Key takeaways of the second LAMASUS Stakeholder Workshop

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Abbreviations

CAP	Common agriculture policy
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organization
IIASA	International Institute for Applied Systems Analysis
JRC	Joint Research Centre – European Commission
LPIS	Land Parcel Identification System
LUCAS	Land use and land cover survey
LUM	Land Use Management
PBL	PBL Netherlands Environmental Assessment Agency
SCAR	Standing Committee on Agricultural Research
WIFO	Austrian Institute of Economic Research
WP	Work Package
WTO	World Trade Organization

1. Introducing the LAMASUS stakeholder engagement

The LAMASUS Horizon Europe project (www.LAMASUS.eu) aims to create a meaningful impact on the formulation, implementation, and monitoring of land-related policies in agriculture and forestry, particularly in the context of climate change. To achieve this, we are developing a comprehensive policy co-design portal and a novel governance model. This innovative framework brings together policymakers, researchers, and experts to provide the necessary tools and information.

The expertise of representatives of interest groups, officials from various government levels, and scientists are an important resource for the project. These participants provide input through sharpening research questions, bringing their expertise on relevant topics, and thus ensuring that policies reflect the diverse needs and aspirations of all involved actors.

CO-DESIGN APPROACH

LAMASUS builds on the expertise from EU-level policy makers that participate in the **Policy Advisory Board,** and on the insights and perspectives from local and national policy makers, land users, and other stakeholders, who participate in the **Stakeholder Board** to review and provide input on key milestones of the project.

The Stakeholder Board consists a diverse group of 27 individuals including land use decision-makers such as farmers, representatives of landowners, NGOs or people working in administration or research, from local to EU levels (Figure 1). 67% of the SB participated either online or in person in both workshops, 26 people during workshop 1, and 18 during workshop 2, despite major transportation strikes.

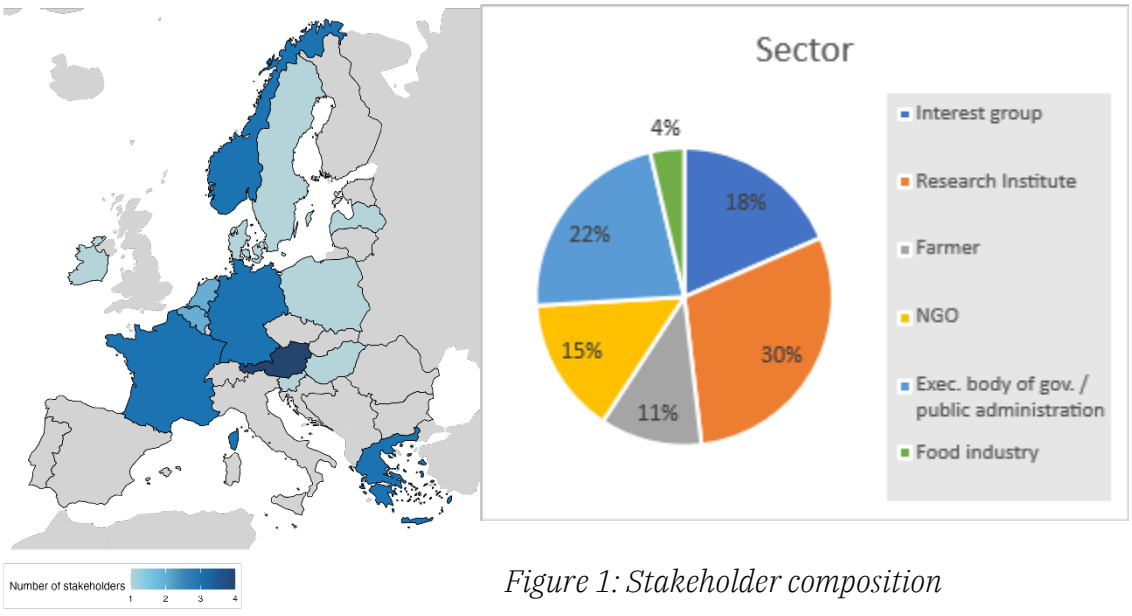


Figure 1: Stakeholder composition

2. Summary of the second stakeholder workshop

The second LAMASUS stakeholder workshop was conducted on March 6th and 7th, 2024. In Hohenkammer, Germany, 18 stakeholders and 18 project team members met. Two representatives from the LAMASUS Policy Advisory Board, Simon Kay, a representative of the European Commission DG CLIMA, and Anastassios Haniotis, formely DG AGRI, now IIASA, participated remotely and on-site.

Petr Havlík welcomed the stakeholders and reiterated the role of LAMASUS to provide guidance for the formulation and implementation of Green Deal policies. Moreover, he highlighted the need to provide policy pathways to support sound EU and country level decision making. Tamás Krisztin provided an overview of the main LAMASUS progress achieved since the first stakeholder meeting and highlighted examples of how stakeholder feedback from the first workshop was used in the project.

Simon Kay's presentation unveiled the complexities of EU land use policies in the context of climate change, emphasizing the necessary transition to a climate-neutral Europe and highlighting challenges and anticipated changes in land use. He outlined the 2040 outlook, the distribution of the expected carbon sink across sectors, and discussed the interconnected policies of the Green Deal, particularly in agriculture land management. Stakeholders expressed concerns about the Common Agricultural Policy (CAP) development process, including the absence of carbon storage measurement and bureaucratic hurdles. Their inquiries ranged from the exclusion of agroforestry from carbon removal calculations to the role of wood in the Emissions Trading System (ETS). Franz Sinabell echoed concerns from landowners regarding policy objectives' convolution affecting land use and speculated about satellite monitoring systems' potential to unlock carbon potential while minimizing bureaucratic burdens.

Tassos Haniotis delivered a keynote address highlighting the need for comprehensive analyses to establish quantitative targets in agriculture. He provided insights into the economic dimensions of agriculture, highlighting three key areas of importance: Commodity price cycles, energy prices, and consumption patterns, as well as the importance of analytical uncertainties resulting from surging energy prices and the war in Ukraine, which affect cost and demand for agricultural products.

