, they produce manure that is a source of nutrients and carbon for plant and soil. This is basically a virtuous circle.
 - Therefore, limiting the concept of livestock efficiency to the ratio “animal product per unit of feed consume” is a too narrow way of thinking, which is not supported by ecology.
 - We have to **acknowledge that imbalance in modern agriculture has appeared with livestock and crop production becoming more intensive, more specialised and spatially separated.** For example, in this situation, livestock plays has impacts on emissions as they decouple the cycle of nitrogen and carbon with excreting mostly insoluble Nitrogen and Carbon in feces, soluble and volatile nitrogen in the urine (just like humans, indeed) and Carbon as methane. On the contrary, photosynthesis recouple N and C during plant growth.
- **From the ATF point of view, the most important challenge that livestock has to face is GHG emissions mitigation and the reduction of other emissions leading to local pollutions (nitrate, P, ammonia) by recoupling the nutrients cycles. Indeed, mitigating GHG can have benefits on water production.**
 - **Greenhouse gas emissions:** livestock accounts for around 60% of agricultural emissions, which in turn represent 11% of total emissions at EU level¹ and 14.5% at global level. No regulation had been adopted within agriculture before the Climate Energy package of Oct. 2014 that imposed a reduction of emissions by 30% by 2030/2050 in sectors not concerned by quota trading, as agriculture. Since the COP 21 agreement, agriculture was included in the Nationally Determined Intended Contributions (NDIC) in 89% of the countries. **Undeniably, those two commitments will boost innovations and initiatives in the sector,** while so far the reduction in GHG emissions (CH₄ and N₂O) has only been a consequence of a voluntary increase of efficiencies in production systems and not a priority. GHG mitigation is now a priority, especially in a context of increase in animal production
 - **Nitrate and ammonia emissions.** Livestock is responsible for 90% of agricultural ammoniac emissions and for more than 70% of nitrate emissions of agriculture including losses related to feed production. The European Nitrate Directive is the only clear environmental regulation that has been implemented at EU level. **Ammonia emissions** have not been on the political agenda until now, nor a priority for research. They can be hugely reduced (-70% or more) by using air washers, optimising manure and increasing pasture management. Reducing ammonia emissions also increases the quantity of nitrogen available for plants and reused.
- **A comment about the animal welfare challenge**
 - **Improving animal welfare not only aims to improve or even eliminate practices that cause pain (castration, cutting of the beak or tail, dehorning).** It also comprises the improvement of living conditions of animals so that they express their natural behaviour while being in good health. Huge progresses have to be made in slaughtering practices. At least, we would recommend positive experiences to outweigh negative experiences during the life time of an animal so that “the life time of an animal is worth living”.
 - Improving of animal welfare should rely on scientific knowledge about animal perception, and not on an anthropomorphic vision. Outdoor rearing does not always mean improved animal welfare, depending on living conditions in buildings. Indeed, outside, animals may come into contact with wildlife, generating a risk of disease transmission and issues related to food safety (e.g. outdoor eggs).

¹ CAIT,2015. CAIT Climate data database ; Washington :World resources institute. <http://cait.wri.org>

Your response to the RISE concept of a safe operating space for livestock in Europe, is it useful?

Overall human activities today exceed planetary boundaries on many criteria (global warming, loss of biodiversity), implying that we must change our ways of life to preserve the planet and ensure good living conditions for humanity.

