



D6.1 Definition of a SJOS for EU livestock with identification of its various dimensions

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Abstract:	The work package 6 aims to elaborate, assess, and identify conditions for implementing scenarios that could lead to more sustainable livestock systems, by embracing the concept of Safe and Just Operating Space (SJOS) for livestock in the European Union. Designing such a SJOS considers both resource boundaries and fairness for all stakeholders, relying on agroecology in a One-World, One Health, One Welfare, One-Quality perspective. The framework aims to integrate sustainability principles into livestock management by addressing environmental, economic, and social aspects while ensuring alignment with EU policy objectives. Deliverable 6.1 reports on the first steps to design a SJOS for livestock in the EU that includes dimensions, variables and indicators for both Safe and Just spaces. Further refinements are in progress such as threshold value calculus and the quantitative assessment of the chosen indicators.

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LIST OF ACRONYMS / ABBREVIATIONS

NAME	MEANING
ASF	Animal-Source Foods
SOS	Safe Operating Space
JOS	Just Operating Space
SJOS	Safe and Just Operating Space
GHG	Greenhouse gas emissions
MS	Member State
EU	European Union
EGD	European Green Deal
CAP	Common Agricultural Policy
UN	United Nation
SDG	Sustainable Development Goal
LCA	Life Cycle Assessment
MAA	Multi-actor Approach
S-LCA	Social-Life Cycle Assessment
FSDN	Farm Sustainable Data Network
WP	Work Packages
FTE	Full-Time Equivalent

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Definition of a SJOS for EU livestock with identification of its various dimensions

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1. Introduction

The concept of Safe and Just Operating Space (SJOS) integrates biophysical earth system tipping points, hence corresponding to thresholds at which small changes may lead to amplifying effects, with social considerations of distributional equity and justice. This concept binds planetary boundaries and associated resource limits to socio-economic systems and public policies. Thus, SJOS provides a powerful conceptual frame that combines dimensions that specify, on the one hand, limits regarding the planetary biophysical boundaries (safe operating space or SOS) and, on the other hand, limits that specify socio-economic needs that must be respected (just operating space or JOS).

Transitioning livestock systems towards an acceptable level of sustainability is on the EU agenda and needs both multisectoral investments and pluridisciplinary approaches that mobilize research, innovation and development, and public policies. In this context, WP6 tackles the challenge to define a SJOS for livestock systems in the EU within several objectives. First, to use it to quantitatively assess scenarios proposed for EU livestock. Second, to evaluate if they operate within the defined SJOS. Third, to provide recommendations for European public policies. To achieve this lofty goal, STEP UP involves experts in the field and collaborates with the Horizon Europe BrightSpace project that aims at “Designing a Roadmap for Effective and Sustainable Strategies for Assessing and Addressing the Challenges of EU Agriculture to Navigate within a Safe and Just Operating Space” (<https://brightspace-project.eu/>). BrightSpace has arisen from the aim of the European Green Deal (EGD, EC 2019) to increase the contribution of EU agriculture to climate change action, improve the management of natural resources, ensure a fair economic return for farmers, and reinforce the protection of biodiversity (EC 2020a and 2020b). STEP UP targets livestock that is an indispensable sector towards sustainable agriculture in the EU.

The deliverable 6.1 reports on a first design of a SJOS for livestock in the EU by drawing a list of dimensions, variables and indicators to consider.

1.1. Safe and Just Operating Space Concept

1.1.1. Safe Operating Space (SOS)

This domain of research on planetary boundary definition and assessment to conceptualize a SOS has been initiated in 2009 by the Stockholm Resilience Center (Rockström et al., 2009) and has generated a continuous great deal of interest. Thanks to work carried out by a growing scientific community, the identification of biophysical dimensions to be considered for defining a SOS has been consolidated (Steffen et al., 2015; Rockström et al., 2023; Fanzo et al., 2021; Richardson et al., 2023). The number of dimensions has evolved from seven to nine since 2009 (<https://www.stockholmresilience.org/research/planetary-boundaries.html>) with a refinement of the metrics and data used to estimate where we stand within the earth systems processes. Moreover, the methodology on thresholds has been further improved, hence allowing to achieve a broader evaluation of the risks taken for different values of limit transgressions.