The remainder of day 1 focused on in-depth discussions and gathering feedback for the beta version of the LAMASUS geodatabase. During breakout sessions, participants provided input on five themes: forestry, marginal grasslands, nutrient management, agroforestry and small landscape elements, and peatlands.

Day 2 started with a demonstration of the potential modelling impacts of LAMASUS research. Participants were split into three groups to discuss research on carbon accounting, biodiversity, and costing for policymaking in Europe. Subsequently, stakeholders were informed on the proposed and ongoing ex-post analysis work, as well as the data sources which will be made available to the public. A plenary discussion on policy priorities allowed

stakeholders to provide their expertise, recommendations, and wishes for the project's next steps. Concerns were raised about the Common Agricultural Policy development process, including carbon storage measurement and bureaucratic challenges.

The workshop ended with a brief discussion on the stakeholder involvement and the coming year expectations from the project.

3. Summaries of the workshop sessions

This Chapter summarizes each of the workshop sessions and details the questions, comments, and suggestions from stakeholders as well as LAMASUS project suggested follow-up. The agenda for the meeting is available in the Annex.

3.1. EU LAND USE RELATED TO CLIMATE POLICY

Simon Kay's presentation and ensuing discussion shed light on the complexities and challenges associated with EU land use policies in the context of climate change mitigation and adaption. His presentation covered the following topics:

- Transition to a climate neutral Europe: Simon discussed anticipated changes in land use as Europe moves towards climate neutrality, highlighting potential challenges.
- The 2040 Outlook: An overview showed the expected carbon sink by 2040, along with its distribution across sectors.
- The Green Deal policy cluster: The presentation outlined the interconnected policies of climate, biodiversity, and land use, focusing on agriculture land management policy. He emphasized understanding the importance of monitoring to understand these interdependencies.
- Policy Tools: Simon highlighted upcoming policy tools, including the Climate Target Plan, LULUCF, Carbon Removal Certification Framework, and the proposal for Monitoring Framework for resilient European Forests. He emphasized the need for rapid development of monitoring, which is key to check compliance with targets.

Stakeholders raised several concerns regarding the CAP development process: despite commitment from the EC, there continues to be a lack of carbon storage measurement in the Austrian CAP. The government also needs to get clearance from different DGs for their plans and sometimes get opposing feedback.

Stakeholders posed several questions, including: Why is agroforestry not counted toward carbon removal? What is the role of wood as a construction material and its connection to ETS? Given the importance of reducing emissions from agriculture, what are the objectives for the agricultural sector in 2040? Franz Sinabell relayed questions he often heard from landowners related to the different policy objectives affecting land use, which hamper clarity and flexibility in policy. And, the heightened bureaucracy and control burdens on farmers could be one reason for the farmer protests, could satellite monitoring systems mobilize carbon potential without increasing burdens?

Simon addressed various concerns raised during the Q&A session, highlighting the importance of agriculture in carbon sequestration, and discussing potential policy approaches. He emphasized the need for balanced policies that consider both climate goals and nature conservation, while also acknowledging the importance of protecting individual farms and minimizing bureaucratic burdens.

3.2. TASSOS HANIOTIS KEYNOTE SPEECH

Anastasios Haniotis' presentation emphasized the critical need for rigorous analysis to inform quantitative targets in agricultural policy. His presentation offered a comprehensive overview of the economic dimensions of agriculture, covering the evolution of commodity price cycles, particularly the recent surge in food prices, as well as the disparity in energy prices between Europe and the US. He highlighted analytical uncertainties surrounding factors such as food inflation, energy prices (particularly natural gas), and the implications of the war in Ukraine on global food security. He underscored the importance of monitoring soil outcomes, noting its significance for key indicators such as water, health, and biodiversity, despite being overlooked in current practices. Finally, Anastasios and Simon reiterated the need for impact analysis that are not limited to prefixed ideas and that account and integrate different visions to be able to assess what will happen following a policy change.

In the ensuing discussion, stakeholders asked clarifying questions about the influence of Ukrainian grain on the European food market, the gap between consumer and producer prices: why do we face this great gap despite great competition? And the importance of assessing the European agricultural production in the global perspective as changes in crops output in Europe will likely affect the world-wide supply.

3.3. ALIGNING OUR MODELS WITH THE EUROPEAN GREEN DEAL

Tamás presented the **key input for the baseline** in the models:

- Drivers: population (demand), GDP growth, technology (e.g., yield increase), renewable energy (drop after 2027), diets (shifts in calories)
- Policies: CAP/Climate policies, which are medium-term dynamics in the baseline
- EU Farm to Fork (F2F): Organic farming, reduction of nutrient losses to the soil (implied reduction of min. fertilizer of 20%), increase in high diversity landscape features, reduction of pesticide use (50%), LULUCF.

Stakeholders provided their views on detailed questions to inform the baseline development through Wooclap. Overall, stakeholder input confirmed the need for an expert-driven baseline over one looking purely at EU or national level targets. This preference stems from the belief that baseline targets should extend beyond the CAP's projections, which only cover policies up to 2027. For the baseline, specific policies were highlighted including nitrogen surplus, e.g. nitrogen fixing crops, crop rotations, and pesticide use.

With regards environmental effects, a prioritization of nutrient losses over fertilizer reduction is considered more prudent, despite ongoing debate regarding the CO2 emissions associated with fertilizer production. Upcoming diseases due to climate change were discussed including new threats like Stolbur, Nanovirus, and invasive species pose challenges, which will require alternative control measures due to limited pesticide efficacy. The Good Agricultural and Environmental Conditions (GAECs) discussion highlighted variation in costs by farm type and size. Here factors such as non-production area allocation and buffer strip establishment contribute substantially. The questions, responses and ensuing discussions are summarized in Table 1.