- **The concept of planetary boundaries is extremely useful** in raising awareness and redefining the overall objectives of all human activities with the aim of preserving ecosystems for our own collective survival. But applying this concept to a narrow sectorial and geographical analysis is reductionist and leads to counterproductive cleavages. There is high potential in looking for balance and synergies, focusing on improving interactions between human activities and ecosystems to increase the total efficiency and reduce impacts of the systems.
- **The RISE report, like most of existing scientific literature, considers livestock with a silo approach and as end user of plants in a linear way of thinking:** plant production → livestock utilisation of plant → food of animal origin vs food of plant origin. This is an inadequate way of reasoning overlooking ecological principles.
 - **Impacts are summed up in a linear way and overlook the strong inter-dependency between livestock and crop sectors.** As a consequence, this linear approach definitely leads to the same apparently obvious conclusion that a large decrease in animal production will hugely improve efficiency and reduce impacts of the whole food system.
 - This way of thinking does not provide solutions, ignores the carry-over effects of a significant reduction in livestock and may promote misleading proposals. It does not encourage **systemic thinking** and **appropriation of preventive agronomic methods to develop a more sustainable agriculture**. I will come back later to this issue.
- **We should not try to determine the SOS of livestock as such, but rather to develop a more efficient agriculture, producing healthy, diverse and affordable food, environmental and societal services and minimising wastes.** This raises 3 issues.
 - **It is urgent to stop considering agricultural sectors independently.** This is an old agenda. Reductionist approaches of isolating livestock and crop production as separate production chains is one of the main causes of ecological inefficiencies of the integral agro-food system.
 - **We need to shift from a focus on efficiency of single products towards optimising natural resource use** of the food system as a whole. The future of European agro-food system does not lie on a linear but on a **circular food system** with an **integrated use of regenerative** natural resources and associated agro-biomass.
 - This requires to **reconnect livestock and plant systems to find new synergies** (meaning that 1 + 1 is higher than 2). Interaction between livestock and cropping sector will be crucial for sustainability of agriculture.
 - Therefore, such a SOS approach should not be limited to livestock but must also include all agricultural sectors and food chains. **The SOS of livestock SOS cannot be considered alone. It will depend on the SOS of cropping systems and vice versa.**
- **In this systemic perspective, livestock is part of solutions and not only a problem.** I will just point out some examples of tremendous potentials for improvements. **Livestock production should contribute to a more efficient agriculture by:**
 - using marginal land not suitable for crop production,
 - **valuing the ability of livestock to use much more diverse biomasses than humans**, it is possible to diversify crop-rotations in order to develop cropping systems less demanding in fertilizers and pesticides, restoring the soil quality and contributing to C sequestration,

- **Legume** should be developed for more sustainable cropping systems and to improve protein autonomy. However, our stomachs will be far too small to be able to eat all legumes grains or lucerne that should be produced when we move towards more sustainable cropping system and a very large part of legumes (probably more than 70%) will have to be used by livestock, thus simultaneously reducing imports of soybean meal.
- **Manure can be consolidated as novel bio-fertilizer and replace mineral fertilizers**, thus recycling several nutrients including P (world resources are limited), improving soil C sequestration and soil fertility. In particular, an important development of organic farming will be very dependent on animal production to ensure soil fertility and organic nutrient supply.
- **Food waste** can be used either directly as animal food (Japan shows the way forward) or indirectly for producing insects which in turn will be used as feed (for poultry and fish).

Does the livestock sector need to be reduced in size or changed in composition in the EU? If so, why, and how? And if not, why not?

I will give my opinion in five points.

- **We are facing a “cognitive lock-in”.** We are familiar with simplistic approaches (one problem - one solution). Here, we consider that livestock farming raises important issues and thus the solution is simple: we need to reduce livestock.
- **The report is related to LIVESTOCK FARMING, but the same exercise could be achieved on CROPPING SYSTEMS** that would lead to the same conclusion. **Looking at the SOS of cropping systems would inevitably lead to promote their reduction**, due to major issues: yield gap, massive use of pesticides (some are suspected to be associated with increased incidence of cancers, altered reproductive functions, neurodevelopmental delays in children, changes in immune functions, presence of residues including endocrine disruptors in food), simplified rotations and increased size of plots for big machinery leading to a huge loss of biodiversity and habitats for wild fauna, loss of soil organic carbon, increased risk of erosion, etc.
- **Consequences of a large reduction of livestock production have never been assessed.** These consequences should be seriously considered before making irreversible decisions. Nothing is said in the RISE report on that point, nor in all other publications.
 - Agronomic and ecological consequences are unknown: they can differ greatly, according to the potential use of agricultural land released by livestock: will it induce an extensification of livestock production? A development of intensive crop production? Of forests?
 - Reducing livestock can raise unintended or unwanted effects and the benefits could be much lower than expected. The proposal from the RISE report always relies on the same LCA analysis, but conclusions ignores some **flaws in current LCA methodologies** for assessing Carbon Footprint in livestock system, leading to an overestimation of the Carbon Footprint of meat vs crops,
 - Reduction of ruminants and thus of associated **grasslands** area will be accompanied by a reduction in the provision of ecosystem services and a massive loss of soil organic carbon and nitrate,
 - Reducing livestock will lead to **a loss of jobs in many regions** (livestock creates much more jobs than the plant sector), notably in the most **vulnerable regions where no other economic alternative exist.**
 - The reduction of the size of the sector will be irreversible and before advocating such a solution, we cannot ignore **geopolitical considerations**. Ukraine and Russia are boosting their

