Supplementary Material 4: Semi-Quantitative Trends

UK Livestock Futures

Co-designing Shared Socioeconomic Pathways

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

UK-Livestock-SSP Semi-Quantitative Trends

Overview and Purpose

To support scenario-based modelling, we compiled and developed semi-quantitative trends for relevant UK livestock socio-economic indicators extending to 2100. These trends bridge the qualitative narratives of the UK-Livestock-SSPs with semi-quantitative information needed for applications such as land-use projections, emissions scenarios, and production outputs. Trends are grouped into three key categories reflecting the same categories in the narratives: *Governance*, *Society and Diet*, and *Production Systems and Land Use*. The trends are intentionally broad to support diverse modelling while staying connected to stakeholder insights and real-world data.

Unless otherwise described, trends are presented on a seven-point scale:

+++ steep increase
++ moderate increase
+ slight increase
0 stable
- slight decline
-- moderate decline
--- steep decline

This scale provides enough granularity to capture nuanced changes while remaining accessible and flexible for different modelling approaches (Harmáčková et al., 2022; Pedde et al., 2021).

UK-SSP Derived Trends

Trends highlighted in light blue on the following pages and citing 'Source: UK-SSP' are drawn directly from the UK-SSP project outputs. Thirteen were selected for replication as they are most relevant and underpin the UK-Livestock-SSP narratives. These trends serve as guiding principles for interpreting sectoral dynamics and ensuring alignment with the broader UK-SSP assumptions. The full set of 50 UK-SSP trends was reviewed during narrative development, but those considered less directly relevant are not shown here; the full set can be accessed here.

Stakeholder-Informed Trends

The additional eleven trends were developed through the stakeholder co-design process. In Workshop 2, participants reviewed the UK-SSPs alongside draft UK-Livestock-SSP narratives and

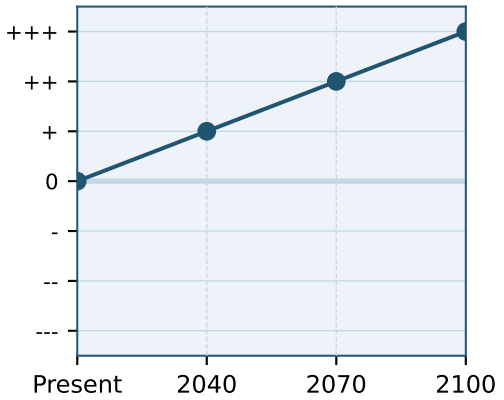
suggested the likely direction of these trends. Where data were available, participants were provided with historical information to extend (e.g., production volumes, emissions intensity), while other trends were developed from a baseline of zero to capture emerging dynamics. Notably, a consumption trend for eggs was added based on stakeholder feedback highlighting its omission. The project team developed this trend by interpreting related trends and narratives. Eggs were initially excluded from workshop activities due to incompatible historical data, an oversight later recognised.

UK-Livestock-SSP1 Semi-Quantitative Trends (Present–2100) — Page 1 of 3

Governance

Environmental policy

Strictness of environmental laws and regulation

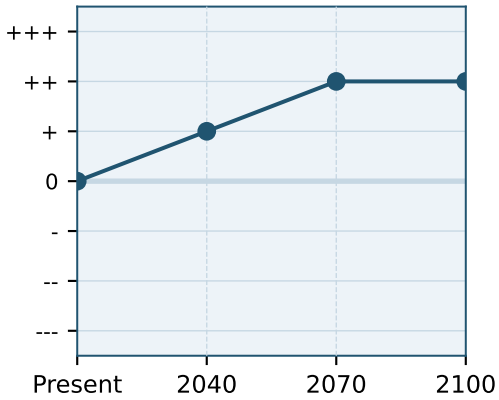


Source: UK-SSP. Strong environmental governance from the 2020s-30s.

Governance

Land use regulation

Level of regulation related to land use change

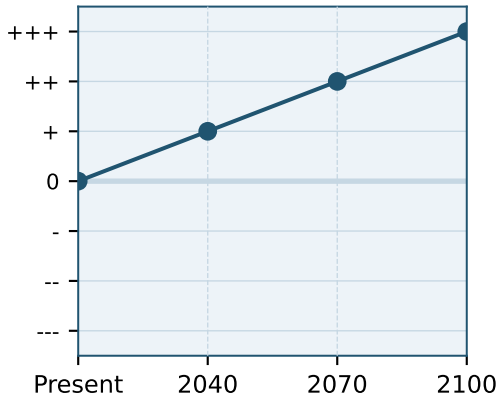


Source: UK-SSP. Strong; led by local governance.

Governance

Effectiveness of institutions

Level of stability and functioning of formal institutions

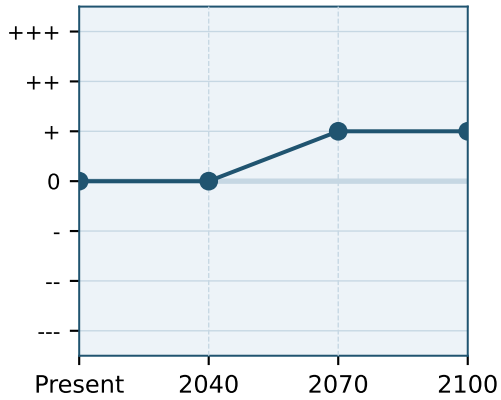


Source: UK-SSP. Legitimate, efficient local governance.

Society & Diet

Population

Population level based on IIASA projections

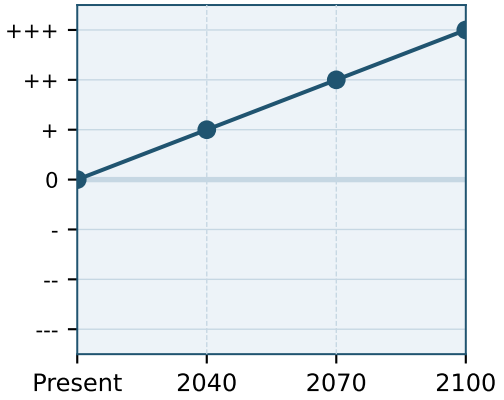


Source: UK-SSP, citing IIASA SSP projections (model IIASA-WiC POP).

Society & Diet

Education

Public and private investment in education

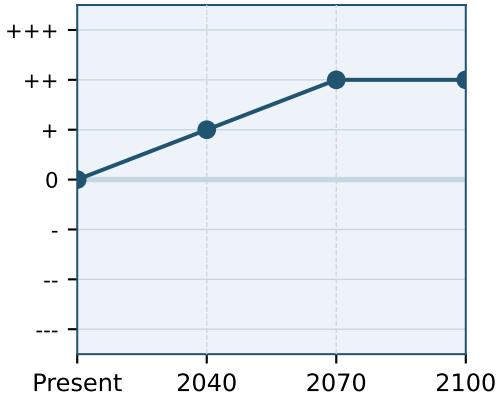


Source: UK-SSP. Education becomes more accessible as inequalities fall and public/community investments grow.

Society & Diet

Health care

Availability of health service per capita

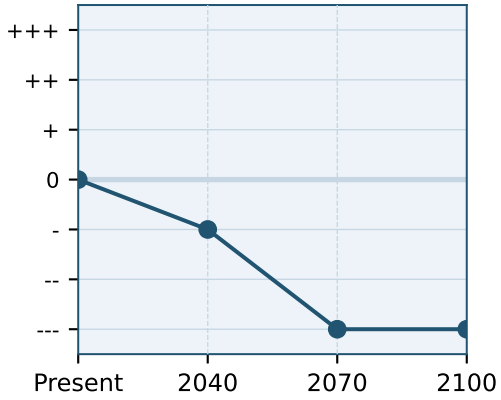


Source: UK-SSP. Initially rises with public investment, then stabilises as population health improves.

Society & Diet

Inequality

Level of income inequality

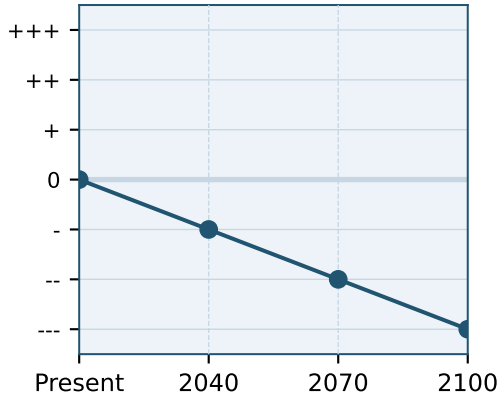


Source: UK-SSP. Equality is a societal priority; society becomes more egalitarian.

Society & Diet

Resource and food waste

The amount of resources and food wasted along the whole supply chain



Source: UK-SSP. Green technology and lifestyle shifts reduce waste.

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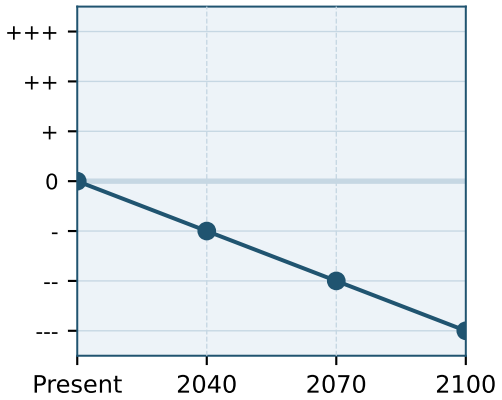
Society & Diet

Meat consumption

Meat consumption per person

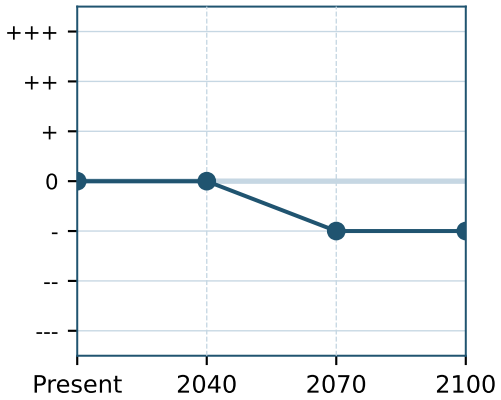


Source: UK-SSP. Meat consumption falls due to sustainability and health concerns.

Society & Diet

Dairy consumption

Dairy consumption per person

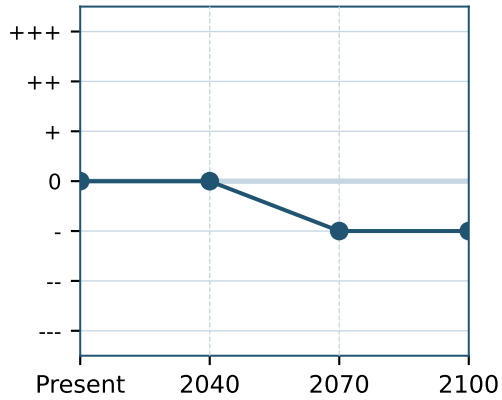


Slight decline as plant-based milk increases in popularity, but large vegetarian population sustains some demand for milk and dairy products.

Society & Diet

Egg consumption

Egg consumption per person

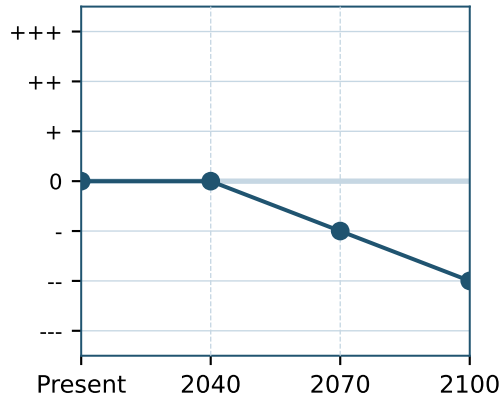


Slight decline with increasing plant-based diets, but large vegetarian population sustains some demand for eggs.