Table 1: Key points on aligning models with the European Green Deal – part 1

WOOCLAP QUESTION	RESULTS	COMMENTS
Which baseline targets for organic farming should the models follow?	Expert driven (59%) CAP strategic Plan (31%) Farm to Fork (17%)	CAP: The baseline should focus on current EU policies, this is why CAP should be covered and not F2F. Expert-driven projections are more realistic than relying solely on the CAP, because baseline targets should incorporate considerations beyond this CAP's projections, which extends only to 2027.
Should we prioritize nutrient losses or fertilizer reduction?	Stakeholders viewed both as equally important.	Fertilizer should not be the target, it should be nutrient losses considering environmental effects. There is debate about whether fertilizer production generates CO2. Traditionally it plays a role in climate change through CO2 generation. However, it may change as fertilizer production through solar/wind and hydrogen reduces this side effect.
Upcoming diseases due to climate change for which available pesticides do not help	New diseases and their vectors: Stolbur, Nanovirus, sand flies, invasive alien species, pests and diseases moving from south to north for which no allowed chemicals are available, mosquitoes, new insects.	Stolbur is a phytoplasma transmitted via new vectors/insects that damage beets and potatoes, where current pesticide measures do not help. The only effective treatment to date is to hinder the vectors physically from entering fields.
Which of the Good agricultural and environmental conditions (GAECs) increase your production costs?	Minimum share of agricultural area devoted to non-prod. areas (76%), establishment of buffer strips along water courses (38%), protection of wetland and peatland (33%), tillage management (33%), ban on converting or plowing permanent grassland Natura 2000 sites (29%), maintenance of permanent grassland (14%), crop rotation (14%), minimum soil cover (10%), ban on burning arable stubble (0%).	The answer depends highly on farm type and size: e.g. dairy farm costs for stables are distributed over the land, for larger farms it can be set-aside, for some it can be permanent grassland. Costs mimic opportunity costs, the foregone profit/income for some of the mentioned costs and therefore cannot be pinpointed.
Which eco-schemes you see most feasible?	Nitrogen fixing crops 70%, enhanced crop rotation 45%, catch crops above 90% in conditionality 14%, Additional landscape features 26%, Organic farming 26%, increase in the share of leguminous plants in grassland 35%, precision farming 48%	There was no time for further discussion.

Petr Havlík presented the EU GHG emissions climate impact assessment for the 2040 targets focusing on natural disturbances. In general, these models expect lower or stagnant yields in maize due to higher volatility and more extreme weather patterns. In the discussion, stakeholders mentioned the baseline must account for all measures reducing food supply in Europe and production leakage will occur to the rest of the world. Therefore, the **baseline should address issues including food waste, diet shifts, compensation for net trade, and pesticides use**. In addition, the work should use historical evidence of how policy evolved to meet stakeholders' (e.g. farmers and politicians) reaction to climatic events. **Scenarios should also account for upcoming technologies**, e.g. currently agri-diesel is not assigned to the agricultural sector but to the transport sector. While no widespread technologies exist yet, future developments may exist in 2050.

Another set of questions focused on trends in emissions from agriculture, trends in forest sink, and forest harvest, the mitigation potential of peatland rewetting, and lignocellulosic crops. The discussion is summarized in Table 2.

Table 2: Key points on aligning models with the European Green Deal – part 2

QUESTION	RESULTS	COMMENTS
Are current CAP policy measures sufficient to reduce emissions from agriculture?	Yes (19%) No (81%)	Measures are available (and in the CAP), but must be implemented to have an effect (e.g. natural reforestation, maintenance of permanent grassland, re-wetting peatlands, etc.) When agriculture stops it has a large impact. Farmers will not reduce production on peatland, because peatland is covered under LULUCF and there is no money from the CAP. Machinery and input manufacturers should be supported for innovation so that there are economically viable options for farmers to adopt measures to reduce emissions. Mineral fertilizer does not fall under agriculture and is not accounted for in these measures.
Can the trend of decreasing forest sink be reversed?	Yes (62%) No (38%)	Harvest level affects the sink: Carbon content increases by cutting less and converting to natural management. Non-management can also help increase the carbon content in natural stocks, particularly in Northern European fringes where production levels increase with climate change. For specific countries, e.g. Austria, climate change related events (e.g. storms, new pests) cause problems. Here there is hardly any chance of influencing the cutting level. In France, afforestation increases the sink, which influences land use. Forest land management and harvesting needs to be determined based on 1) whether a forest is balanced, 2) risks of unmanaged forests, and 3) bioeconomy for renewable resources.
Are there sustainable ways to increase stagnating forest wood harvest?	Yes (94%) No (6%)	On a global scale there are countries with the potential for an improvement in forest management. Time horizon needs to be accounted for as we (re)introduce slow-growing species for climate resilient reforestation. A consistent definition for sustainable does not exist across Europe. How we harvest and manage forests in the future is important to ensure climate resilient forests.

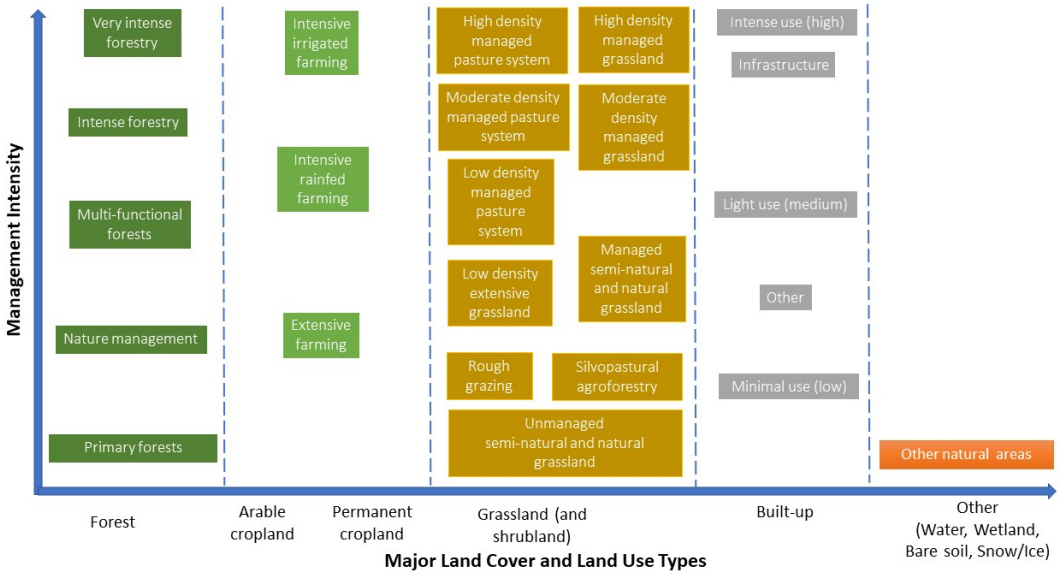
QUESTION	RESULTS	COMMENTS
Do currently planned policies support the mitigation potential of peatland rewetting?	Yes (6%) No (94%)	When peatland is rewetted it becomes a natural site, which is not allowed to be covered and thus cannot be used for photovoltaic (PV). PV can be good but is risky due to legal uncertainties and may create a societal problem. Other option for peatlands: Paludiculture (reeds) even though it is not economically viable now and/or garden-moss, combined with paludiculture. This long-term investment is too risky for young farmers.
Can lignocellulosic crops production be scaled up?	Yes (68%) No (32%)	One of the nay-respondents explained it is not feasible, because it depends highly on the prices and it is difficult due to competition with arable land.