The most recent proposal for a global SOS was reported by Richardson et al. (2023) who confirmed that six out of nine boundaries have been crossed, indicating that Earth has moved well beyond the safe operating space for humanity. In 2023, the transgressed boundaries comprised: climate change (CO₂ concentration, radiative forcing), biosphere integrity relating to biodiversity (genetic, functional), land system change, freshwater change (blue and green waters), biogeochemical flows (phosphorus and nitrogen), and novel entities (e.g., pollutants). Ocean acidification and stratospheric ozone levels are nearing their threshold, while aerosol loading regionally exceeds its threshold, but not globally. For boundaries initially identified as overstepped, the degree of transgression was found to be much higher than what was initially estimated in 2009. Given the critical role of primary production in supporting Earth biosphere functions, human appropriation of net primary production is proposed as a key variable for maintaining biosphere integrity. Earth system modeling highlighted that the compounded impacts of crossing climate and land system change boundaries must be addressed within a systemic context to understand and mitigate their effects and externalities.

Agriculture and livestock systems contribute to the transgression of each of the six overshoot dimensions whereas they depend on the sustainability of the associated resources. Thus, elaborating a SOS for agriculture and more specifically, livestock, is of high interest.

1.1.2. Just Operating Space (JOS)

In 2012, the concept of JOS was published by Oxfam (Raworth et al., 2012) ahead of the “RIO +20” United Nations conference on sustainable development, which redefined the Millennium Development Goals. Despite its relevance to monitor planetary boundaries, the SOS does not consider any socio-economic concerns and issues. Thus, Raworth et al. (2012) introduced the “Just”-related aspects by adding dimensions that define the minimal fundamental needs of humans. Placing the JOS as a necessary counterpart of the SOS led to the concept of SJOS represented as a doughnut that is a space that enables humanity to work and live in just and fair conditions under a respected environmental ceiling.

Very recently, Gupta et al. (2021 and 2023) further proposed another way to include “just” aspects and generated a new form of SJOS. The framework explores how boundaries might be adjusted to mitigate harm, improve access, and address inequality, striving to secure a just future for humanity, other species, and the planet beyond safety aspects. To have stringent “safe” boundaries may impact equitable access to resources such as food, water, energy, and infrastructures. This allowed the calculation of new thresholds in the literature to include the potential risks that the former thresholds posed to justice.