Society & Diet

Fish consumption

Fish consumption per person

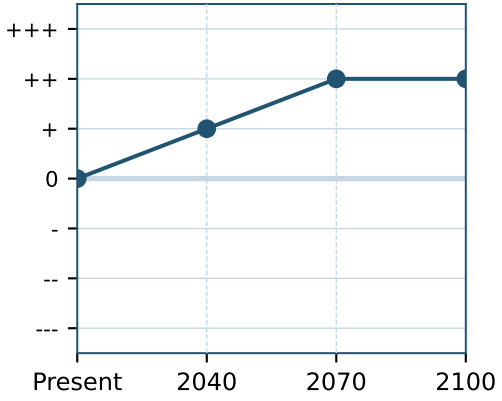


Stable initially, then declines after 2040 as awareness of environmental limits grows, leading to smaller, more sustainable sourcing.

Society & Diet

Plant-based meat consumption

Per capita consumption of plant-based meat alternatives mimicking meat taste and texture.

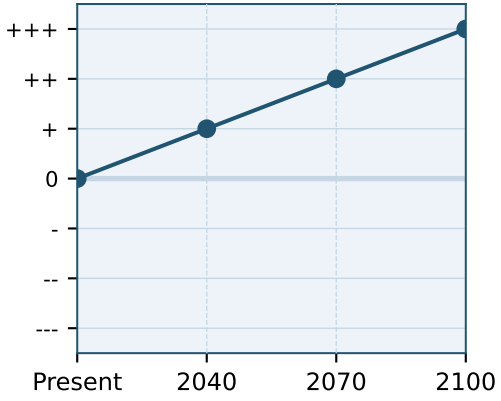


Increases as meat consumption declines, with growing popularity of minimally processed meat replicas like tofu and tempeh, driven by health.

Production Systems & Land Use

Technological development

Speed of technological development

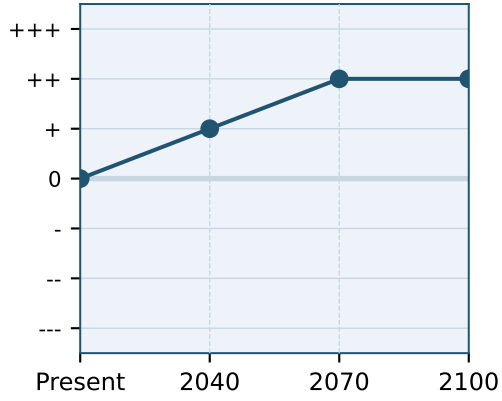


Source: UK-SSP. Major green technology investments drive collaborative "green alliances."

Production Systems & Land Use

R&D effects on agricultural yields

Changes in agricultural yields due to R&D such as crop breeding, agronomy, etc.

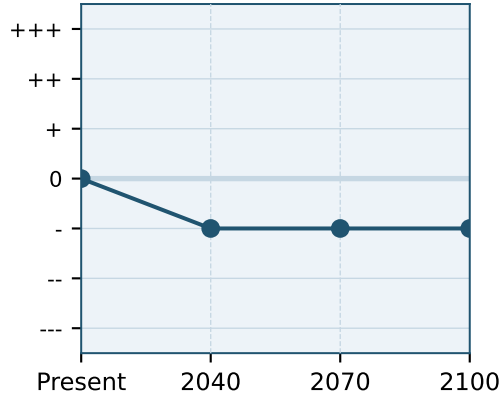


Source: UK-SSP. Green technology, advanced plant and animal breeding, and urban growing are employed to increase yields more sustainably.

Production Systems & Land Use

Agricultural area

Area of agricultural land



Source: UK-SSP. Agricultural land slightly decreases due to less waste, lower meat and dairy consumption, and sustainable technologies.

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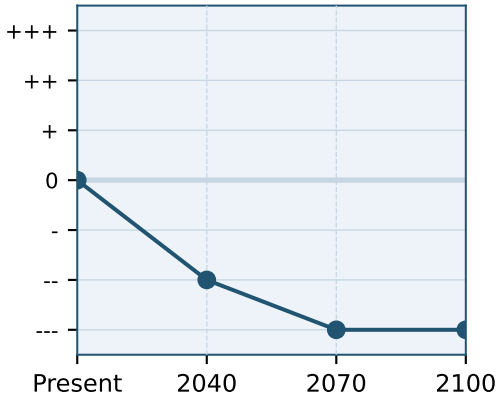
Production Systems & Land Use

Fertiliser use

Amount of fertiliser inputs in agricultural production

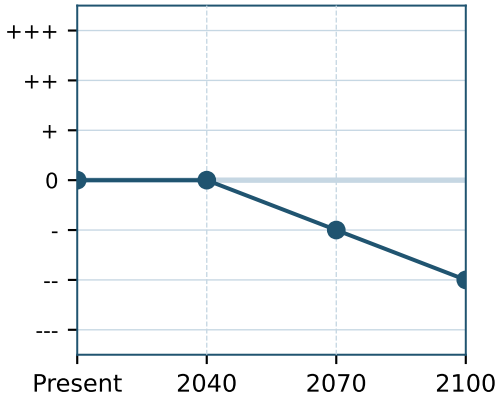


Source: UK-SSP. Green technology, breeding, hydroponics, and GMOs boost yields; artificial fertiliser use drops to zero by 2070.

Production Systems & Land Use

Mongastric production

Total production of monogastric livestock (e.g., pigs, poultry)

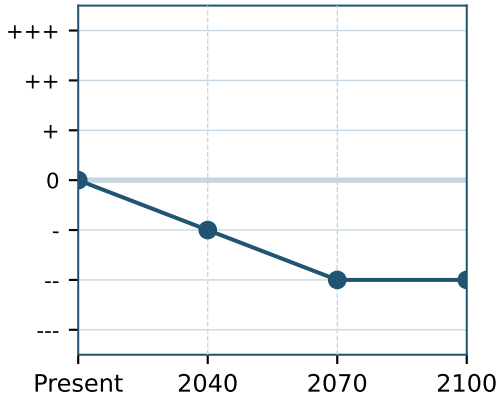


Reduced demand from dietary shifts and policy reform, with poultry declining more slowly than pig production due to consumer preference.

Production Systems & Land Use

Ruminant production

Total production of ruminant livestock (e.g., cattle, sheep)

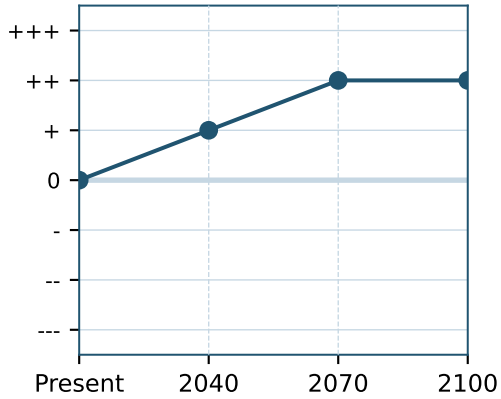


Reduced demand from dietary shifts and food system reform, with production shifting toward less but higher-quality pasture-fed ruminant products.

Production Systems & Land Use

Cultured meat production

Total production of cultured (lab-grown) meat

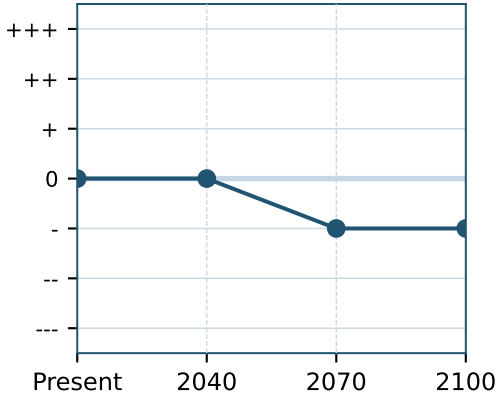


Moderate growth with regulation, investment, and demand.

Production Systems & Land Use

Input intensity of monogastric production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

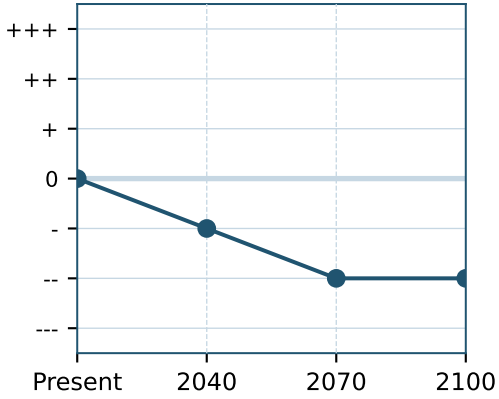


Early-century mix of pasture-raised and sustainable intensification, shifting toward pasture-based systems that enhance ecosystems as demand falls.

Production Systems & Land Use

Emissions intensity of monogastric production

The level of greenhouse gas emissions per unit of output from monogastric systems

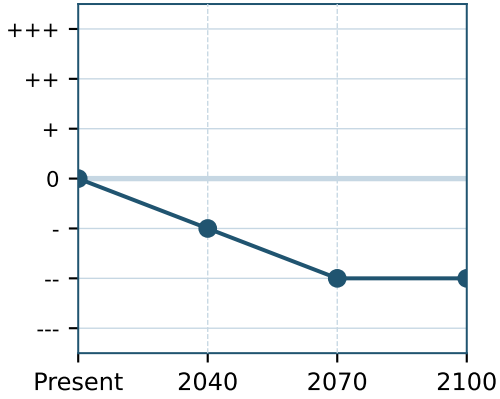


Improvements from precision feed, cleaner energy, and better manure handling, slowing as limits reached.

Production Systems & Land Use

Input intensity of ruminant production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

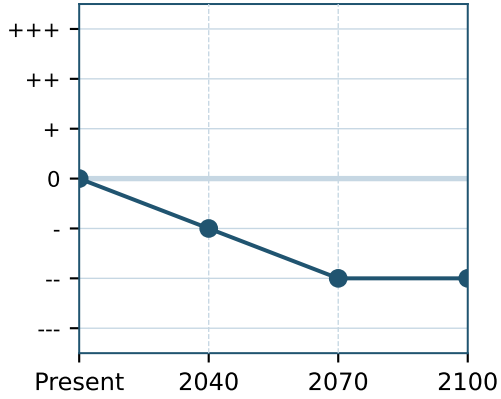


Production shifts to smaller, pasture-based systems that enhance ecosystems, animal welfare, and rural resilience, with declining intensification.

Production Systems & Land Use

Emissions intensity of ruminant production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)



Methane reductions via inhibitors, improved forage quality, and covered stores; gains slow as limits approached.

