Developing UK-Livestock-Shared Socioeconomic Pathways (UK-Livestock-SSPs): A Participatory Co-design Approach

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Background

Why This Matters: The UK livestock sector faces complex challenges — from climate change and public health to animal welfare. Responding effectively requires shared, long-term thinking about future pathways.

What Are Shared Socioeconomic Pathways (SSPs)? SSPs, first developed by the IPCC, explore five possible global socio-economic futures and their climate implications (see Figure 1). They have since been adapted for national and sectoral use — including the UK-SSPs.

What Do We Do — and Why? We co-develop UK-Livestock-SSPs by working with stakeholders to identify sectoral drivers of change, and map them onto the UK-SSPs. The outputs will help inform policy, research & industry planning for sustainable livestock futures.

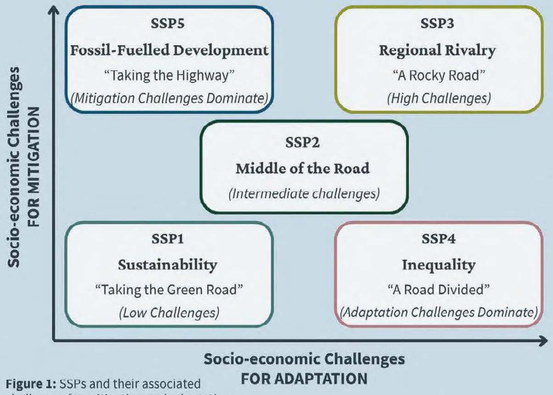


Figure 1: SSPs and their associated challenges for mitigation and adaptation.
Adapted from UK-SSP Project, www.ukclimateresilience.org/products-of-the-uk-ssps-project/

Project Outputs

Abstracts & Narratives

Presents five possible futures for the UK livestock sector, exploring key drivers of change over time and across regions.

In draft

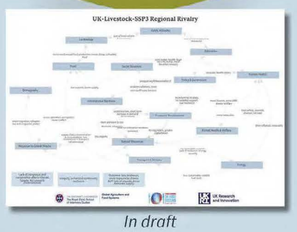
Visual Summaries

Simplified visuals highlight core themes of each scenario for easier interpretation.

See drafts below and on poster 2

System Diagrams

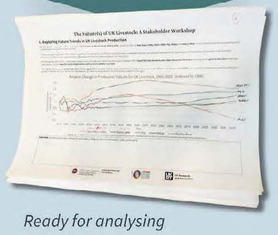
Shows how key drivers interact in each scenario to clarify complex relationships.



In draft

Semi-Quantitative Trends

Suggested trends for key sector variables to 2100, linking narratives to potential model use.



Ready for analysing

Want to Get Involved?

The visual summaries shown to the right and on Poster 2 are in draft. Please use Post-it notes to provide feedback. If you are interested in the upcoming feedback survey on the project outputs, email livestock.futures@ed.ac.uk or scan the QR code.

This research is part of the TRAnsforming the DEbate about livestock systems transformation (TRADE) project, funded under UKRI grant number BB/W018152/1.

Our Approach

Literature Review

To identify research gaps & relevant drivers

Semi-Structured Interviews

Engaging stakeholders to inform the approach

Stakeholder Mapping

Identifying stakeholders for targeted engagement

Participatory Workshops

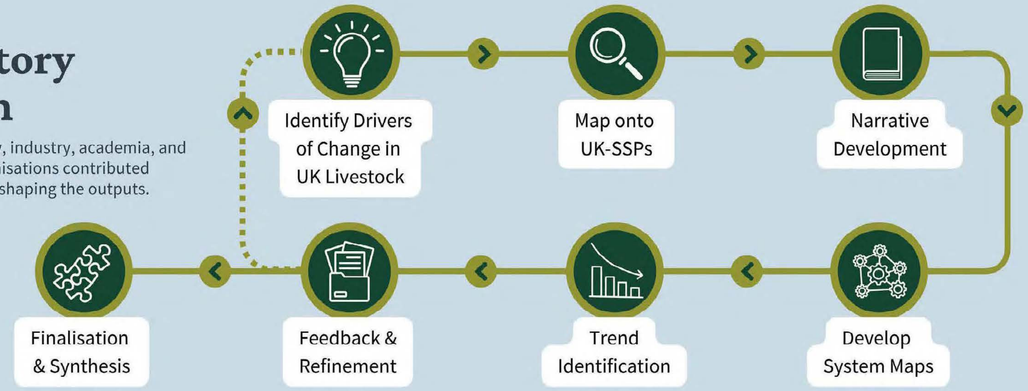
Shaping scenarios through collaboration

Follow-Up Survey

Gathering feedback to refine scenarios

Participatory Co-design

Stakeholders from policy, industry, academia, and non-governmental organisations contributed throughout the process, shaping the outputs.