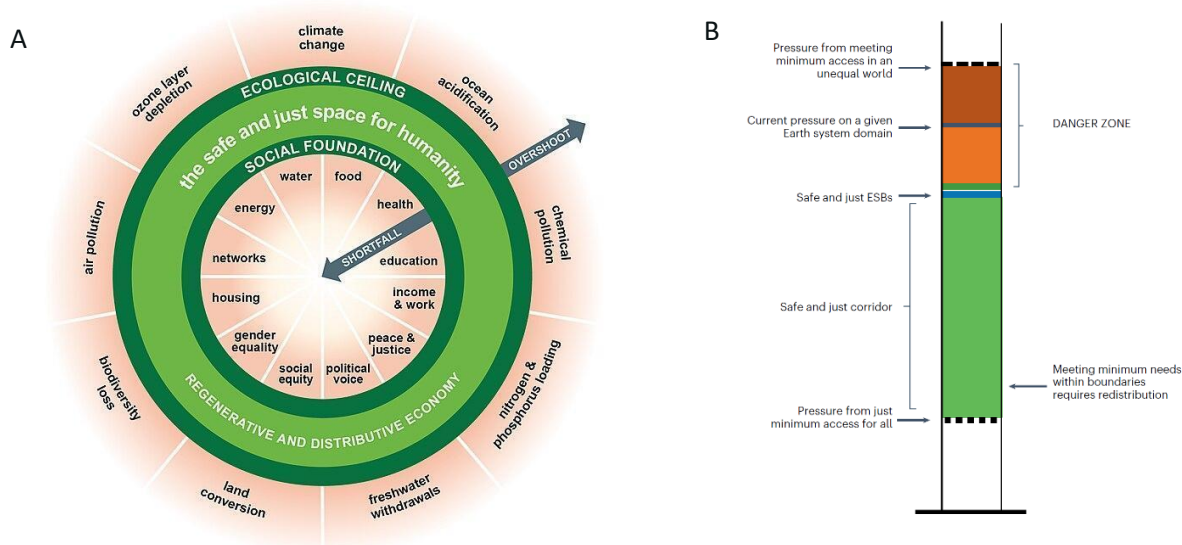


Figure 1 : Two representations to visualize boundary thresholds for both safety and justice

1.2. Expected value added of the concept of SJOS for EU livestock

In a context of global warming and societal changes, agriculture and livestock systems are facing challenges to meet sustainable goals with a wide range of complex issues that must be addressed in a holistic perspective. European livestock plays a central role in food production, organic fertilization, crop co-product use, rural livelihoods, cultural heritage, etc., but it also has major environmental impacts, including resource consumption that may compete with human food needs, high emissions of greenhouse gases (GHG) especially methane, etc. Job attractiveness, farmers' incomes and perception of animal welfare by citizens-consumers are also important concerns driving the sustainability of production and consumption. Moreover, the European Green Deal (EU, 2019) highlights the importance to better balance European diets between animal and plant-based products for environmental and public health good. European livestock has to adapt to climate change and to contribute to its mitigation, and to evolve to respond to societal demand. Thus, the

SJOS provides a highly relevant conceptual framework by considering the environmental biophysical limits at the planetary level together with the minimal socio-economic human needs. The strength of SJOS is also to define limits with associated variables and indicators that can be calculated and compared to threshold values.

The question remains as to how the necessary transformation of the livestock sector can be reflected within the SJOS analytical framework? Establishing a SJOS for livestock in the EU will involve setting clear boundaries for the environmental pressures while also addressing the social foundations of the sector, at the European scale. The SJOS for livestock in the EU is expected to provide thresholds to be respected in order to comply with sustainable practices able to reduce environmental footprint and guarantee economic viability of the sector in the EU.

1.3. Type of challenges to consider in the design of a SJOS for livestock in EU

1.3.1. Dimensions, indicators and associated data

The boundaries for SOS and JOS are referred to as dimensions. They are further specified by one or several control variables with indicators and associated data used for calculation and comparison with the preconized thresholds. Identification of the dimensions to consider and the appropriate control variables and indicators is a founding step to design a SJOS, whatever the sector and the geographical scale.

The 9 dimensions that define the planetary biophysical boundaries (SOS) have been extensively discussed, and they provide a consistent frame (Richardson et al., 2023) to address the declination of the SOS for the European livestock farming. By contrast, the social foundation comprises 12 dimensions derived from the UN's 2015 sustainable development goals (SDG) (Raworth, 2017b). They cover access to services (health, education), to goods (food, water, energy, housing), to decent revenue, and to take advantage of human rights (gender and social equity, political voice, peace and justice). It is possible to discuss Safe and Just dimensions at member state or EU level as one can consider environmental and social values governing these areas comparable. More information and reports are available on the Safe dimensions than on the Just dimensions. However, similar difficulties exist to define both SOS and JOS.

Last, discrepancies between an ideal list of indicators and the corresponding data availability may occur. This has to be considered as a bottleneck in the workflow to design a SJOS because all indicators identified as relevant will not be quantitatively assessed. However, it is important to draw the list of relevant variables and indicators even if all data are not available, in order to foster the monitoring of new indicators that are missing.

1.3.2. Downscaling, disaggregation and threshold values

The authors who have published updates on global SJOS that serve as genuine pillars of the literature on the subject (Steffen et al., 2015; Rockström et al., 2023; Fanzo et al., 2023; Richardson et al., 2023; Rockström et al., 2024), are still very cautious about the adaptation of SJOS concept to regions (downscaling) or sectors of the economy (disaggregation). This is why there is a scientific field that explores ways to correctly adapt the concept of SJOS to regions, nations, sectors or even individuals (Ryberg et al., 2018b; Nykvist et al., 2013; Barnosell et al., 2024).