3.4. LUM GEODATABASE

Linda See, from IIASA, presented the beta version of the Land Use Management (LUM) geodatabase to stakeholders. The starting point was an overview of definitions of land cover and land use, illustrating how they are mapped using the Copernicus Corine land cover product; a satellite image and the Corine land cover product for an area around the workshop venue were used as an illustration of what this product looks like.

Land use management was then defined, and its importance was highlighted in relation to current EU policies under the umbrella of the EU Green Deal. This was followed by a figure showing the current LUM classes, which was modified after stakeholder feedback from the 1st workshop (Figure 2).

Figure 2: LAMASUS land use management geodatabases classes



Linda presented each of the classes in the forest, cropland, grassland, and urban domains. This involved explaining the classes, how they were defined using different existing sources

of input data, and visualized using photographs from Google StreetView, the LUCAS survey, and the internet.

In summary, five management classes for forestry and the resulting map, produced by LAMASUS partner VU, were shown. Cropland has three main classes, i.e., irrigated, intensive rainfed and extensive rainfed, separated into arable and permanent cropland. It was explained that an energy input layer produced by the JRC (and the CAPRI model) was used as the main input to produce these classes. For grassland, ten classes were presented that are largely based on high-resolution livestock-density data collected by IIASA and a method for allocation of grazing livestock to Corine land cover developed by Malek et al. (2024). Finally, the urban classes were presented that cover three levels of intensity based on the density of buildings, an infrastructure class, and another class to cover areas of mining. These were mapped using the Copernicus Urban Atlas and soil sealing products in combination with Corine land cover.

The current version of the European land use management map that integrates all the classes described previously was then presented (Figure 3). The stakeholders were encouraged to access the data via the Geo-Wiki visualization tool, which contains digital feedback tools along with A3 paper copies of the grassland map for Europe on which stakeholders could write their comments.

Figure 3: LUM geodatabase classes (Geo-Wiki)

Linda also introduced the ALFAWetlands project, which has supplied a new peatland map for the Netherlands for use in the Peatland breakout group and will provide information on wetland management for use by the LAMASUS project in the future.

During the plenary, stakeholders particularly asked questions around the public use of the product, grassland management typology and classification, and wetland typology and consistency with the LUM geodatabase. The issues and questions raised during the plenary discussion are summarized in Table 3 including the responses and subsequent actions that have been taken.

Following the plenary discussion, the stakeholders were split into five breakout groups during which the LUM geodatabase and specific land uses were discussed in more detail.

Stakeholder validation of LUM geodatabase

Stakeholders were encouraged to access the Lum geodatabase data via the Geo-Wiki visualization tool, which contains digital feedback tools.

During the forestry breakout, stakeholders discussed the forestry management typology developed and regional classifications, particularly Sweden and Hungary.

During the grasslands' breakout, stakeholders used paper copies of the grassland maps to discuss the resulting maps and provide feedback on typology and classification.

Table 3: Plenary LUM geodatabase discussion comments, responses, and actions

AREA OF COMMENT	QUESTIONS AND COMMENTS	RESPONSES AND ACTIONS
Usefulness of the product	• The LUM map is important for constructing a base but is only a snapshot. You also need to capture what is in the soil and its relation to management practices. How will this be done?	Soil data have been collected and available on Geo-Wiki. It is possible to overlay the LUM map with detailed soil data to infer relationships between them.
	• Is the LUM map a useful product on its own? • Can we use the data (i.e., livestock densities and grassland management) for our own purposes/studies?	The LUM map, in addition to being an input to the LAMASUS models, is indeed intended to be a product that can be used on its own. We encourage the maps (including livestock density data and the grassland management map) for purposes beyond the LAMASUS project. **Action:** The grassland map was since sent to the relevant stakeholder and further collaborations have been initiated.
Grassland management	• Are unmanaged and semi-natural grasslands included in the map?	Grassland classes cover all grasslands, i.e., permanent grasslands, semi-natural grasslands and unmanaged grasslands.
	• How do you deal with grasslands that are not grazed? Grazing cows is not a good (or not the only) input that should be considered in grassland management. In Germany, every county must make a map of % grazing? Wouldn't this be a better tool to solve the problem? There is also IACS data (INSPIRE data) that could be used.	We gathered data on percentage grazing from official sources and from expert consultation and used this in the development of the map. Data on organic farming is difficult to get although we are working with JRC to get more information on this. IACS data is only available for some countries, e.g., Austria, so we cannot use this as a consistent source of grassland data for Europe. **Action:** Check the % grazing data for Germany.
	• Why are there so many non-grazed areas in Austria shown on the livestock density map (in grey)? Organic grasslands are also important and need to be considered. There were other comments on densities being too low on the map based on personal experiences of the stakeholders with their farms/areas/countries.	Comments highlighting issues with the map were noted. Non-grazed areas are considered by using certain Corine classes but when the mowing event data becomes available from Copernicus, we will use these data to improve the map. Right now, we only have mowing event data for Germany and Switzerland. **Action:** Grassland maps have been sent to relevant stakeholders so that they could provide additional feedback and suggestions.
	• You should increase the classes to cover more LSU densities, which would allow some patterns in e.g. Ireland to appear that are currently not visible.	The plan is to increase the number of classes so there are more ranges of LSU density in the classes. This should bring out the patterns in Ireland better.
	• The heterogeneous resolution of the data explains some of the classes, but can we somehow trace out this bias?	There are limitations to the input data used to develop the classes as they are heterogenous, have different minimum mapping units, and thus will not capture all details.