wheat production and what is true today for wheat will be true tomorrow for pig and chicken with industrial farms backed by cereal farms (big hen-houses are being developed including 12 million chickens). Imports of very low cost meat (cheaper than processed plant protein) will find EU consumers seeking to reduce food costs even with products that do not meet our standards.

- **Advocating for a reduction of animal production does not provide a vision towards more sustainable agri-food chains. The main issue is not whether we should reduce livestock production per se but what type of livestock farming is needed to achieve a more sustainable agri-food chain based on circularity.**
 - **Do we need more ruminants that emit GHGs but value fibrous biomasses or more pig and poultry which are more efficient but do not maintain landscapes and use a lot of cereals?** What is the optimal share of **intensive systems that provide cheap food and extensive/organic systems which are far less efficient** (high cost products) **but produce many ecosystem services**, etc.
 - The type of livestock farming systems and the economic dimension of this sector should result from **thorough holistic analysis including ecological considerations and economics/market analysis**. It **cannot be the starting point based on a sectorial, linear and partial analysis**.
 - Livestock are present in almost all regions in Europe across a **wide diversity of production systems** in terms of local, economic, geographical & sociological contexts and these systems provide a large diversity of services and disservices as well as resilience to the entire production.

Will the recent and future developments in technology and innovation be enough to address the challenges outlined in the RISE report?

- **The RISE report provides a list of propositions** to improve the efficiency of livestock production systems and reduce nutrient loads. Some are incremental innovations and concern changes in animal feed, including new feedstuffs as insects or alga, changes in manure management. Change in the concentration of livestock production is more disruptive but requires fundamental changes in the organisation of sectors that are difficult to implement in the next decade because the economic forces pushing towards a concentration of activities are very strong.
- **However, the RISE report overlooks some avenues of progress.** I will stress on 5 only:
 - **Genomic selection.** Genomic selection will allow to produce more robust animals to cope with a huge diversity of environments and new constraints (climate conditions, new feed resources) while reducing the use of antimicrobial. Genomic selection towards low methane emitting ruminants is another avenue for improvement.
 - **Enteric methane production can be drastically reduced by using feed additives.** Using polyunsaturated fatty acids or 3-nitrooxypropanol (3-NOP) reduces methane emissions by -30 to -40% and the effects are persistent over lactations. Using PUFA also increases the omega-3 content in animal products.
 - **Digital technologies** (sensors, robotics, informatics, nanotechnology, block-chain, IoT) will provide new tools for the management of livestock by continuous, automated, real-time monitoring of production, reproduction, feed use, animal health and welfare and have great potential to achieve more efficient use of resources and “smart” livestock farming.
 - **Management of manure.** A major avenue of progress lies in manure refinement towards the production of compost, of standardised fertilizers. Solutions based on circular economy principles offer huge potentialities in a triple win process: (i) reducing load of nutrients in

intensive livestock production (from export), (ii) bringing N, P and C in areas specialised in crops production thus contributing to reduce the use of mineral fertilizers and to improve soil fertility and (iii) supporting a reduction of dependency on imports of P and fossil energy required to produce mineral N fertilizers.