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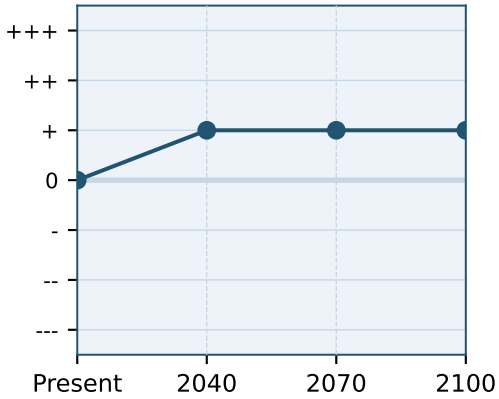
Governance

Environmental policy

Strictness of environmental laws and regulation

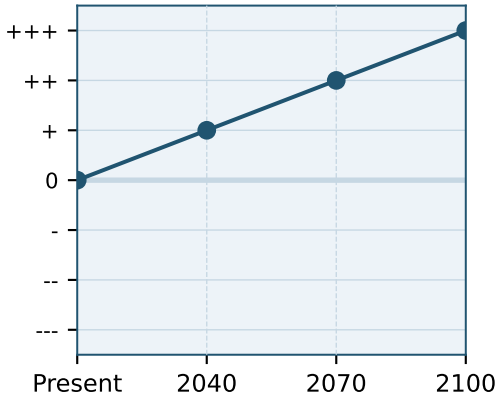


Source: UK-SSP. Effective land use planning stabilises some environmental conditions.

Governance

Land use regulation

Level of regulation related to land use change

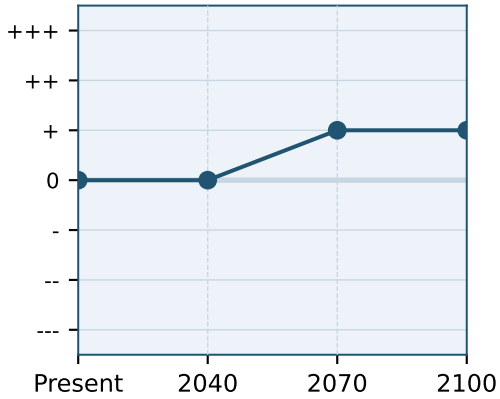


Source: UK-SSP. Very strong; led by centralised planning.

Governance

Effectiveness of institutions

Level of stability and functioning of formal institutions

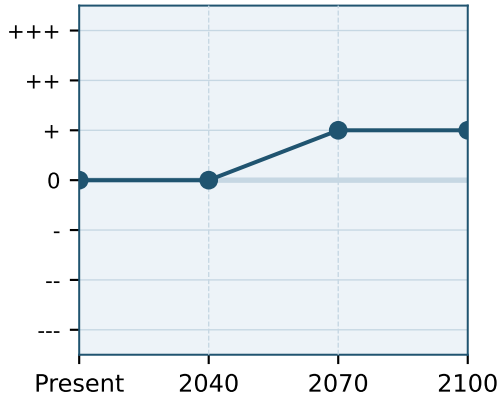


Source: UK-SSP. Gradual shift from centralised to citizen and government driven decision-making.

Society & Diet

Population

Population level based on IIASA projections

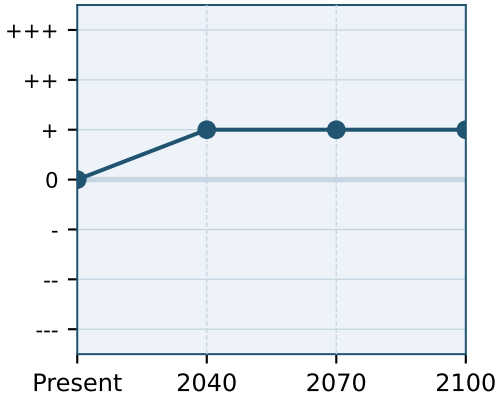


Source: UK-SSP, citing IIASA SSP projections (model IIASA-WiC POP).

Society & Diet

Education

Public and private investment in education

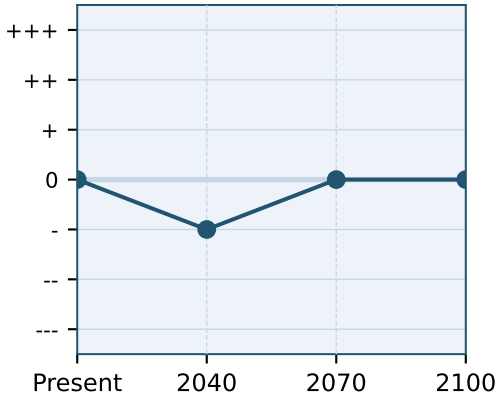


Source: UK-SSP. Public-private partnerships and basic income slightly boost education investment.

Society & Diet

Health care

Availability of health service per capita

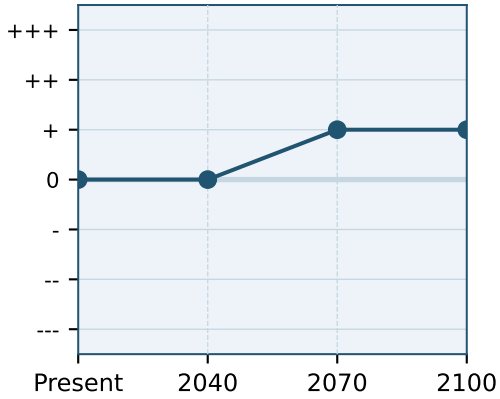


Source: UK-SSP. After the NHS collapse, healthcare availability returns to previous levels via public-private investment.

Society & Diet

Inequality

Level of income inequality

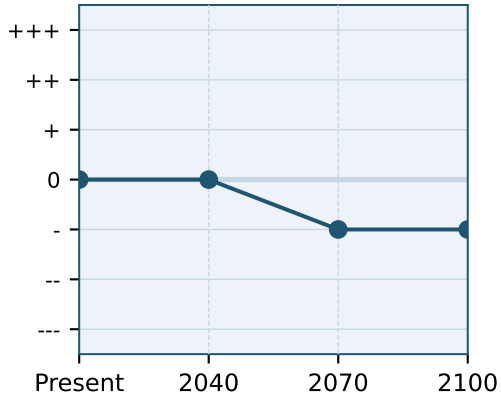


Source: UK-SSP. Inequality stays stable, then rises slightly despite growth and basic income.

Society & Diet

Resource and food waste

The amount of resources and food wasted along the whole supply chain



Source: UK-SSP. Agri-tech reduces food chain waste, but lifestyle inertia slows progress.

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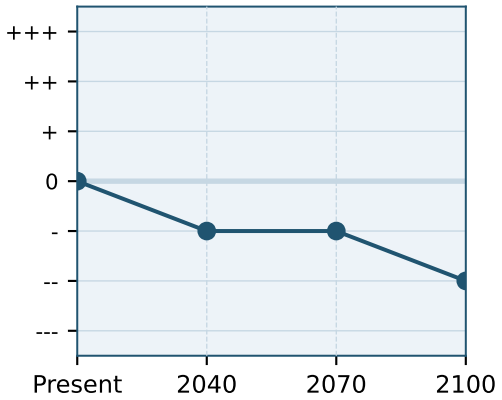
Society & Diet

Meat consumption

Meat consumption per person

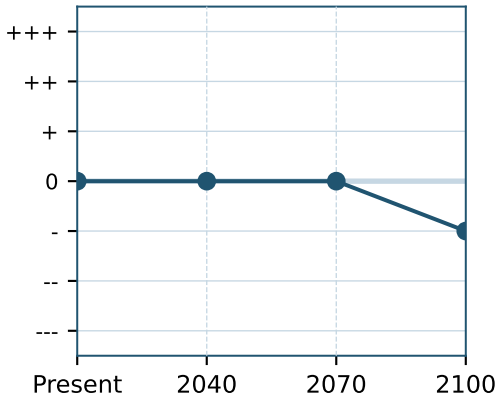


Source: UK-SSP. Meat consumption declines slowly, but remains widespread alongside a gradual shift toward affordable vegetarian and vegan diets.

Society & Diet

Dairy consumption

Dairy consumption per person

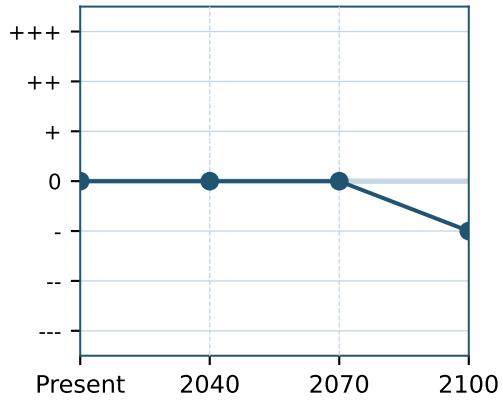


Stable initially, with plant-based milk rises offset by other dairy; declines later as preferences shift to alternatives.

Society & Diet

Egg consumption

Egg consumption per person

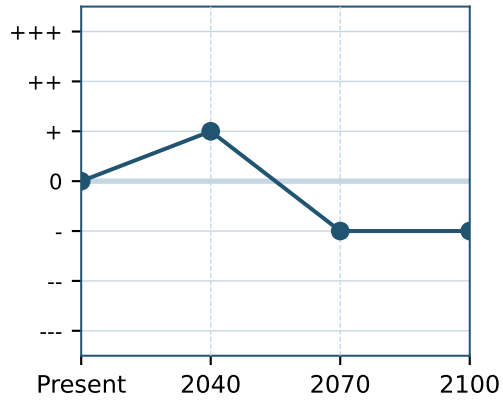


Stable initially, then declines slightly as diets diversify and plant-based alternatives gain popularity later in the century.

Society & Diet

Fish consumption

Fish consumption per person

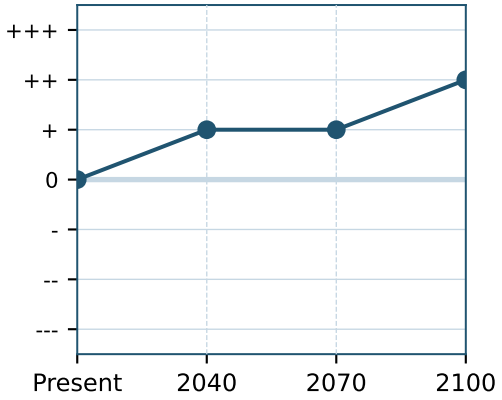


Rises slighly at first, supported by aquaculture growth, then declines moderately as sutainability awareness and dietary shifts reduce demand.

Society & Diet

Plant-based meat consumption

Per capita consumption of plant-based meat alternatives mimicking meat taste and texture.

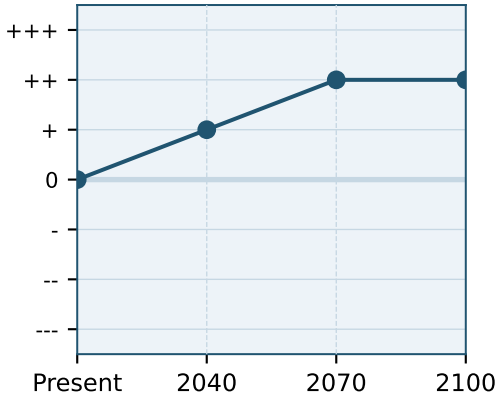


Slow growth with some environmental awareness but hindered by poor coordination, conflicting policies, and concerns over processing.

Production Systems & Land Use

Technological development

Speed of technological development

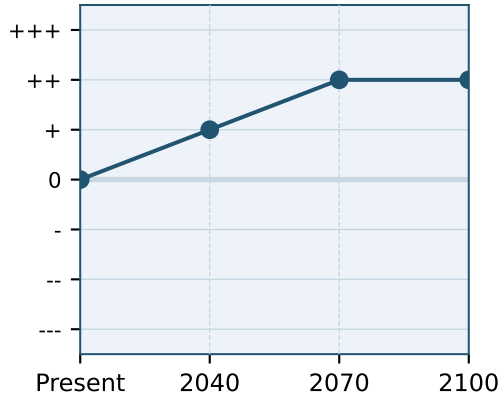


Source: UK-SSP. Market-driven economy supports ongoing technology growth.