Particularly, in the case of EU livestock, there is a need to adapt the dimensions and variables to the region/sector. But, more importantly, the chosen thresholds need to reflect the maximum pressure that the region/sector is “allowed” to inflict on the environment (e.g., GHG emissions, water consumption) and the minimum access to needs the sector must offer to its citizens in order to be “just” (e.g., affordability of ASF, farmers' income). It means that keeping apart the dimensions for which there will never be consensus data

on planetary or justice boundaries, discussions on downscaling and disaggregation are challenging even on the most referenced global thresholds. Indeed, there are several ways to downscale and disaggregate that will all be the result of hypotheses and assumptions and will not reveal the exact same story (Ryberg et al., 2020).

Moreover, assuming that this issue is solved (for instance by calculating multiple thresholds and explaining the methodology and philosophy behind it), perspective issues still remain. Indeed, there are also several ways to make the same calculus, depending on available data and perspectives. For instance, there are two major ways to address the emissions of a sector, first the consumption-based approach that includes the emissions caused by the consumption of a product (including domestic production and imports), secondly the production-based approach (also referred to as territorial based-approach), which focuses on emissions from the industry producing within a territory (including domestic production and exports). All these challenges raise a wide complexity and mean that the EU livestock SJOS can always be improved in some ways or complemented by another approach.

Defining thresholds is thus a political issue that needs sharing and discussion across stakeholders.

1.4. Objectives of deliverable 6.1

The deliverable 6.1 results from Task 6.1 that aims to frame a SJOS for livestock in the EU, by relying on literature review, starting with goals and targets put forward in policy programs at EU and UN levels (Green Deal and SDGs). The work is carried out in synergy with the BrightSpace program that was launched one year before STEP UP, at the end of 2022, and has already delivered a report on the first design of a SJOS for agriculture in the EU (Muller et al., 2024; Aladesuru et al., 2024). While BrightSpace provides a broad framework across spatial scales, STEP-UP will add depth and precision by addressing livestock-related issues with the aim to provide a detailed exploration of specific dimensions, variables and indicators to consider.

The purpose is to work in close connection with WP3, WP4 and WP5 of STEP UP to design the SJOS, as shown on Figure 2.

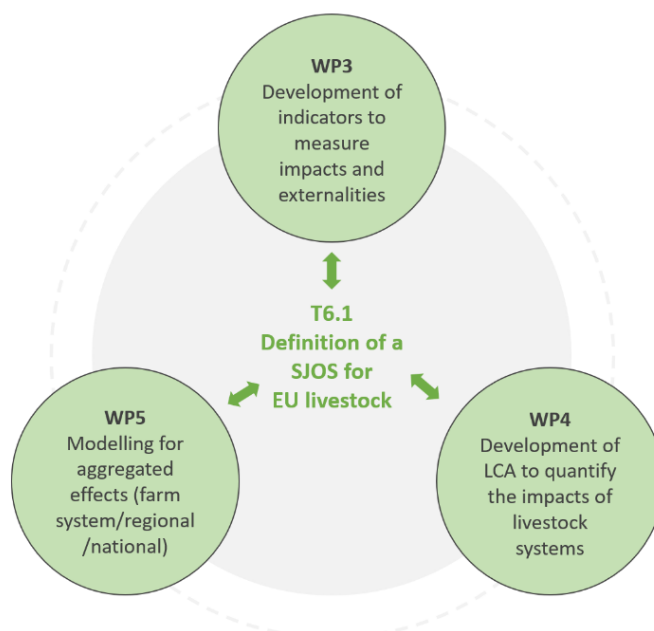


Figure 2 : Interaction with other STEP UP work packages (WP)

Summary of task 6.1. The work will largely consist of literature review, starting with goals and targets put forward in policy programs at EU and UN levels (Green Deal and SDGs). The scientific literature regarding boundaries and social equity, food security, and other desirable just space dimensions will be considered.