Visual Summary 1

Visual Summaries 2-4 are continued on Poster 2

1: Sustainable Transformation

UK-wide policy adapts to local sustainability needs.

Crop self-sufficiency improves, but climate challenges persist.

Agrochemical regulations protect environment.

Renewable energy lowers farm costs and boosts stability.

Better water management cuts agricultural demand.

Genetically Modified Organism (GMO) rules ensure fair use and limit monopoly influence.

Biosecurity and antimicrobial rules curb disease.

Reforms and regulations cut livestock numbers by 2100.

Fertilisers phased out mid-century for soil health and lower fossil fuel reliance.

Green technology, including breeding, hydroponics, and biotechnology boosts resilience and yields.

Less land required for livestock as meat demand and waste decline and sustainable practices adopted.

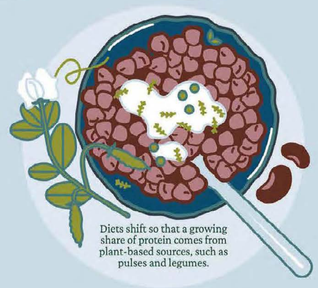
Some farmland transitions to rewilding and conservation uses.

Farmers are also supported through low-interest loans and training to transition to higher-welfare, sustainable systems.

Awareness of the environmental and health impacts of animal source foods and policy reforms drive change.

Demand for ethical, sustainable food links rural and urban areas, reshaping the countryside.

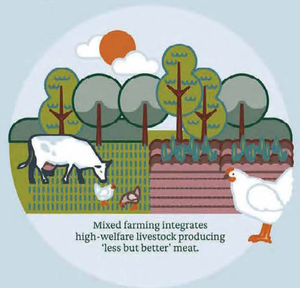
Rural areas focus on heritage and sustainable land use.



Diets shift so that a growing share of protein comes from plant-based sources, such as pulses and legumes.

Decreasing consumption of meat and dairy due to sustainability concerns.

More arable land supports plant-based diets.



Mixed farming integrates high-welfare livestock producing 'less but better' meat.

Farmers earn more for quality production via innovation, circularity, shorter supply chains, and government support.

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Visual Summaries (2-4) Continued

Refer to Poster 1 for the Project Overview and Visual Summary 1. Feel free to use the Post-it Notes provided to give feedback.

2: Middle of the Road

Climate risks and shocks threaten food and livestock system resilience.

Benefits of technology driven growth are unequally distributed.

Young farmers lack support and labour shortages further deepen.

Sector consolidation squeezes small farms.

Rural-urban economic disparities persist due to weak rural investment.

Gradual sustainability transition but with continued biodiversity loss.

Rising social inequalities despite economic growth.

Local food production and regional branding gain traction, especially demand for high-quality traceable meat.

Moderate growth in the livestock sector masks deepening inequalities.

Payment for Ecosystem Services (PES) scheme rolled out but with limited impact due to insufficient financial incentives and economic pressure favouring intensive practices.

Moderate livestock sector growth, with conventional farming models central, rather than regenerative or alternative systems.

Consumer demand slowly shifts to affordable plant-based foods, but uptake faces resistance and health concerns over processed options.

Technological innovations, including drones, genomics, and precision farming, improve efficiency.

Regulatory frameworks around food labelling and health standards are slow to adapt, creating confusion for consumers.

Land use regulations promote agroforestry and solar-livestock farms.

Artificial meat remains limited at first but develops later in century.

Continued consumption of red and processed meat contributes to high rates diet-related diseases.

Meat tax rejected.

Devolved governments and UK-wide policies conflict on dietary shifts.

Public-private partnerships drive technology advances in agriculture but reinforce inequalities.

UK leads globally in agricultural technology and exports innovations.

3: Regional Rivalry

Rising antimicrobial resistance due to lax antibiotic regulations.

Soil degradation, water pollution, and biodiversity loss accelerate.

Food safety standards erode, increasing diet-related diseases.

Frequent zoonotic disease outbreaks disrupt food production.