AREA OF COMMENT	QUESTIONS AND COMMENTS	RESPONSES AND ACTIONS
		For modelling purposes, these large-scale patterns are the ones of interest. **Action:** We need to be transparent about the limitations of these classes.
Wetlands/ Glaciers and ice	• Are wetlands and glaciers/ice included in the map (since there are UNFCCC statistics on these)? • If you obtain an external map for wetlands, will this be consistent with wetlands from Corine and how will you deal with this?	Wetlands are not currently included. The ALFAWetlands project will be providing information on wetlands and wetland management. At present, Wetlands are mapped in the 'Other' class of the LUM map. Glaciers/ice are currently included in the 'Other' class of the LUM map as this information is not directly used by the LAMASUS models. Reconciling wetland presence information from ALFAWetlands with the Wetland class from Corine will be challenging. **Action:** We will investigate how we can harmonize these products, while matching UNFCCC statistics on managed and unmanaged wetlands.

3.4.1. Forestry breakout

In all European countries, forest policies aim for sustainable forest management and promote activities to obtain multiple uses from forests. Concrete instruments deviate because conditions vary widely. In central European countries many forests are located on land that was used for other purposes 100 or more years ago.

Forest inventory surveys in EU member states have similar methodological approaches, but results are not spatially explicit. In several EU funded projects (among them ForestNavigator and PathFinder) are currently gathering more insights based on spatially explicit data at European scale.

During this interactive session, participants discussed the draft forest typology developed in LAMASUS and validated forest maps for regions of their expertise. The terminology used in the graphical presentation of forest management maps, such as "combined objective", was debated with forest experts. A prevailing terminology has been established among forest experts, who co-operate internationally, even though individual countries classify forests in various ways.

Stakeholders highlighted contextual information of importance to interpret some of the patterns shown. Two examples include 1) Sweden where close to the border of Norway, forests have been set aside of management at large scales, 2) locations in Hungary identified as intensively managed, which are effectively close to nature.

A general observation on forests in Europe is that an increasing mortality is observed, while harvesting levels remain relatively stable. High mortality may be the consequence of "under-harvesting" in many areas. An indicator of the change in the stock of wood is to set fellings in relation to the net increment.

Table 4: Summary of comments on the forest management map and responses

AREA OF COMMENT	COMMENTS FROM STAKEHOLDERS	RESPONSE
Classification	• The classification "very intensive management" may be ambiguous because parcels without trees may be the result of clear cutting for harvest purposes or the consequence of a storm. • The classes are not entirely pure reflections of forest management.	The feedback will be taken account into account in the next update of the forest management map, in particular to improve those areas of very intense management that are overestimated in some areas. There are different definitions of forest management, but we are following the typology of Duncker et al. (2012). The map will also be updated with new data sets that have become available (tree age, tree height, new disturbance data sets, etc.).
Resolution	• The spatial resolution (1x1 km) chosen for the maps is suitable for many purposes. However, for specific questions it is likely too coarse (e.g. average clear cut in Norway is 1.5 hectares or 1.5% of a grid cell).	The original map was at 1 km but then downscaled to a 100 m resolution to match the Corine resolution.

3.4.2. Marginal Grasslands breakout

Anna Renhart from WIFO discussed the grassland maps for Germany and Austria.

During the breakout session, stakeholders were presented maps with the different grassland types classified. Additionally, we looked at classification of land in the Geo-Wiki. Stakeholders discussed the importance of soil for livestock density and land characteristics for frequency of grassland use. In addition, validation and feedback on the maps for their regions of expertise was given at the NUTS-2 level, with a special regard to the geographic background of our stakeholders. This feedback was taken up to make improvements for the next grassland map and is represented in Table 5.

Table 5: Summary of the key points raised during the marginal grasslands sessions.

AREA OF COMMENT	STAKEHOLDER COMMENTS	RESPONSE
Definitions	• Intensity of land use: does it combine mowing events and grazing? • North and South facing pasture is an important determinant for frequency of grazing / mowing. Was this considered?	The classes separate out grazing from mowing events based on Corine classes and grazing probability maps. Estimates of the amount of grazing was collected on a national (and some cases sub-national level). Mowing events are not yet available pan-European as the Copernicus product on mowing events has not yet been released. Mowing events for Germany from remote sensing have been used in validation. North/south facing pasture was not used in the development of the grassland management map, which instead relied on livestock densities and the amount of grazing.
Data	• Was IACS data used? • Was data from AgrarAtlas used?	IACS data are used in validation but not in the development of the map as these are not available for all European countries. Livestock at NUTS3 was used from AgrarAtlas to calculate densities of grazing livestock by livestock unit.

3.4.3. Nutrient Management breakout

Klaus Mittenzwei, from Ruralis, introduced nutrient management challenges to the stakeholders using a South-Western Norwegian case study example. In that region, livestock intensity is particularly high with a risk of nutrient leakage to waterways and groundwater. A regulation to reduce nutrient leakage is currently under preparation. The bio-economic single farm model FarmDyn will be applied to study mitigation options to reduce nutrient losses and leakages.

Table 6 summarizes the key points raised across the stakeholder groups and how these comments are being considered by the project.