Identification of drivers and indicators to include in the dimensions of the SJOS will be developed in close interaction with WP1 & WP3. The common aspects will be collected and compared with the capabilities of the methods developed in WP4 and models developed in WP5. Once an outline draft selection of SJOS dimensions is achieved, a multi-actor approach (MAA) workshop will be conducted to gain diverse actor perspectives in relation to the SJOS dimensions to be considered.

1.

2. Methodology

2.1. Expert meetings

The work was organized following the methodology described by Van Vuuren et al. (2022), which relies on expert meetings in order to define principles and selection criteria. The organized meetings intended to discuss the thematic areas (referred to as dimensions in STEP UP) identified by the BrightSpace Project (Figure 3) and to adjust them to the livestock sector. Two expert sub-groups were formed, corresponding to the expertise of each team member. One expert group focused on the **Safe dimensions** and the other on the **Just dimensions**.

As a first step, the two expert groups were asked to identify relevant dimensions and corresponding main issues in order to further specify the variables and indicators considered the most appropriate, whatever the data availability. Three meetings were organized, allowing all contributors to suggest as many relevant issues as possible per dimension. Thus, the work orientation has been to undertake an extensive and comprehensive study aimed at achieving the most holistic and well-rounded frame as possible, ensuring that all relevant aspects are thoroughly considered and integrated before making the critical decisions regarding data selection and the establishment of thresholds, which will ultimately serve to generate the SJOS.

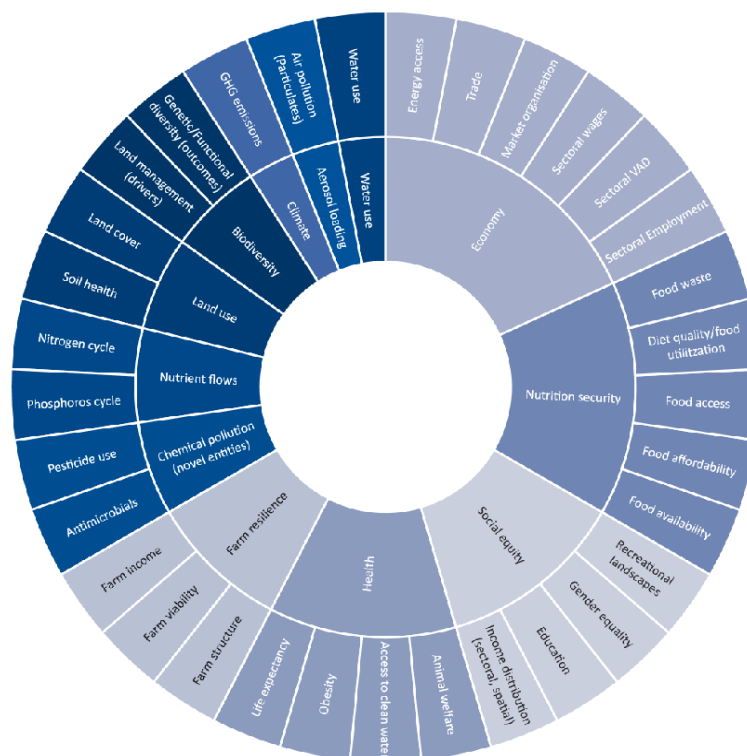


Figure 3 : BrightSpace Provisional SJOS for EU Agriculture

2.2. Selection of dimensions, variables and indicators

The vocabulary used in STEP UP is as follows: the dimensions correspond to thematic areas defined by BrightSpace, the variables correspond to the indicator domains defined by BrightSpace, and the indicators correspond to the measures with associated data that will be used for calculation.

Concerning dimensions, as introduced earlier, there is a lot more to discuss on the Just dimensions than on the Safe dimensions. For the SOS, all dimensions included in BrightSpace were kept. Once the dimensions were chosen, specific variables linked to livestock farming had to be determined. For this step, the expert groups relied on the questions addressed to each dimension, intending to cover most environmental pressures and most concerns relating to justice.