Production Systems & Land Use

R&D effects on agricultural yields

Changes in agricultural yields due to R&D such as crop breeding, agronomy, etc.

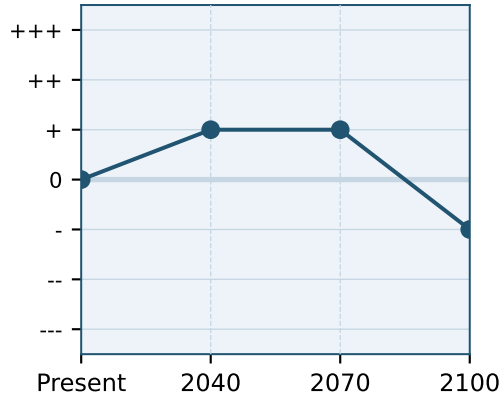


Source: UK-SSP. Steady improvement; later, artificial meat and large-scale urban vertical farming expand.

Production Systems & Land Use

Agricultural area

Area of agricultural land



Source: UK-SSP. Land area grows with food demand, then declines slightly via technological innovation and vertical farming.

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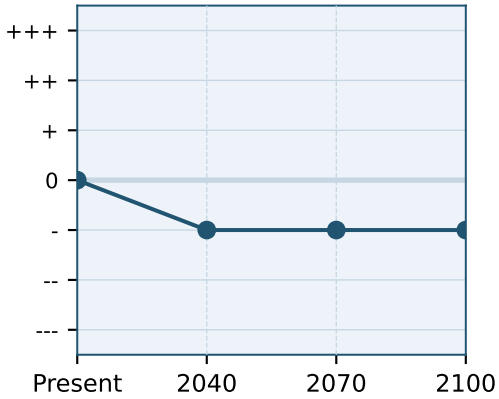
UK-Livestock-SSP2 Semi-Quantitative Trends (Present–2100) — Page 3 of 3

Production Systems & Land Use

Fertiliser use

Amount of fertiliser inputs in agricultural production

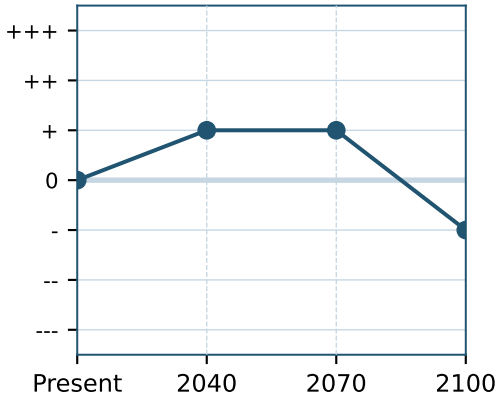


Source: UK-SSP. Fertiliser use declines gradually with sustainable intensification and more arable land.

Production Systems & Land Use

Mongastric production

Total production of monogastric livestock (e.g., pigs, poultry)

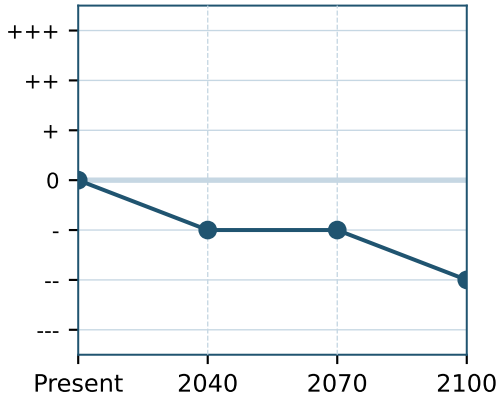


Initial moderate growth, especially in poultry, then slight decline late century as alternative protein production replaces some demand.

Production Systems & Land Use

Ruminant production

Total production of ruminant livestock (e.g., cattle, sheep)

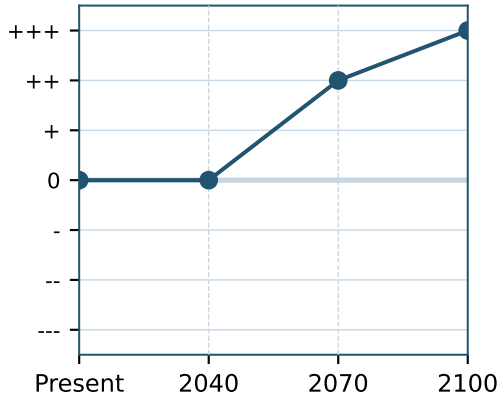


Gradually declines due to changing demand and shifts toward smaller, sustainable systems, while alternative meat production steadily rises.

Production Systems & Land Use

Cultured meat production

Total production of cultured (lab-grown) meat

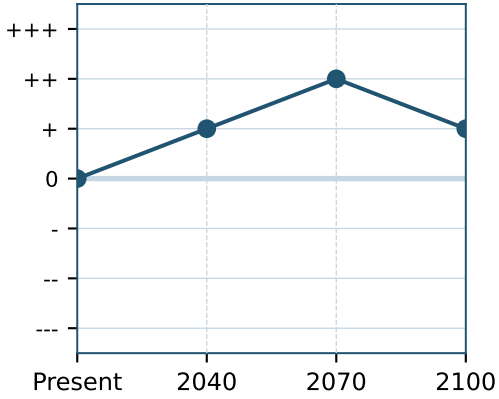


Slow initial growth; accelerating mid-century as technology and acceptance increase.

Production Systems & Land Use

Input intensity of monogastric production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

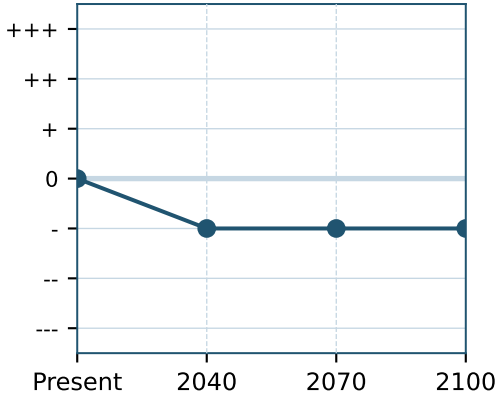


Moderate intensification to 2040 with technology adoption; slight decline later as some increase in pasture-based farms within mixed systems.

Production Systems & Land Use

Emissions intensity of monogastric production

The level of greenhouse gas emissions per unit of output from monogastric systems

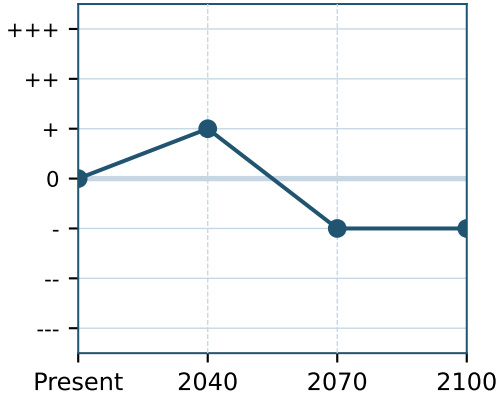


Gradual feed conversion improvements and partial energy decarbonisation; but modest gains plateau.

Production Systems & Land Use

Input intensity of ruminant production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

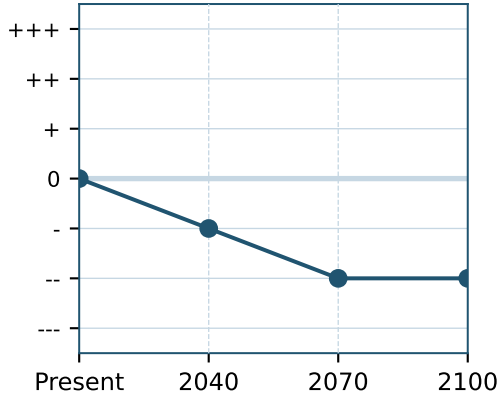


Some initial intensification in cattle while sheep remain stable; later shift to smaller-scale, more extensive farming that reduces intensity.

Production Systems & Land Use

Emissions intensity of ruminant production

The level of greenhouse gas emissions per unit of output from ruminant systems



Better manure management and animal health gradually reduce methane per unit; flattening by late century.

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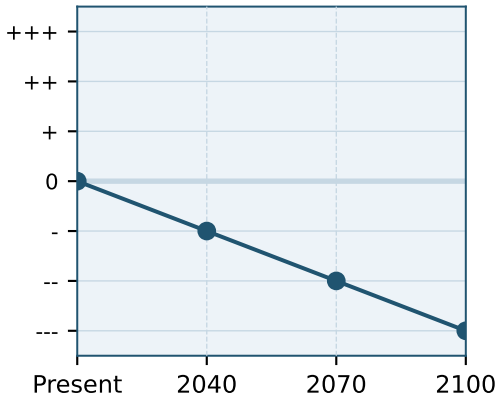
Governance

Environmental policy

Strictness of environmental laws and regulation

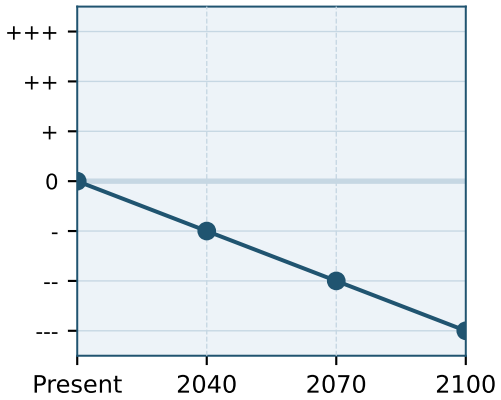


Source: UK-SSP. Eased regulations to allow resource access but causes widespread degradation.

Governance

Land use regulation

Level of regulation related to land use change

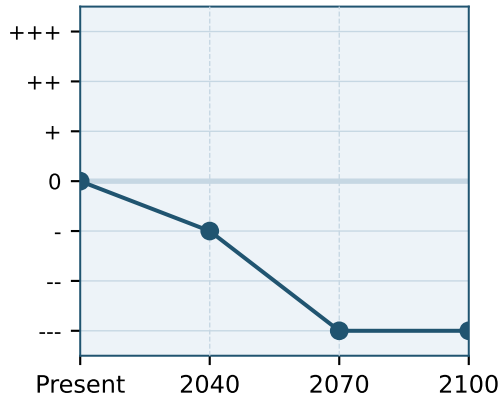


Source: UK-SSP. Reduced land use restrictions lead to uncontrolled land competition.

Governance

Effectiveness of institutions

Level of stability and functioning of formal institutions

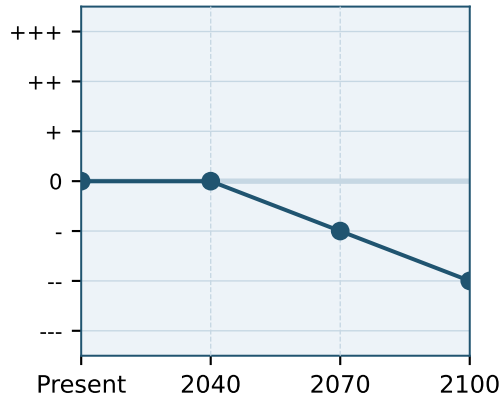


Source: UK-SSP. Failed institutions and collapsed governance by 2070.