Table 6: Summary of the key points raised during the sessions on the LUM classes

AREA OF COMMENT	STAKEHOLDER COMMENTS	RESPONSE
Nutrient coverage	• Phosphorus was mentioned as a problem arising from animal production, particularly in Norway and the Netherlands, with a risk of leakage and environmental damage.	Besides nitrogen, phosphorus, and relevant mitigation options will be included in the bio-economic farm model analysis.
Farmer behavior	• Farmers do not maximize farm income, but keep farming as a lifestyle, suggesting modelling analysis that assumes profit maximization may be incorrect.	Profit maximization approximates reality. However, optimization models must rely on this general behaviour, which may also be interpreted as cost minimization.
Farming practices	• JRC has reviewed farming practices that might be relevant to include in the case study analysis of nutrient management.	The JRC overview of farming practices (IMAP Wiki) will be reviewed with respect to relevant farming practices.

3.4.4. Peatland breakout

Nico Polman from Wageningen University gave a brief overview of on various aspects of peatland and its management, particularly highlighting the capacity and potential of different types of peatlands in the case study country the Netherlands. Stakeholders emphasized the importance of exploring peatland's role in governmental climate strategies, for which it is important to understand the carbon content of peatland, and the need for a comprehensive cost and benefit assessment for peatland management. They also discussed strategies for peatland restoration and rehabilitation and the importance of mapping peatlands for effective management. In the Netherlands, stakeholders highlighted grants and payments for peatland rewetting are often given to farms as a cooperative to ensure agreement. Finally, they highlighted the importance of societal and infrastructure implications of peatland rewetting strategies into modelling. Questions and stakeholder responses are detailed in Table 7 below.

Table 7: Summary of the key points raised during the sessions on peatland

AREA OF COMMENT	RESPONSE
What is the carbon content of peatlands?	• Emphasized peatlands' role in sequestering carbon. • Important for governmental climate strategies and carbon reduction targets.
There is a need for a cost and benefit assessments	• Essential for evaluating economic and ecological impacts. • Justifies investments and guides policy decisions • Case study could provide valuable insights.
What strategies exist for peatland restoration?	• Reverse drainage techniques • Detailed mapping for effective restoration
What are the potential uses of rewetted peatlands?	• Diversifying peatland production (e.g. for biomass etc.) depends on demand. • An additional benefit is biodiversity.

AREA OF COMMENT	RESPONSE
How should peatlands be integrated into modeling?	• Consider societal and infrastructural implications, such as increased flood risks and agricultural conditions (such as grassland intensity and livestock density). • And integrate member state specific rules pertaining peatland. For example, in the Netherlands, there are GAEC conditions for peatland where it is forbidden to plough the peatland.

3.4.5. Hedgerows & Agroforestry breakout

The aim of this round table was to collect input from the stakeholder on the usability of the information available on hedgerows and agroforestry. Linda See (IIASA), Trond Selnes (WUR) and Raja Chakir (INRAE) informed stakeholders about the current situation using the posters that Linda See created for this workshop.

The core is that we know way too little about the different types and definitions of hedgerows and agroforestry, while what is wanted is easily accessible information. Is it 3 or 10 million hectares? We don't know. Much information is actually there it is just not always publicly available. We would also need more info on for example the effects on soil, or somehow the usefulness, as a proof of concept. Better data mapping and data mining could even be used to prevent illegal land use. Or make it into a weapon against erosion. We need more before and after information. We need more remote sensing. Better links between agriculture-environmental data could be a source for improvements and upscaling.

Table 8 gives an overview of the major points raised by the stakeholders during the roundtable discussions and the response by the modelers.

Table 8: Key comments and response: hedgerows & agroforestry roundtable discussion

AREA OF COMMENT	STAKEHOLDER COMMENTS	RESPONSE
Definitions	• More concrete information would be useful for policy makers, practitioners and researchers. • A typology of different usages would be useful. Today there are different definitions across countries and sectors.	We do not by far know enough about the different types and definitions of hedgerows and agroforestry, although easily accessible information is needed. We would like to know whether it is 3 or 10 million hectares. Much information is actually there it is just not always publicly available. Today there is not one specific definition of agroforestry, for instance. Thus, different models use different definitions.
Data	• It would also be useful to know more about who is providing data, are they public or private providers? • Eventually one would like to compare different sectors involved in land-use.	Data are provided for by universities and public agencies. Better data would offer better insights into for instance soil and topography. Soil moisture correlates with hedgerows and agroforestry.

AREA OF COMMENT	STAKEHOLDER COMMENTS	RESPONSE
	• Also local data are important, as farmers often experience constraints by local conditions. But in Germany, for example, farmers are supposed to do more on agroforestry. • With less arable land, what would be the costs and benefits? Better tools to understand such matters would be welcome.	The usefulness of data would be enhanced by combining the data of land-use with environmental data; biodiversity, climate, erosion. Some digital tools for agroforestry are already available: DIGItaf: https://digitaf.eu/ Every country should have data on these matters and make them available.
Conflicting land-use goals	• Landowners are exposed to many different claims from different groups of society and there is pressure to develop (agricultural) land. More information could help making choices and avoid for instance illegal or unsustainable land-use. An example mentioned is the burning of residues of forests and hedgerows in Greece.	The project aims at exploring in detail how land uses changed over the last two decades. The trade-offs between different land uses will be explicitly analysed and modelled. It is important for the team to understand how different levels of governance interact. This will enable the team to propose measures that can effectively achieve the policy objectives.

3.5. RESEARCHING CARBON ACCOUNTING, BIODIVERSITY, AND COSTING FOR POLICYMAKING IN EUROPE

3.5.1. Roundtable 1– Carbon

In this breakout session, we gave an overview of the knowledge base of carbon response functions that we are establishing. We briefly explained the purpose of these response functions, the methods we use to generate them, and, using two examples, we demonstrated how the response functions and related maps of coefficients look like, and how they can be applied. We were asked which time-horizon we consider for the carbon stock changes. The time-horizon remains flexible as we can select this. The most interesting time horizons would be 2030 and 2050, as those are used by the European Green Deal.

We asked stakeholders questions related to the effects of forest management on forest biomass that are not directly addressed in our LUM classification scheme (like choice of tree species) and their perception of soil carbon stocks, beyond climate impact. Stakeholders discussed the underlying reasons for afforestation, which play a role in the selection of tree species, and the role of climate change and societal preferences on tree species' choice. Additionally, stakeholders stressed the need to achieve permanent management changes to improve carbon stocks and the potential role of biochar to increase carbon stocks. This valuable input is summarized in Table 9.