This methodology brought up many questions, sometimes overlapping and potentially changing the dimension featured. The group members progressively agreed on questions that have proven to be the most robust and relevant for ensuring coherence and framing. Defining variables was much easier since each question explicitly referred to one variable. In the same way, the selection of indicators is based on the alignment between the information given by the indicator and the related answer. The work on the selection of indicators has been shared with WP3.

Summary of the main steps of the work:

1. Literature review on SJOS
2. Analysis of the dimensions considered in BrightSpace and selection of the appropriate dimensions to be considered in STEP UP
3. Identification of questions to be addressed at each dimension level
4. Identification of variables that match with the questions within each dimension
5. Identification of indicators that specify the variables
6. Discussions on available data and databases to identify with the aim of quantifying the indicators

3. Results

The first results are presented in Figure 4 and in two tables splitting the SOS (Table 1) and the JOS (Table 2). The stars in Figure 4 indicate variables specific to livestock systems. Results on few dimensions/variables/indicators are preliminary, and the work is still in progress to refine them by enlarging the discussion to other expert groups. For instance, keeping in mind that nothing is definitive in this SJOS, results have to be deepened for the dimension relating to “health and safety” that comprises “animal health” and “public health” issues linked to animal source-food (ASF) consumption. Another example is the dimension relating to the economy with issues linked to profitability, productivity, employment and market organization. Work has also to be deepened on the variable referred to as one welfare linking animal welfare and human well-being. This livestock-specific variable (as compared to BrightSpace) is connected to the dimension related to social equity.



Figure 4 : STEP-UP Provisional SJOS for EU livestock

Definition of a SJOS for EU livestock with identification of its various dimensions



Table 1 : Provisional EU livestock Safe Operating Space (SOS)

DIMENSIONS	QUESTIONS ¹	VARIABLES ¹	INDICATORS ¹
BIODIVERSITY	What is the state of biodiversity associated with livestock production systems?	BIODIVERSITY STATE	Total Permanent Pasture Area
			Total Temporary Pasture Area
			Livestock density on pastures
			Domestic diversity
			General biodiversity
LAND USE	Are livestock production systems competing with other land use ?	LAND COMPETITION	Required agricultural area for feed demand (pastures and feed splitted)
	Is Soil health associated with livestock farming sufficient to ensure production viability?	SOIL HEALTH	Soil organic carbon concentration in pasture and feed soils
			Manure produced (discriminated by excretion in pastures and storage manure)
WATER USE	What is the effort needed from livestock production systems concerning water use ?	WATER USE	Consumptive Blue Water uses ASF production
NUTRIENT FLOWS	How significantly do livestock production systems alter nitrogen cycles ?	NITROGEN CYCLE	Release of organic and inorganic fertilizer (Nitrogen)
	How significantly do livestock production systems alter phosphorus cycles ?	PHOSPHORUS CYCLE	Input of organic and inorganic fertilizer (Nitrogen)
			Release of organic and inorganic fertilizer (Phosphorus)
			Input of inorganic fertilizer (Phosphorus)
CHEMICAL POLLUTION	Is livestock farming too pesticide-intensive ?	PESTICIDE POLLUTION	Use of pesticides for animal feed production
	Is livestock farming too antimicrobial-intensive ?	ANTIMICROBIAL POLLUTION	Use of antimicrobials in animal breeding
AEROSOL LOADING	Is there an issue with air pollution produced by livestock farming?	AEROSOL LOADING	Share of the Ammonia emissions allowed for ASF production
			Share of PM 2.5 emissions allowed for livestock production
CLIMATE	Is livestock farming a disproportionate contributor to GHG emissions ?	GHG EMISSIONS	Share of GHG emissions allowed for livestock production
	Is livestock farming a disproportionate contributor to Radiative forcing ?	RADIATIVE FORCING	Share of Radiative forcing allowed for livestock production

¹ The information to be deepened are highlighted in purple font.