Society & Diet

Population

Population level based on IIASA projections

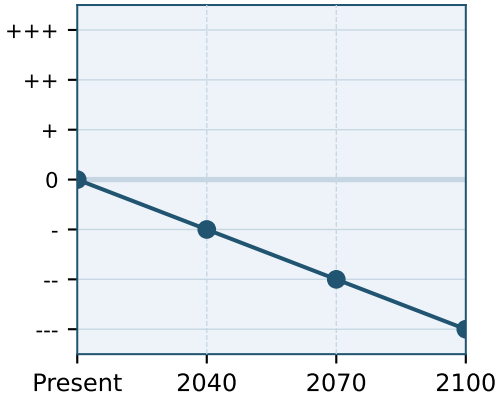


Source: UK-SSP, citing IIASA SSP projections (model IIASA-WiC POP).

Society & Diet

Education

Public and private investment in education

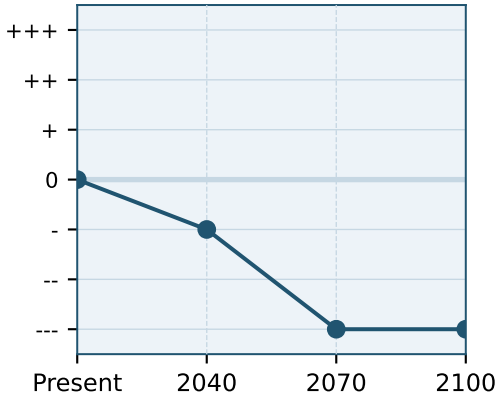


Source: UK-SSP. Defence spending is prioritised over social, education, health, and infrastructure.

Society & Diet

Health care

Availability of health service per capita

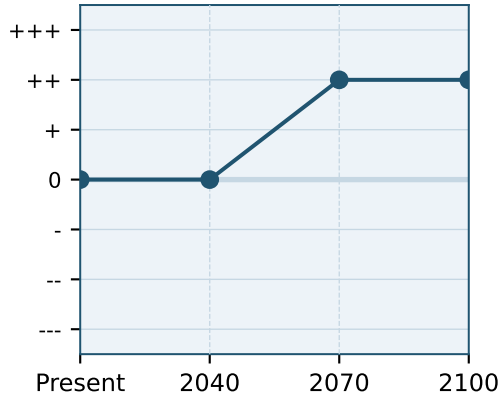


Source: UK-SSP. Defence spending is prioritised over social, education, health, and infrastructure.

Society & Diet

Inequality

Level of income inequality

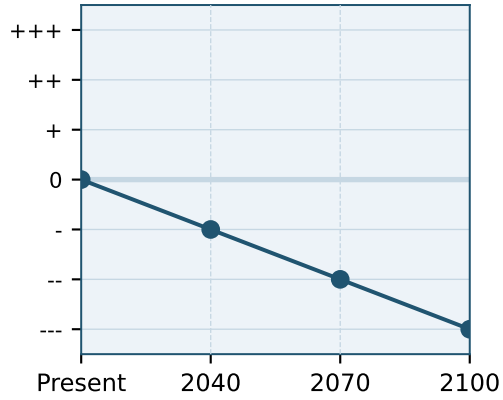


Source: UK-SSP. Inequality worsens as education and healthcare collapse; most live poorly by 2100.

Society & Diet

Resource and food waste

The amount of resources and food wasted along the whole supply chain



Source: UK-SSP. Reliance on domestic resources drives fuller use, reducing waste.

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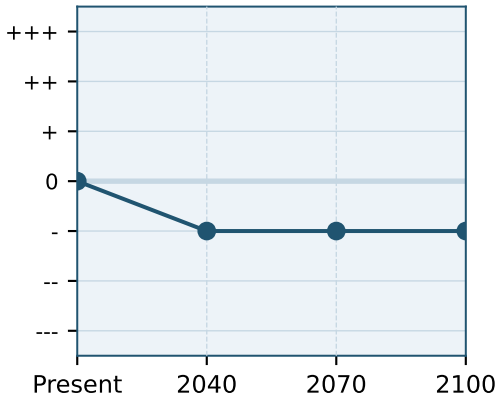
Society & Diet

Meat consumption

Meat consumption per person

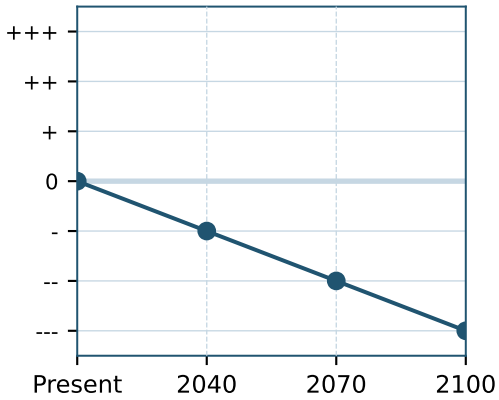


Source: UK-SSP. Meat becomes scarce and a luxury.

Society & Diet

Dairy consumption

Dairy consumption per person

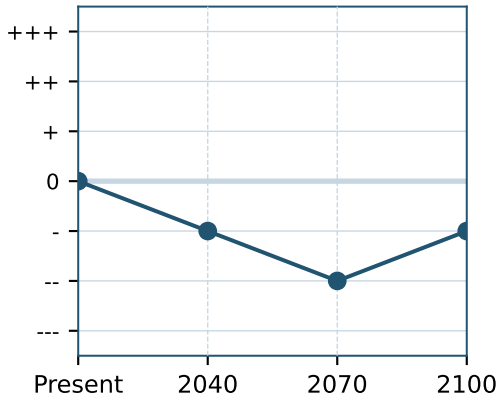


Gradual decline as affordability and availability fall, worsening with late-century system and infrastructure collapse.

Society & Diet

Egg consumption

Egg consumption per person

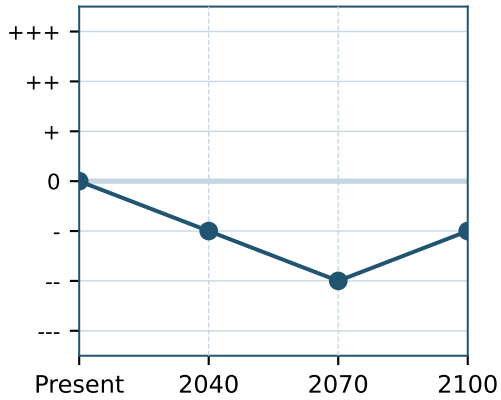


Initial decline from affordability and supply issues, later partially recovers via subsistence farming as eggs gain importance.

Society & Diet

Fish consumption

Fish consumption per person

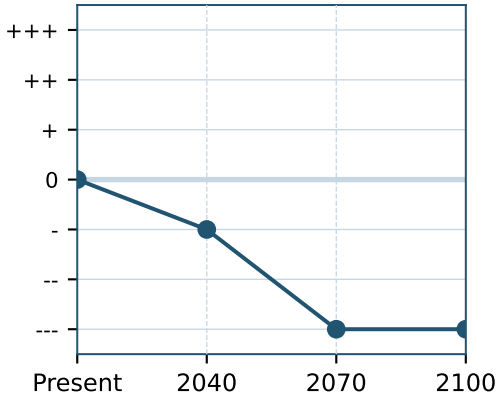


Declines from maritime tensions and ocean degradation, with some later recovery via local subsistence fishing.

Society & Diet

Plant-based meat consumption

Per capita consumption of plant-based meat alternatives mimicking meat taste and texture.

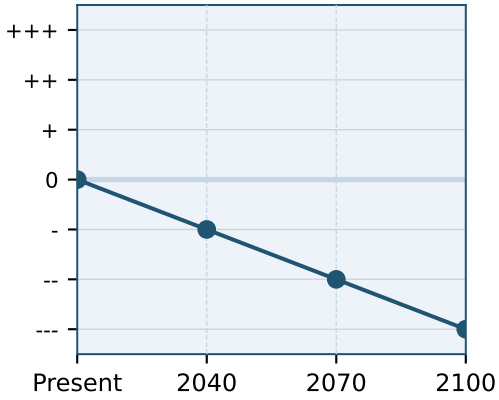


Declines sharply in second half of the century due to limited technological investment and broader system collapse.

Production Systems & Land Use

Technological development

Speed of technological development

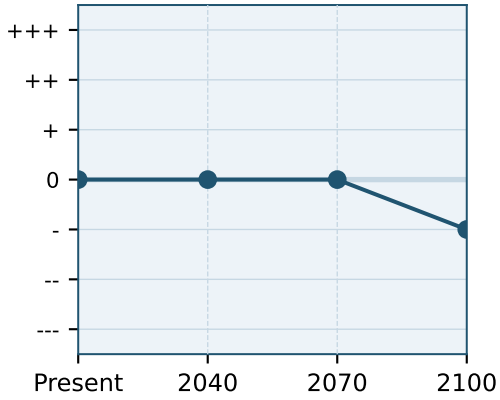


Source: UK-SSP. Resource limits and isolation hinder technology development.

Production Systems & Land Use

R&D effects on agricultural yields

Changes in agricultural yields due to R&D such as crop breeding, agronomy, etc.

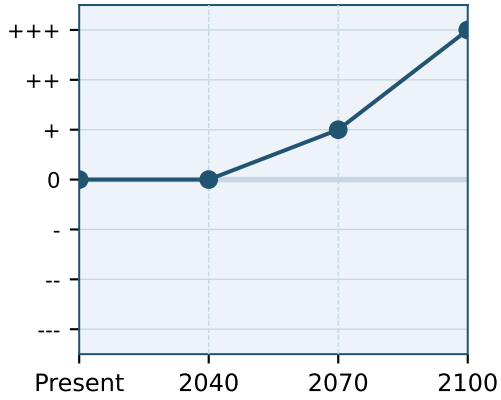


Source: UK-SSP. Initial intensification offsets reduced imports, but yield declines later due to land degradation and limited R&D.

Production Systems & Land Use

Agricultural area

Area of agricultural land



Source: UK-SSP. Land expands after initial stability due to high domestic demand and low yields.

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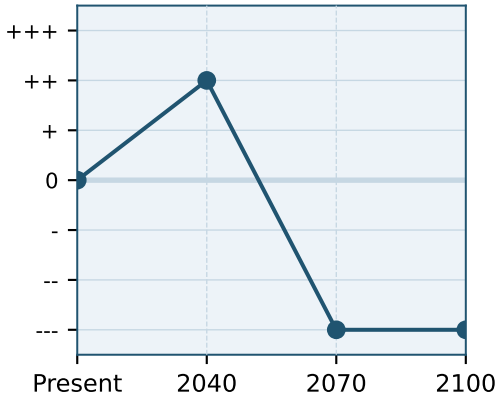
Production Systems & Land Use

Fertiliser use

Amount of fertiliser inputs in agricultural production

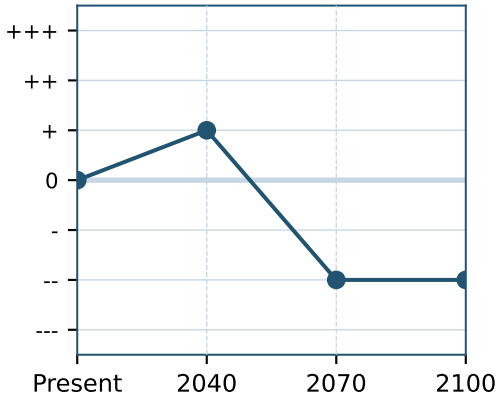


Source: UK-SSP. Fertiliser use rises initially, then falls as costs and availability become prohibitive.