- **Management of landscape mosaics** to foster nutrients' capture (leaching, run-off) is another avenue for improvement. The report also completely misses the opportunity of agro-forestry to foster sequestration of carbon in soil.
- **What gain can we expect?**
 - **Concerning GHG emissions (methane and nitrous oxide)**, the FAO report (2013) shows that it is possible to reduce the sector's global emissions by 30% by generalising the practices of the most successful livestock farmers in each region of the world and therefore before doing any research. In Europe, the situation is different: livestock systems still have the world's lowest emissions intensity. When all stakeholders are mobilised, a further reduction in emissions intensity by -30 to -40% from the current level is achievable by 2050. Several initiatives like EU-funded research and innovation projects as well as public private partnerships (see for example Danone's initiative towards neutral dairy systems...) are currently running to implement good practices on farm. Production of biogas from manure will also drastically reduce the Carbon footprint of livestock farms. **So the "Livestock long shadow" is not a "fait accompli"**.
 - **Ammonia emissions** can be hugely reduced (up to -70 to -90%) by using air washers in buildings, optimising manure management and increasing grazing for ruminants. These are win-win solutions that preserve N for plant production and improve animal welfare.
 - **Nitrates**: It remains a difficult case. During the last 20 years, a reduction in nitrate content in surface waters has been implemented, even in intensive livestock areas. Provided that good practices are adopted, performances of all farms are improving but this is not sufficient and there is a need to step up dimension of solutions. **Technological treatments for slurry in a context of circular economy offer tremendous opportunities to reduce nutrient loads without changing very much the concentration of livestock**. It is noteworthy that in France, whereas nitrite content in water has decreased in Brittany, it is still increasing in surface and ground water in areas specialising in cereals.
 - **Antibiotics use**: The use of antibiotics can be drastically and rapidly reduced as shown by recent efforts in several countries, even in very intensive systems (e.g. Denmark: -11% 2013/2009 after a huge reduction before 2009, Netherlands: -58% 2015/2009; Belgium -26% 2017/2011; France: -35% 2017/2012). New value chains of animals raised without antibiotics are developing. In this area, the livestock sector is much more reactive than human and pets medicine.
- **It therefore appears that the margin of progress are very important and ATF proposes a conceptual framework based on 4 types of levers to avoid fragmented approaches and create synergies**
 - **Use of agro-ecological processes**: This covers the so-called "sustainable intensification" directed to improving efficiency of current production systems (we can say soft agro-ecology) combined to stronger agro ecological approaches. This will promote more disruptive solutions. Avenues for improvement will rely on adaptive capacities of animals, use, preservation and enhancement of (bio)diversity and improvement of the metabolic functioning of agro-ecosystems.
 - **Use of circularity and cascading approaches** for the development of innovative feed chains not in competition with human food, to better manage manure and valorise the non-food part of animals. This clearly implies the search for synergies between livestock and cropping systems, making the search of a single SOS for livestock alone irrelevant.

- **Use of disruptive technologies.** This concerns the advances in (bio)technologies to produce more robust, adaptable and easy-to-rear animals and innovations and digital technologies.
- **Governance and cooperation between stakeholders** (consumers, farmers, industry, policy makers, NGOs...). This is an essential component of sustainability to design new public policies, transitions towards future systems and new cooperation among stakeholders. Co-construction of innovations is a crucial point.

Do consumers need to reduce livestock product consumption and if so, why and how should this happen?

I will consider three points in my answer:

- **First of all, the evolution of the consumption of meat in Europe must be reflected in a global landscape**
 - Europe consumes 15% of the world's meat and therefore **a change in European internal consumption will have little influence on the global stakes,**
 - Concerning **meat consumption**, the main problem is more the **disparity between populations** (even in Europe) than the level of consumption per se, with people eating more than 100 kg of meat per year in North and in Latin America and some eating less than 5 kg per year in Africa.
 - Experiences of vegetarian diets show it is possible to live without eating meat, providing some precautions are made to **balance the diet to avoid deficiencies.** But for the vast majority of people, the only or **easiest way to have a balanced diet is to be omnivorous.** In average, animal based product should represents **between 30 to 50% of total protein in the diet** (dietary recommendations differ across countries). **This means less than the current 60% in Western Europe.**
 - The major challenge for sustainable diet in Europe is to evolve towards less food in the basket to **avoid wastes** (direct wastes, obesity is maybe also a waste), less processed and more diverse foods. Every year, 88 million tons of food are wasted in the European Union, that's 20% of all food it produces.
- **In Europe, consumption of animal-based products exceeds recommendations and thus can be reduced.** Some papers advocate for a reduction of -50% on average or even more. None of those papers were written by nutritionists. Indeed, **it is risky to promote such a large mean reduction in meat consumption in Europe for at least three reasons:**
 - **From a nutritional perspective.** We should consider:
 - **Dietary requirements of specific populations**, sometimes at-risk, that should not be concerned by the decline. **Animal products are essential for (i) children** for the development of skeleton, muscle and brain, for (ii) **elderly people** (currently, 25% of seniors are below the recommended protein intake and sarcopenia is a major health issue; for (iii) **poor population** (10%) that cannot afford enough meat to balance their diet and (iv) **women of childbearing age** have high requirements for iron and 15 to 25% of this population (France, Denmark, more in UK) has a marked depletion of reserves.
 - As said in the RISE report, **at current level, mean meat consumption does not damage human health per se**, and only the big meat eaters (5% of the population) are concerned by the WHO 2016 recommendations. After more than 20 years of scientific debates, it is now clear that there is no health effects associated to animal fat (but negative effects linked to hydrogenated fats of plant origin).

- **From a cultural point of view:** sustainable food systems must also be culturally acceptable and it is very difficult to change people's eating habits. European populations may never eat significant quantities of insects. **There is a slow decline in the consumption of meat and even dairy products in Europe.** This trend is likely to continue. **It is probably virtuous as long as it does not affect at-risk populations.**
- **For economic reasons:** today, the offer of plant based substitutes of meat is increasing very quickly, but the price of these products is often higher than the price of conventional chicken and part of the population will not be able to afford these products. In addition, the nutritional quality of those substitutes needs assessment.
- **Lower consumption should not be associated to lower production.** Indeed, the volume consumed equals volume produced at a global level (apart waste), but this is obviously not the case at local scales for several reasons due to competitive advantages, history and culture.
 - Due to its climate and soils quality, **Western Europe is the most favourable region in the world to produce milk. European systems are also the most efficient from an environmental point of view.** The level of technicity of farmers is very high. Therefore, Europe can produce a little bit more than its internal consumption, thus contributing to the world demand while minimising global impacts of its increase. **The challenge is to adjust production levels to minimise local pollutions.**
 - Conversely, and although this is not envisaged in the RISE report, it cannot be ruled out that **production could fall more sharply and rapidly than domestic consumption**, particularly because of climate change or a lack of competitiveness (facing Brazil, Ukraine...).

We all recognize that, due to the impacts of livestock production, and the growing global demand for meat production, there will need to be some form of adaptation or change in the livestock sector in Europe. How can policy makers support this change?

Several economic tools can be used to guide systems towards greater sustainability and encourage changes. These concern the production side and the demand side. However, decision making should consider all the facets of a problem to avoid misunderstanding, simplistic reasoning and dogmatic positions. **We need to think twice before making wrong and irreversible decisions:**

- **On the production side: public policies are able to implement subsidies, taxes or norms to reduce the environmental footprint of livestock farming and promote changes in practices.** There is no ideal solution.
 - **Developing penalties (taxes) is not the most efficient means.** Systematic taxation on emissions (or inputs) appears as an obvious proposal. But taxes will penalise competitiveness. In addition, a tax on GHG emissions in EU countries would result in a significant increase in production in other non-regulated countries, thus partially offsetting the mitigation gains on global level. Cross-compliance in CAP aims to foster improvements in practices without taxes.
 - **An alternative to taxes is a policy using norms or quotas** that guarantees reaching an environmental result provided these quotas are controlled. Combining a quota with penalties in case of excess can promote innovations to avoid penalties. On the opposite, quotas implemented in emission trading schemes can be considered as non-ethical “rights to pollute”.
 - **Payments for environmental services are intended to prevent or repair environmental damage** and to encourage more ecological ways of production at least in certain regions. For example, we can imagine that farmers developing systems aiming to stock C in soils may be

rewarded for that, notably when these systems lead to reduce productivity. The European Commission is thinking in this direction.