Informal economies emerge as rural communities struggle.

Urban sprawl encroaches on farmland, reducing agricultural space.

Agricultural output rises in the short-term but is unsustainable long-term.

Increased reliance on Genetically Modified Organisms (GMOs).

Environmental regulations are relaxed to enable exploitation of domestic natural resources, driving agricultural intensification.

Public health declines as food security deteriorates for many.

Collapse of infrastructure and the breakdown of public services increases social divides and poverty.

Climate change accelerates, further degrading agricultural land.

Rising international tensions and protectionist policies lead to sector fragmentation.

Devolved nations adopt divergent agricultural strategies with poor coordination weakening resilience.

Some meat availability declines – still consumed but increasingly a luxury due to trade barriers and rising costs.

Sector vulnerable to resource shortages, disease, and political unrest.

Trade barriers limit UK market access, boosting self-sufficiency but increasing economic and supply risks.

Shift towards subsistence farming due to trade restrictions.

Land and resource competition fuels social unrest.

Scotland retains subsidies, England adopts market liberalisation.

Weak governance stifles innovation and crisis response.

Fragmented policies and trade limits reduce food variety, worsening nutrition.

Increasing regional inequalities in farming sector.

Extreme weather events worsen agricultural instability.

4: Inequality

Renewable energy stabilises sector costs but remains unequally distributed.

Worsening pollution, biodiversity loss, soil depletion, water shortages, and ecosystem damage.

Relaxation of antibiotic rules raises antimicrobial resistance concerns, but genetic improvements reduce some reliance.

Reliance on agrochemicals increases to protect yields in a more unpredictable environment.

Intensive farming expands, with extensive systems primarily occupying marginal lands.

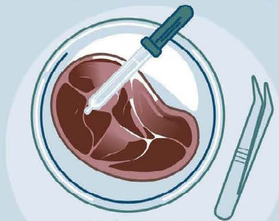
Increased automation, precision farming, and genetic modification drive productivity gains.

Animal welfare declines in priority, despite some developments in precision care.

Agricultural jobs decline due to automation.

Economic growth driven by decentralisation and a National Strategy promoting agricultural technology.

Absence of agricultural subsidies or payments increases financial uncertainty.



Overall meat consumption drops initially but rebounds with cheaper cultured (lab-grown) meat.

Socio-economic inequalities deepen, rural-urban gap widens.

Supermarkets dictate food prices, reducing competition.

Corporate control over supply chains and food marketing.

Land ownership concentrated in large agribusinesses.

Small farms struggle, leading to closures, while others consolidate to survive.

Some former farmland is repurposed for housing, bioenergy, and biomass.

Meat consumption diverges – whole cuts become even more of a luxury, most rely on processed options.

Ultra-processed alternative proteins become more widely consumed due to affordability.

Food insecurity persists among vulnerable populations.

Climate shocks and market disruptions cause price volatility.

5: Fossil-Fuelled Development

Relaxation of antibiotic rules raises antimicrobial resistance concerns, but genetic improvements reduce some reliance.

Initially productive but environmentally unsustainable.

Technological solutions fail to prevent ecological damage in the long-term.

Fertiliser shortages post-2040 hinder productivity.

Urban expansion reduces farmland, accelerating intensification and degradation.

Increased stocking densities and automation.

Animal welfare declines in priority, despite some developments in precision care.

Precision farming and genetics boost productivity in the short term.

Large-scale, energy-intensive farming yields high output initially.

Growing reliance on food imports exposes vulnerabilities.

Trade disruptions and suppiy shocks risk shortages and threaten food security.

Environmental protections rolled back, with no subsidies or payments for ecosystem services introduced.

Rising consumption of processed meat worsens public health.

Livestock sector intensifies with fossil-fuelled growth.

Fossil fuel-driven economic growth reduces inequalities in the short-term, but poor climate resilience threatens long-term social cohesion.

Loosening regulations prioritises economic growth over sustainability.

Environmental damage undermines production systems, restricting long-term productivity.

Obesity and diet-related diseases increase.

Declining food diversity and ultra-processed diets exacerbate health crises.

High-technology, high-input farming dominates the lowlands with some urban expansion.

Poorly managed intensive systems contribute to biodiversity loss, soil degradation, and water pollution.

Intensive farming practices harm the mental health of some workers.

Climate change disrupts livestock profitability in the long term.

Mitigation strategies lacking weakening food system stability.

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