Production Systems & Land Use

Mongastric production

Total production of monogastric livestock (e.g., pigs, poultry)

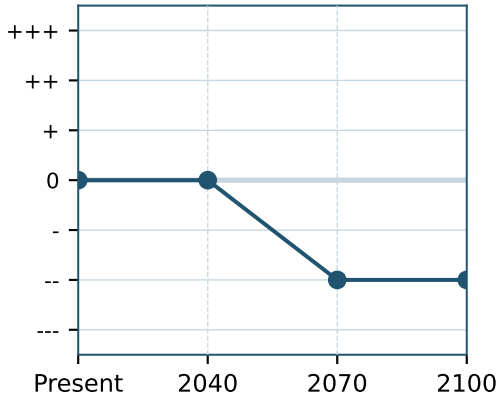


Initial increase through intensification, then decline post-2040 due to resource shortages and system collapse; low-input subsistence by 2100.

Production Systems & Land Use

Ruminant production

Total production of ruminant livestock (e.g., cattle, sheep)

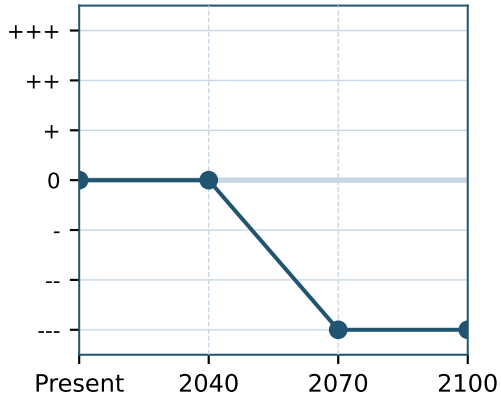


Stable initially, then decline post-2040 due to resource shortages and system collapse; low-input subsistence by 2100.

Production Systems & Land Use

Cultured meat production

Total production of cultured (lab-grown) meat

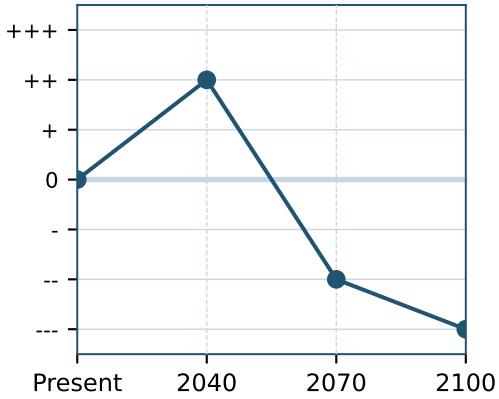


Limited due to underinvestment and instability; declining viability post-2040.

Production Systems & Land Use

Input intensity of monogastric production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

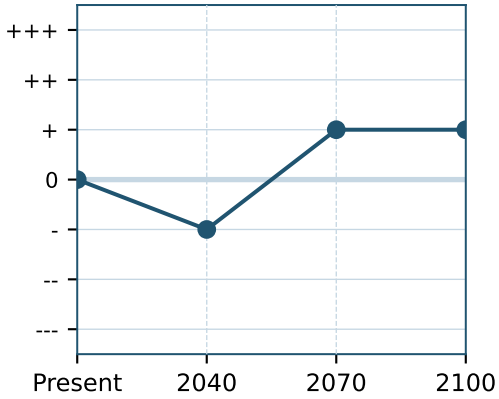


Rapid intensification to 2040 amid food security pressures; collapse post-2040 leads to reliance on low-input, subsistence-based extensive systems.

Production Systems & Land Use

Emissions intensity of monogastric production

The level of greenhouse gas emissions per unit of output from monogastric systems

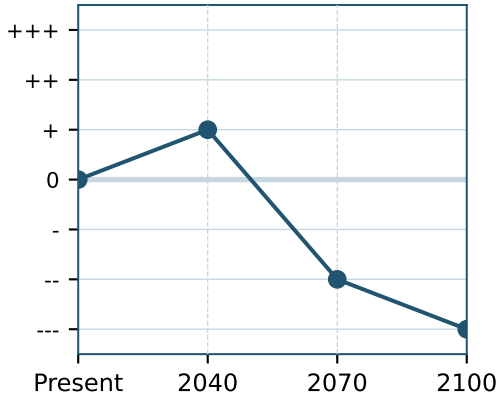


Early gains slightly reduce emissions intensity, but post-2040 system collapse, low R&D, and more extensive subsistence farming increase it.

Production Systems & Land Use

Input intensity of ruminant production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

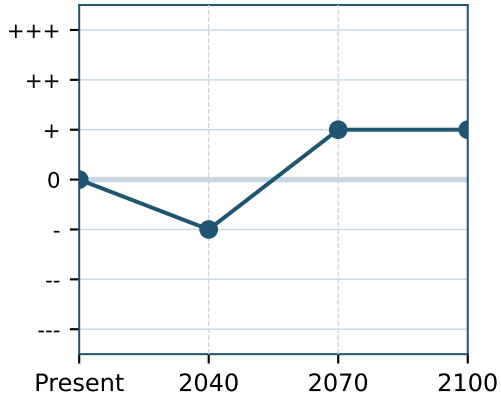


Intensification increases to 2040 under food security concerns, but post-2040 systems collapse leads to reliance on extensive, low-input subsistence.

Production Systems & Land Use

Emissions intensity of ruminant production

The level of greenhouse gas emissions per unit of output from ruminant systems



Some early pasture and feed improvements reduce emissions intensity; post-2040 shift to extensive and less innovation later push emissions intensity higher.

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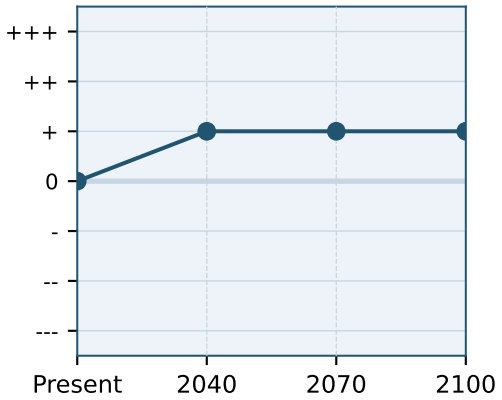
Governance

Environmental policy

Strictness of environmental laws and regulation

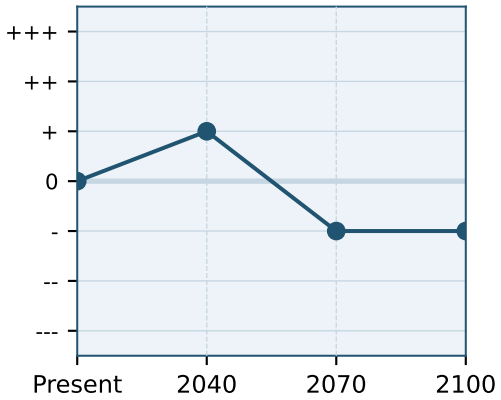


Source: UK-SSP. Legislation increases slightly but primarily benefits large businesses, which often overlook genuine environmental protection.

Governance

Land use regulation

Level of regulation related to land use change

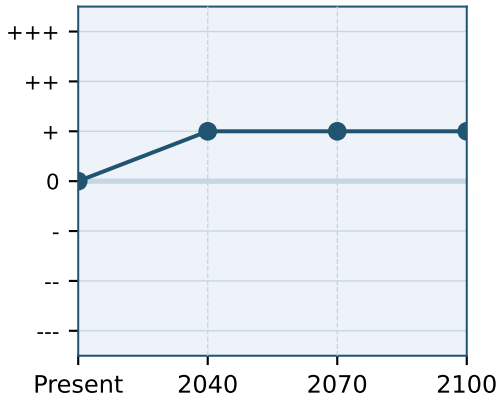


Source: UK-SSP. Regulations rise initially then shift to incentives and favouritism benefiting businesses.

Governance

Effectiveness of institutions

Level of stability and functioning of formal institutions

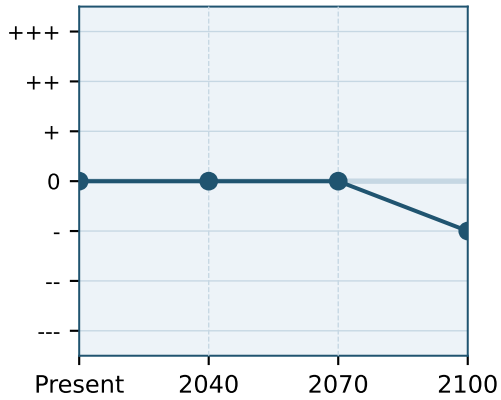


Source: UK-SSP. Stable but elite-dominated governance.

Society & Diet

Population

Population level based on IIASA projections

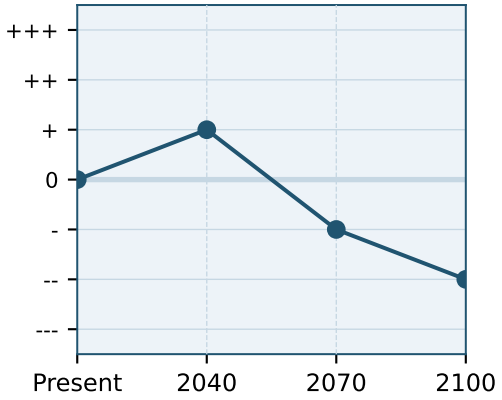


Source: UK-SSP, citing IIASA SSP projections (model IIASA-WiC POP).

Society & Diet

Education

Public and private investment in education

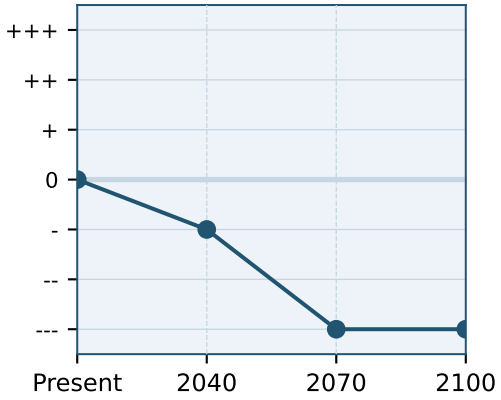


Source: UK-SSP. Early STEM investment followed by education privatisation for elites.

Society & Diet

Health care

Availability of health service per capita

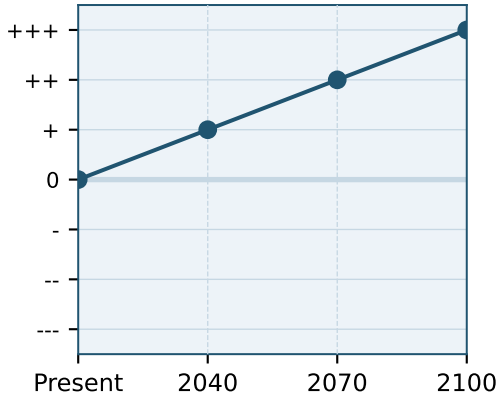


Source: UK-SSP. The NHS declines from the 2020s, ending with the welfare state by 2060.

Society & Diet

Inequality

Level of income inequality

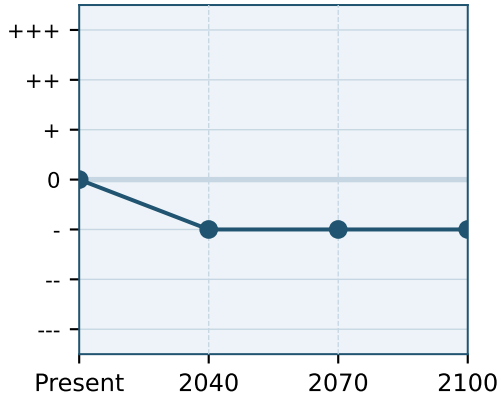


Source: UK-SSP. Deep and growing inequalities are central to this scenario.