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Table 9: Summary of stakeholder comments on carbon during the roundtable discussion

DISCUSSION QUESTION	STAKEHOLDER COMMENTS
How can we best assume the tree species composition for our afforestation scenarios?	**Important distinction between afforestation and natural succession after land abandonment.** In the case of land abandonment, observed in the higher parts of the alps, species composition of nearby forests matter. For afforestation, species can be chosen on purpose for afforestation. For commercial use, spruce remains popular. The market itself has no direct influence on tree species selection, due to the time lag between planting and harvest. Climate-change and plantations are two reasons for shifting tree species: Diversity in tree species may become more important to withstand climate-change related events. Spruce is prone to perturbations (e.g. bark beetle outbreaks, which may intensify through climate change and related draught-stress). Also, short-rotation species may be preferred where trees are planted for biofuel. **Social expectations may influence tree species diversity**: Would the public accept exotic tree species? In Canada planting exotic tree species may be an acceptable strategy to adapt to climate change. Or, will species be preferred that are similar to existing tree species (e.g. replacing oak by southern oak)?
In how far would an increase in soil carbon stocks be important for you, also beyond the climate impact?	Agricultural sector stakeholders stressed the **importance of adopting management practices to increase soil carbon stocks permanently**. Soil carbon stock buildup takes decades but can be destroyed within a few years. Therefore, a mere temporary change in management practices, followed by a return to business to usual is useless. **Biochar** could be a faster way to build-up more resilient soil carbon stocks, which benefits soil structure and nutrient cycling. However, biochar is expensive and depending on the provenance of the biochar, risks contamination. The feasibility/rentability of these practices depends on how the by-products of biochar can be used. Unlike farmers, **public is generally not aware of the importance of soil carbon stocks** and efforts to increase or protect them. Knowledge about peatlands is an exception and special case.

3.5.2. Roundtable 2– Biodiversity

In this breakout session, methods and planned outputs of analysis investigating biodiversity responses to land-use management across Europe were presented. Two complementary approaches were discussed: the PREDICTS modelling framework, which generates the Biodiversity Intactness Index (BII) and the GLOBIO model, which estimates mean species abundance (MSA).

Overall, stakeholders supported the inclusion of biodiversity in the wider LAMASUS analysis. The main comments and questions from stakeholders, summarised in the table below, related to the need to carefully interpret outputs; extent to which very local landscape features (e.g.,

hedgerows) are incorporated. In addition, stakeholders discussed the potential use of these results, which will be openly available, which could include evaluating trade-offs in land-use management after combining biodiversity results with other WP 5 outputs, and the biodiversity impacts of current protected areas/reserved across Europe based on land use management.

Table 10: Summary of stakeholder comments on biodiversity and response

AREA OF COMMENT	STAKEHOLDER COMMENTS	RESPONSE
Model capacity	Aside from land use, many other factors (e.g. human population, environmental disasters, and invasive species) impact biodiversity. How are these accounted for?	Currently, these factors are not included. Human population density layers could be added but information on environmental disasters would be harder to consider. Impacts of invasive species are not modelled, but such species do affect the ecological metrics calculated prior to modelling.
Model capacity	Are local habitat features (e.g. hedgerows) considered? How are pesticide and fertilizer impacts considered?	Local habitat features, pesticides and fertilizers are not directly modelled. However, these aspects are considered in the specification of LUM classes and so should be indirectly captured. For example, energy input is considered when determining cropland categories, livestock density affects grassland classes, and a separate organic layer will likely incorporate the extent of 'natural' habitat features such as hedgerows.
Interpreting BII/MSA	What would a BII of zero indicate?	BII of zero indicates complete loss of native biodiversity.

3.5.3. Roundtable 3– Costing

The agricultural and forestry costing module highlight the production costs associated with diverse land uses and management systems. Stakeholders discussed how the costing module and database could be applied in farm management and policy design. Additional data sources (i.e., national data) were discussed.

Stakeholders highlighted additional important costs related to land use (e.g., investments, environmental costs, land tenure, risks and uncertainty). Stakeholders also emphasized that different cost items are relevant for different LUMs. For cropland use systems, fertiliser, pesticides, energy and machinery costs were the most relevant, whiles for livestock systems, energy, wages and feed costs were more relevant for farm management decisions. Finally, there is a need to account for costs associated to soil health and improvements, which influences land value. The benefits of improving soil health are not short term. Therefore, the decisions to improve the soils are driven by land ownership and nature of rental markets. Although economic impacts/profits are the relevant and easily calculated, the environmental

profits are more relevant as they have long term impacts. A summary of the comments and questions and our proposed follow-up is available in the next table.

Table 11: Summary of the key points raised during the costing session.

AREA OF COMMENT	STAKEHOLDER COMMENTS	RESPONSE
Soil quality and land tenure	It is relevant to capture the costs associated with soil treatment (i.e., lime). Databases such as KTBL provide costs associated with lime.	Data on soil treatment and its associated costs are very scarce. An interesting way to explore this dimension is to use suggested data from KTBL and others to evaluate country case studies.
	The nature of land tenure (renting vs owning land) affects the investments made into soil health and improvements, which will further influence land value. • Rented land can be exhausted in 10-15 years, while there is an incentive to be conservative in the case of owned land, as I want my son to have higher yields. These intrinsic and non-monetary values (i.e., succession and inheritance consideration) associated with enhancing soil quality cannot be easily measured/modelled.	Renting land is good information on the value of land in the short term.
Accounting for buildings and other investments in the model	Costs associated to investments and other fixed costs are necessary for assessing farms debts and profit margins. In some cases banks don't accept profits/subsidies as collateral for loans	These costs are not represented in our models (e.g. CAPRI/GLOBIOM). We are assessing whether this can be represented at a NUTS level as the use of too disaggregated plot level data cannot be readily represented.