Definition of a SJOS for EU livestock with identification of its various dimensions



Table 2 : Provisional EU livestock Just Operating Space (JOS)

DIMENSIONS	QUESTIONS ¹	VARIABLES ¹	INDICATORS ¹
NUTRITION SECURITY	Can European consumers buy animal-source foods recommendations at an affordable price?	AFFORDABILITY	Share of population that cannot afford animal-source foods
			Percentage of price increase of animal-source foods
	Does the EU guarantee a stable supply of animal-source foods?	SUPPLY STABILITY	Import dependency ratio for animal-source foods
			Self-sufficiency ratio for feed
	Is Europe producing excessive waste from animal-source foods?	WASTE MANAGEMENT	Share of animal-source foods waste from food processing, transport and food waste from commodities and food services consumption
HEALTH AND SAFETY	Is animal health and biosafety putting human health at risk?	ANIMAL HEALTH AND BIOSAFETY	Zoonoses
			Animal source food consumption safety
	Are we over-consuming animal-source food?	ASF CONSUMPTION	Share of population that over-consume animal-source foods (split products ?)
ECONOMY	Is animal products and services value chain a profitable activity ?	PROFITABILITY	Average value added in animal food value chain
	Is animal products and services value a productive activity ?	PRODUCTIVITY	Total factor productivity in animal food value chain
	How many people are employed directly and indirectly by the animal production sector in EU?	EMPLOYMENT	Number of employment (EQUIVALENCE TO full-time workers) in animal production (full sector)
			Evolution of employment rate in rural areas
	To be determined	MARKET ORGANISATION	Share of value added for primary producers in the food chain
	Do sectoral wages continue to attract future farmers?	WAGES	Difference between sectoral and MS wages
LIVESTOCK SYSTEMS RESILIENCE	Is the current workforce capable of sustaining itself and meeting future demands effectively?	WORKFORCE	(Difference or ratio) of young farmers and farmers going into retirement
	Are EU livestock systems able to guarantee viable income earning farms?	INCOME LEVELS	Net farm income / FTE (Full-Time Equivalent) farmer
		INCOME RESILIENCE	Farm net income - Total subsidies / Total Output
	Are EU livestock systems able to be passed on easily and cost effectively ?	TRANSFERABILITY	Fixed assets (excluding land) + stocks / FTE farmer

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	Are farms too sensitive to market conditions ?	STRUCTURE	Gross product of the farm's main production, before subsidies / farm Gross Product before subsidies (%)
	How financially autonomous are livestock systems?	AUTONOMY	Yearly bank loans repayment / Gross Product (%)
	Are livestock systems too sensitive to subsidies ?	SUBSIDIES SENSITIVITY	Total subsidies / Farm net Income (%)
SOCIAL EQUITY	Is there equity concerning livestock farms income distribution (sectoral, spatial)?	INCOME DISTRIBUTION	Palma Ratio
	Is one Welfare guaranteed in Livestock farms?	WELFARE	<i>Animal friendly practices index?</i>
			<i>Farmers' welfare index?</i>
	Are there enough people competent to work in the EU agro-industry?	EDUCATION	Nb of people with a professional diploma who work in agro-industry
			Nb of people with a professional diploma who work in livestock farms
	Is Gender equality respected in livestock production systems?	GENDER EQUALITY	Number of female-owned agri-businesses on farm and on farm product/business
			% women/men students in agriculture

¹ The information to be deepened are highlighted in purple font.

4. Discussion and perspectives

4.1. SJOS design refinement

4.1.1. Enlarging the expertise

The work on SJOS design will be deepened for a few dimensions, as highlighted in the results section. Experts in food systems and nutrition, animal health and welfare have been invited to contribute. The aim will be to complete the current draft by elaborating a SJOS that comprises all relevant dimensions and variables, and to best select the associated indicators in order to avoid redundancy while ensuring their usefulness in assessing the variables within their dimensions.

This work will also be carried out by continuing the collaboration with WP3 for indicators and data availability and with WP4 and WP5 for anticipating modeling to quantitatively assess scenarios.