- **On the demand side:**
 - **Public policies can encourage a reduction in meat consumption** through the introduction of a tax (e.g. C tax on meat). However, taxes will penalise the poorest and at the same time we need policies to encourage consumption for at-risk populations. This might lead to particularly complicated policies and to date all the proposals made in this direction have been rejected by national governments.
 - **Labelling and/or information campaigns** can be another means of action, but they may preferably be carried out on indisputable scientific basis. Today, consumers receive a lot of messages that are misleading and not necessarily scientifically valid.
 - **At the same time**, it is important to assess implications for supply dynamics in response to the dynamics of demand. A postponement of consumption of meat to other foods, such as fruits or plant meat substitutes, can probably lead to an increase in prices of products thus limiting effects. In the opposite direction, if the policy towards meat consumption reduction generates significant changes in food habit, the question of economic support for the production sector and/or the development of exports will have to be raised to manage transitions.
- **A shared, global and unbiased vision of the risks and benefits of livestock farming to promote evolutions is required.** This is the role of research to provide undisputable data and information for policy makers. Great care must be given in developing metrics when determining the role; services and impacts provided by livestock. Unfortunately, the RISE report does not take a scientific critical look on published data, whereas there is a **lack of clear metrics and the reality is often much more complex** than generally claimed. I will provide two examples:
 - **The statement that livestock is inefficient and wasteful must be kept in perspective.**
 - Concerning the **competition between feed and food, the net contribution of livestock to protein security is not correctly calculated.** It is true that 2.5 to 10 kg of plant proteins are required to produce 1 kg of animal protein according to animal species and management. But competition between feed and food does in fact concern those proteins of plant origin that are consumable by humans, but are actually consumed by animals. Using these metrics, **data show we need 0.1 to 2 kg of edible plant proteins to produce 1 kg of animal proteins** thus showing that **some livestock systems (particularly grassland based-dairy systems) can be net producers of edible protein** and not in competition with human food. On the other side they use land.
 - **There are flaws in the use of LCA for assessing Carbon Footprint (CF) in livestock systems** because LCA uses static state and linear approaches whereas it is well established that most of the mechanisms are based on dynamic relationships with a lot of integrated feedback loops.
 - Based on emissions calculated on inventory data, C footprint of animal-based products is higher than C footprint of plant-based products, **but LCA analysis ignores that livestock system maintain soil organic carbon (SOC) content**, whereas most cropping systems loose SOC, which is a matter of great concern in the long term. Grassland can also act as carbon sink and contribute to mitigate soil erosion (0.30 vs 3.6 t/ha per year according to Eurostat). Although it is clear that soil carbon dynamics cannot offset other emissions from the system, but these results clearly show that the difference in CF between crop- and ruminant-based food, especially those based on grassland, is highly overestimated.
 - The choice of functional unit also affects the comparison, especially in the case of nutrient-rich food. Using “kg” of foods leads to overlook the **difference in nutritional quality** between products. **Using a Nutrient density score** (considering 9 nutrients to capture the composite value of a food and its supply in term of daily human needs for several nutrients),

the C footprint of milk is 2 times lower than the C footprint of soy drinks whereas it was 2 times higher when considering only protein. What can we conclude? It is not so evident!

- Last but not least, **LCA does not consider animal by-products in the global assessment of the livestock sector**. Using economical allocation, GHG emissions from ruminants are almost exclusively attributed to meat although a significant proportion of animals (42% for ruminant, 34% for pig, 25% for poultry) is not used for human consumption and contributes to provide **edible fats, raw materials for high value industries such as leather or wool industry, proteins for gelatine production and pet food industry** (1.67 million tons from which 50% are animal by-products), **fats for oleo chemicals** (575 thousand tons). High risk by-products are recycled to produce 1 million tons of solid fuel replacing fossil coal in power station and cement kilns, liquid fuels and fertilizer (N and P). This is never considered in the overall assessment of the sector. In other words, your dogs and cats can eat animal proteins in their pet-food without increasing their CF but you should avoid to eat a steak yourself to limit your own CF.

Jean-Louis Peyraud, Animal Task Force, Sept. 2018