Society & Diet

Resource and food waste

The amount of resources and food wasted along the whole supply chain



Source: UK-SSP. Technology cuts food waste, but low public awareness limits impact.

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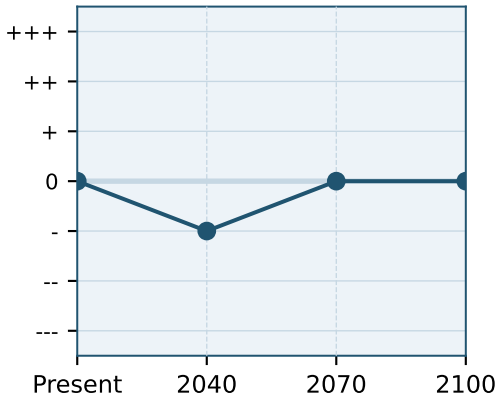
Society & Diet

Meat consumption

Meat consumption per person

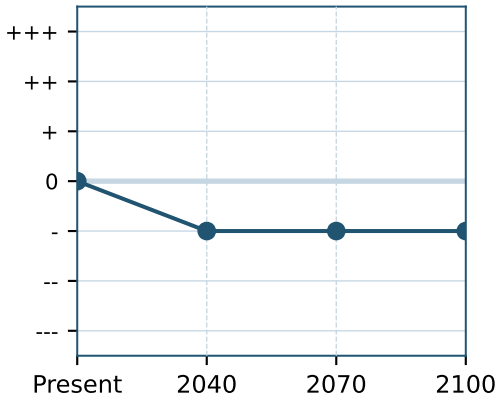


Source: UK-SSP. Meat drops initially for most due to cost, but artificial meat boosts mid-period consumption under corporate influence.

Society & Diet

Dairy consumption

Dairy consumption per person

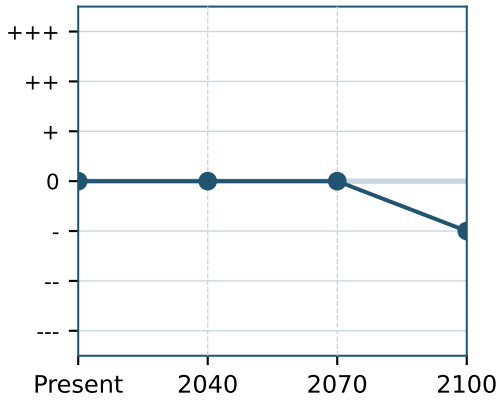


Declines for most as fresh dairy and dairy products become less affordable.

Society & Diet

Egg consumption

Egg consumption per person

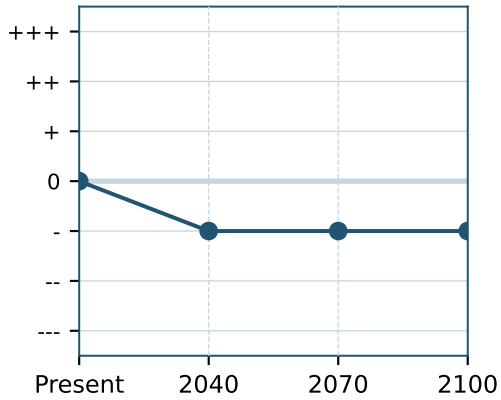


Stable for much of the century, supported by affordable intensive production, but declines later as intensive operations contract.

Society & Diet

Fish consumption

Fish consumption per person

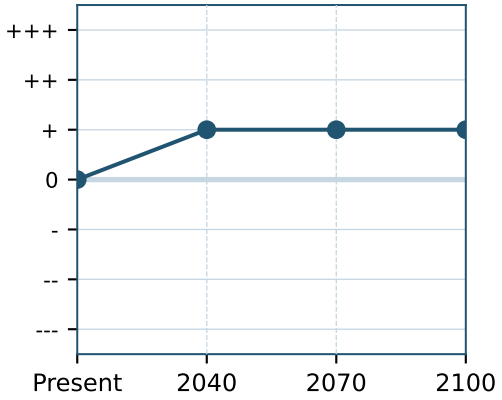


Declines for most due to cost, limited access, and cheaper protein alternatives, though the wealthy maintain high intake.

Society & Diet

Plant-based meat consumption

Per capita consumption of plant-based meat alternatives mimicking meat taste and texture.

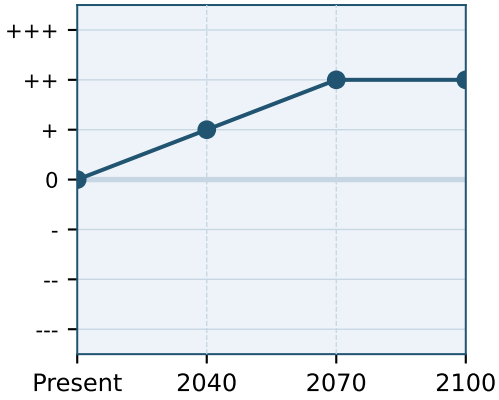


Uneven uptake; higher among wealthy, slower elsewhere.

Production Systems & Land Use

Technological development

Speed of technological development

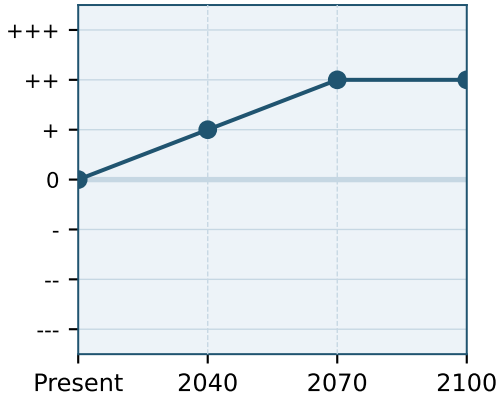


Source: UK-SSP. Early strong technology investment slows due to competition and limited education access.

Production Systems & Land Use

R&D effects on agricultural yields

Changes in agricultural yields due to R&D such as crop breeding, agronomy, etc.

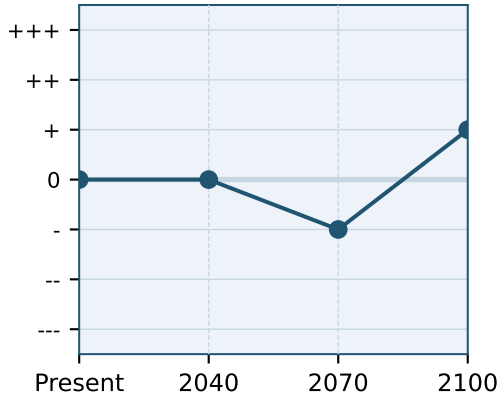


Source: UK-SSP. Strong agricultural R&D drives large-scale, efficient, high-profit farming, mainly in the private sector.

Production Systems & Land Use

Agricultural area

Area of agricultural land



Source: UK-SSP. Stable, then slightly decreases due to intensification; after 2070, large-scale corporate land acquisitions and declining soil quality invert the trend slightly.

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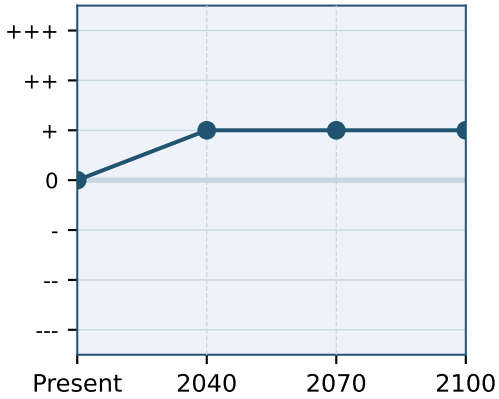
Production Systems & Land Use

Fertiliser use

Amount of fertiliser inputs in agricultural production

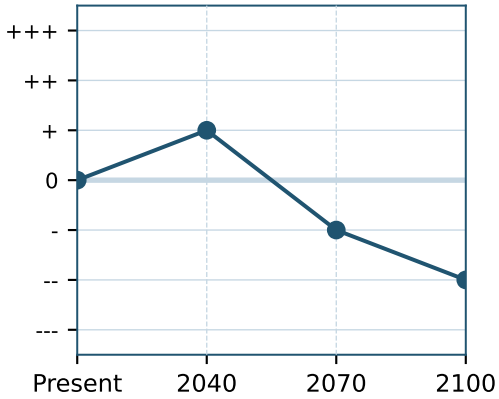


Source: UK-SSP. Fertiliser use grows with intensification but is partly offset by improved efficiency technology.

Production Systems & Land Use

Mongastric production

Total production of monogastric livestock (e.g., pigs, poultry)

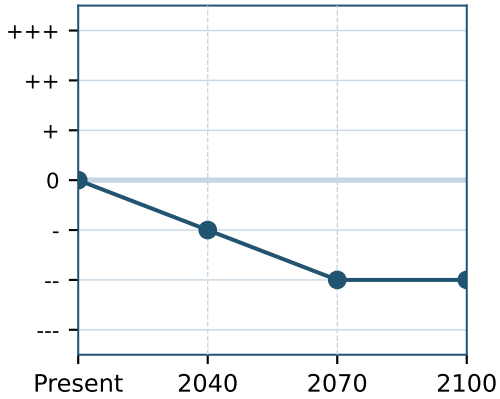


Growth driven by industrial farms early-mid century; decline after mid-century due to land pressures and alternative proteins.

Production Systems & Land Use

Ruminant production

Total production of ruminant livestock (e.g., cattle, sheep)

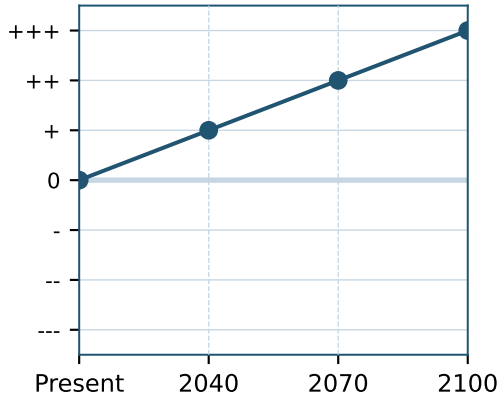


Declines from moderate early-century levels to a small, high-value niche by 2100, with extensive grazing on marginal land.

Production Systems & Land Use

Cultured meat production

Total production of cultured (lab-grown) meat

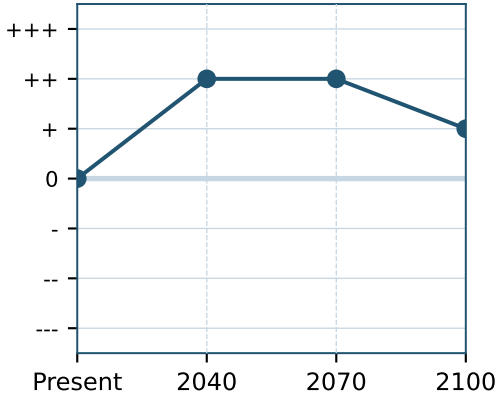


Slow adoption early on due to high production costs and limited demand, followed by widespread, rapid switch to affordable cultured products late century.