Even once the first version of the SJOS is completed, it is very likely to be adjusted thanks to the new tools that other WPs will provide. Indeed, there is a very good chance that new indicators defined within WP3 could fit in and sharpen the SJOS. Moreover, the multiple efforts that are done by the team of WP4 could bring new Life Cycle Assessment (LCA) indicators, metrics and inventories specific to livestock (within diverse farming/production systems and among different species) interesting to fill in the gaps where the chosen database is not a perfect fit. For instance, WP4 aims to cover aspects related to Social-Life Cycle Assessment (S-LCA). The goal of those S-LCA is to evaluate the positive and negative social impacts associated with the production, use, and disposal of livestock systems products, considering their impacts on stakeholders such as workers/farmers, consumers, communities, and society as a whole, while not excluding the animal. For instance, it will assess the impact on: human rights, labor practices, health and safety, consumer well-being, etc. It might be a relevant approach to enrich our JOS that will likely be based on data available in the Farm Sustainability Data Network (FSDN). Finally, WP5 will also modify some details of the SJOS to make it compatible with model outputs. Indeed, there is no current guarantee to end up with a simple alignment between SJOS variables and model variables. All those discussions will enrich the process and sharpen the final SJOS, while providing the first framework of SJOS for livestock evaluation

4.2. Next steps towards quantitative assessment

4.2.1. Thresholds

As explained before, there are still some challenges to tackle. The most important one is the work on thresholds. Indeed, in the SJOS reported here, there are variables that do not have any threshold available in the literature. This means that decisions and proposals have to be made following an arbitrary approach or other methods that need to be identified. Moreover, there are several methods to produce regional/sectoral thresholds even when there is a consensus from the literature for the considered dimension.

As for now, there is still an approach that could be interesting to use in order to enhance the objectivity of threshold choices. Indeed, if there is a consensus on a global value from reference articles, this consensus should be chosen. Then, concerning disaggregation and downscaling methodology, there should be many of them, in the early stages of the work at least, to increase the range of visions on responsibility and distributive justice. Ryberg et al. (2020) proposed guidance on best practices for systematically defining sharing principles by drawing on theories of distributive justice. They also highlighted areas for further research. The most commonly used area on sharing principles involves equal per capita allocation of the SOS across countries or individuals. This approach is frequently combined with utilitarian principles for distribution among industrial units.

In case global limits are not defined in the literature, there are still policy targets that can be used as references. Indeed, the European Green Deal, Common Agricultural Policy objectives, the SDG, etc., may legitimate choices for boundaries not to be crossed (poverty lines for instance). There are still other sources of thresholds, such as the “best/worst percentile” method. After ensuring the comparability of results, it can be a solution to calculate the state of affairs for the best/worst percentile of practices for the area covered in the study. Then the value of the best/worst percentile will be the boundary for the variable.

The expert advice will be the last solution for deciding on the missing thresholds. A meeting engaging stakeholder will be organized for this purpose (MAA meeting planned in Task 6.1).

4.2.2. Database choices

The choice of databases will very likely have a significant impact on final results. There are a lot of databases that could be interesting including Multi-regional Environmentally extended Input-Output databases (REX-3, Exiobase 3, Eora26, etc.), secondary data (EUROSTAT, FAOSTAT, FSDN, etc.) and LCA databases (Ecoinvent, Agri-footprint, etc.).

All those databases have benefits and drawbacks. Some databases include data from imports and exports, which are suitable for consumption- and production-based approaches. Most of them include some of the Safe dimensions, but rarely cover all of them. The solution might be to use multiple databases as a first-line treatment. However, it is primordial to ensure that these databases can be compared, meaning that they are built on the same assumptions, they follow a similar methodology, cover the same scope, etc. If so, this will allow a comparison between the derived SOS and help to identify if any major trends emerge. Furthermore, concerning the JOS, FSDN seems to be the only database that will be suitable for a majority of dimensions. Using a single database is expected to bring coherence when looking at different dimensions at the same time, but it might be difficult to give depth to the results.

The work on databases and available data is essential and will be started after the list of indicators is being completed, and the thresholds are clearly defined, by interacting with STEP UP members at large and with interested stakeholders. This will contribute to enrich the SJOS and further quantitative assessments by providing new and missing indicators and databases.

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