3.6. POLICY DATABASE

Anna Renhart (WIFO) presented the structure and contents of the policy database, highlighting its relevance and utility in policy analysis and modelling. It will cover data on agricultural payments, EU cohesion policy, LIFE funding, forestry policies and policy layers, such as Natura 2000 areas.

Feedback focussed on the reusability of the database and the aspects most relevant for stakeholders. Farmers organizations might be more interested than farmers.

One representative expressed particular interest in the LIFE data to help understand the relevance of NGOs. Stakeholders suggested that the Environmental and Forest Policy database could be used to identify what is happening in other MS, not your own MS where they have more detailed information. Farmers' representatives were mostly interested in data on agricultural payments, as it might encourage farmers to compare themselves internationally. Stakeholders also highlighted the importance of clean data in an easy-to-handle platform.

3.7. EX-POST MODELLING

Tamás Krisztin (IIASA) gave an overview of planned empirical work. The discussion focussed on planned advancements in policy analysis using ex-post modelling. It revolved around planned policy briefs, which detail the scope of ex-post modelling, the policy questions addressed, and the geographical focus.

Comments from stakeholders focussed on technical details of the design of some studies.

3.8. STAKEHOLDER ENGAGEMENT AND WRAP-UP

Franz Sinabell wrapped up the workshop with a short summary.

The LAMASUS project is grateful for the contributions of the stakeholders. Stakeholder input is valuable for various purposes. These external perspectives are important to help shape research questions, checking and validate assumptions and consistency of findings. Stakeholders are seen as important resources throughout the project lifecycle, including providing feedback on research outputs and acting as multipliers during the roadshow and in the final stages of and beyond the project.

Stakeholders were invited to make proposals on how to make the stakeholder involvement more attractive for them. Among the suggestions that the LAMASUS partners will follow-up for the next workshops are the following:

- Prepare one page fact sheets for the presentations of the workshop and distribute them together with the final agenda.
- Add more details to the agenda (not only titles and aims) so that participants can prepare and search for relevant materials to be better able to contribute to the discussion.
- Share presentations before the workshop.

Annex

Day 1

11:00 – 11:30 **Registration at the hotel**

11:30 – 12:30 **Welcome and lunch buffet**

12:30 – 13:00 **Welcome, progress and recent developments (Petr Havlík & Tamás Krisztin, IIASA)**
Kammerberg **Logic of the agenda and introduction of participants (Trond Selnes & Nico Polman, WUR)**

13:00– 14:30 **Keynote on Climate policies from Simon Kay (DG Clima)**
Kammerberg **"Can we have the fuel and eat it? Market trends, land use pressures and sustainability challenges" Keynote from Tassos Haniotis (IIASA)**

14:30– 15:00 **Coffee break**

15:00 - 16:15 **Aligning Our Models with the EU Green Deal by Peter Havlík (IIASA) & Tassos Haniotis (IIASA)**

Kammerberg

Aim 1: *To discuss our latest modelling outcomes in the agricultural sector, focusing on the EU Outlook and comparing it with the US Outlook.*
Aim 2: *To outline our strategies for implementing the Baseline scenario across the LAMASUS models. This includes variables, timing of events, and geographical resolution.*

16:15 – 16:45 **Present the first version of the Land Use Modelling (LUM) geodatabase (Linda See, IIASA)**
Kammerberg

Aim: Giving insight into how we compiled our LUM geodatabase and showing its potential benefits.

Head to breakout sessions

17:00 – 18:00 **Breakout sessions: topics provide feedback on LUM geodatabase**

Aim: To present and validate through stories regional/NUTS 3 specific examples.
We will discuss within different groups (1) nutrient management (Klaus Mittenzwei, Ruralis); (2) peatland (Nico Polman, WUR); (3) marginal grassland (Anna Renhart, WIFO); (4) hedgerows & agroforestry (Trond Selnes, WUR) and (5) forestry (Petr Havlík, IIASA)

19:00 – 22:00 **Drinks and dinner at Schloss Hohenkammer**

Day 2

08:30 – 10:00 **Breakout session II: Carbon accounting, biodiversity impact assessment, and cost evaluation (Tamás Krisztin, IIASA)**
Aim: To demonstrate the significance of researching carbon accounting, biodiversity, and costing for policymaking in Europe, in 3 different groups. This is expected to help understand the potential impact of LAMASUS at the end of the project. The group leads will report the meeting results in the plenary session at the end of the meeting.

08:00 – 09:15 **Discussion I: Integrating Policy and Ex-Post Modelling: Insights and Developments (Anna Renhart, WIFO & Tamás Krisztin, IIASA)**

Aim*: The discussion will focus on planned advancements in policy analysis using ex-post modelling. It will revolve around planned policy briefs, which detail the scope of ex-post modelling, the policy questions addressed, and the geographical focus.*

Sub-session 1: *Presenting the structure and contents of the policy database, highlighting its relevance and utility in policy analysis and modelling*

Sub-session 2: *Present an overview of policy work, including the scope and planned timeline. Describe the envisioned work within the policy briefs and provide selected examples. Finally, outline the next steps.*

10:30 – 11:00 **Tea / coffee (group picture)**

11:00 – 11:30 **Reporting back from day 1 breakout sessions and introduction of day 2 (Nico Polman, WUR)**

Kammerberg

Aim: To share the results of the feedback session from day 1

11:30 – 11:50 **Key focus points for 2024 and possible ways of interacting with stakeholders (Trond Selnes &**
Kammerberg **Nico Polman, WUR).**

Aim: To present the focus points and get feedback on possible ways to interact with stakeholders.

11:50 – 12:00 **Wrap-up and view ahead (Peter Havlík & Tamás Krisztin, IIASA)**
Kammerberg

Aim: *Wrap-up of the project and outline the topics that will be discussed in the upcoming stakeholder meetings, including agreeing on the location and dates.*

12:00 – 13:30 **Lunch and departure**

13:30 – 15:30 **Optional walk and tour in Gut Eichethof**

A tour of Gut Eichethof where two sustainability goals are being pursued: the meeting of environmental requirements and the sustainable economic management of the estate.