Production Systems & Land Use

Input intensity of monogastric production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

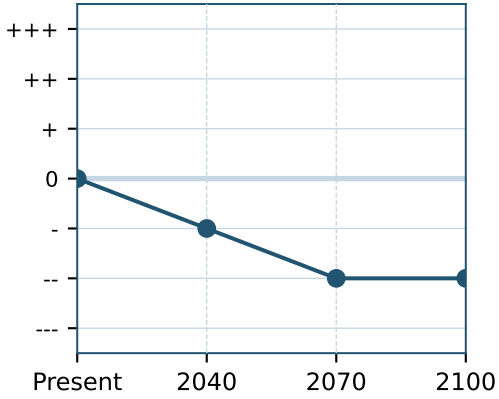


Strong industrial-scale intensification to 2040, then slows with land/feed constraints and reduced demand; some pasture-based niche persists.

Production Systems & Land Use

Emissions intensity of monogastric production

The level of greenhouse gas emissions per unit of output from monogastric systems

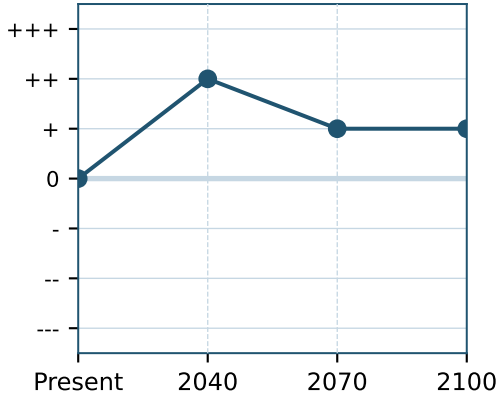


Large, capitalised farms invest heavily in efficiency and feed quality, achieving strong early gains; rate of improvement slows as limits are reached.

Production Systems & Land Use

Input intensity of ruminant production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

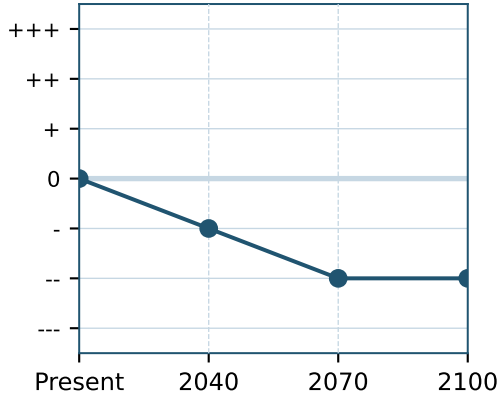


Intensity rises until 2040, then falls as alternative proteins reduce demand; niche market for extensive ruminants grows.

Production Systems & Land Use

Emissions intensity of ruminant production

The level of greenhouse gas emissions per unit of output from ruminant systems



Advanced units adopt methane abatement and better forage, with strong early gains; later progress slows as limits approached.

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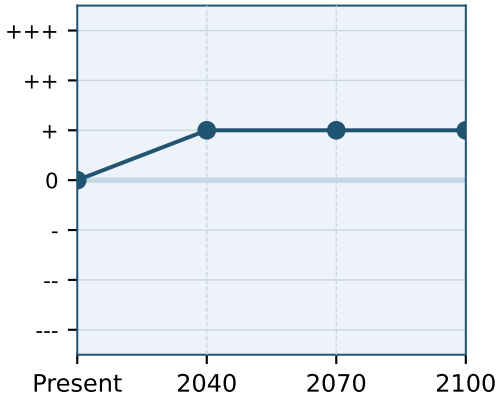
Governance

Environmental policy

Strictness of environmental laws and regulation

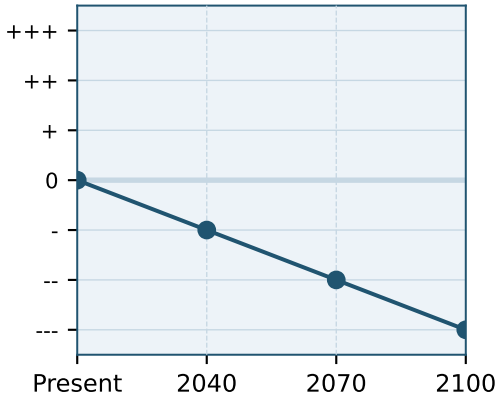


Source: UK-SSP. Environmental legislation weakens amid a focus on on economic development at all costs.

Governance

Land use regulation

Level of regulation related to land use change

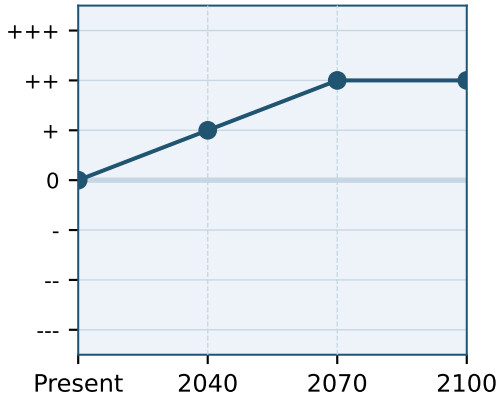


Source: UK-SSP. Market forces reduce land use regulations.

Governance

Effectiveness of institutions

Level of stability and functioning of formal institutions

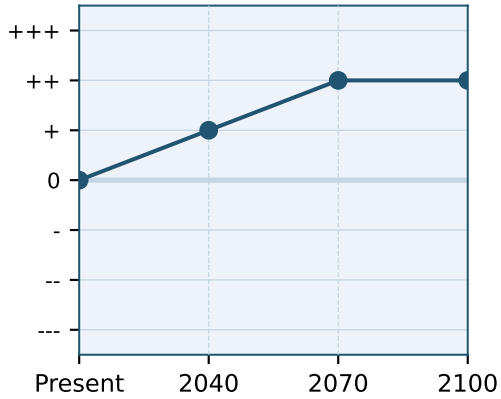


Source: UK-SSP. Effective institutions with uneven participation due to individualism.

Society & Diet

Population

Population level based on IIASA projections

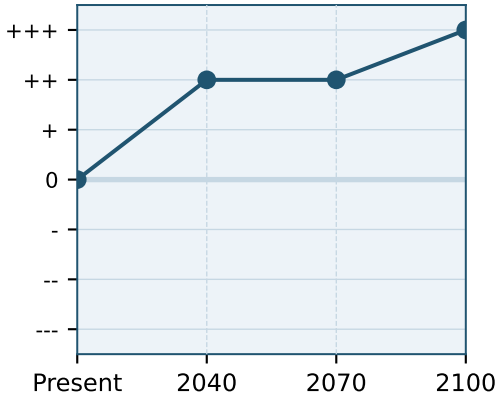


Source: UK-SSP, citing IIASA SSP projections (model IIASA-WiC POP).

Society & Diet

Education

Public and private investment in education

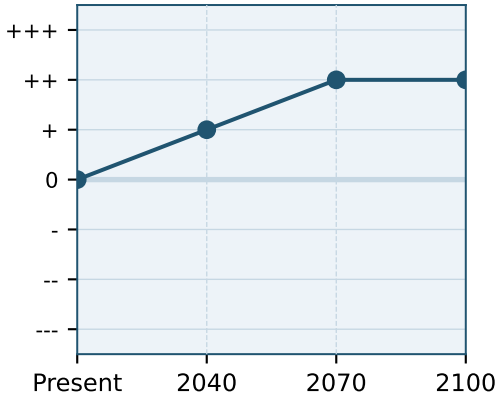


Source: UK-SSP. Strong, sustained education investment funded by high-income taxes.

Society & Diet

Health care

Availability of health service per capita

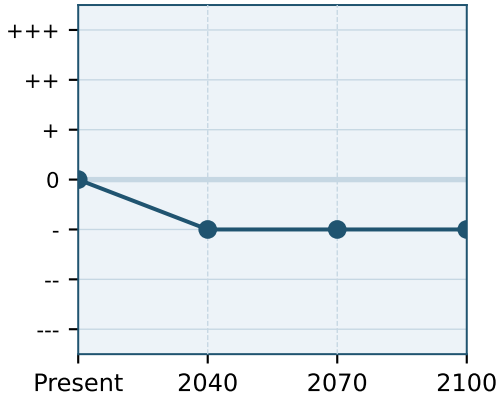


Source: UK-SSP. Health investment drives strong improvement despite population growth.

Society & Diet

Inequality

Level of income inequality

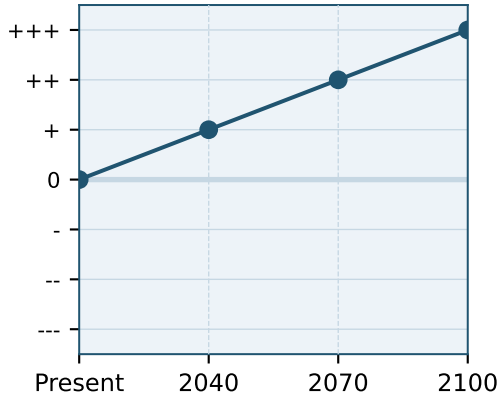


Source: UK-SSP. Inequality is reduced through growth and redistribution, though "millionaires" increase.

Society & Diet

Resource and food waste

The amount of resources and food wasted along the whole supply chain



Source: UK-SSP. Waste drops only when profitable; consumerism hinders reduction.

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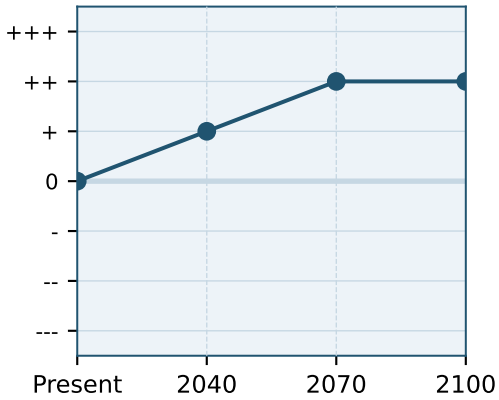
Society & Diet

Meat consumption

Meat consumption per person

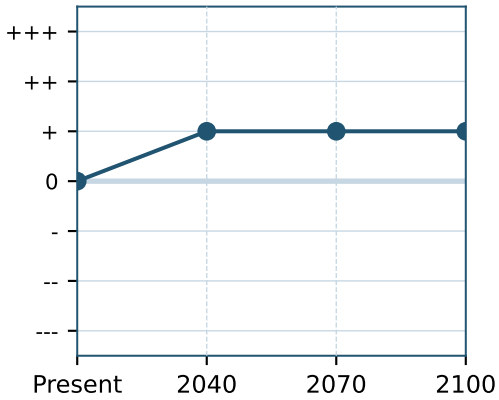


Source: UK-SSP. Meat rises with consumerism, then plateaus due to prices and saturation.

Society & Diet

Dairy consumption

Dairy consumption per person

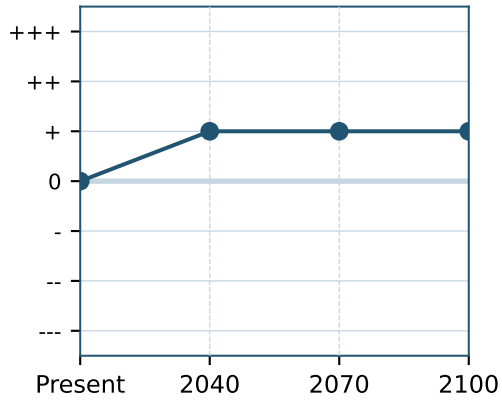


Rises slightly with higher incomes and growing demand for animal-source foods.

Society & Diet

Egg consumption

Egg consumption per person

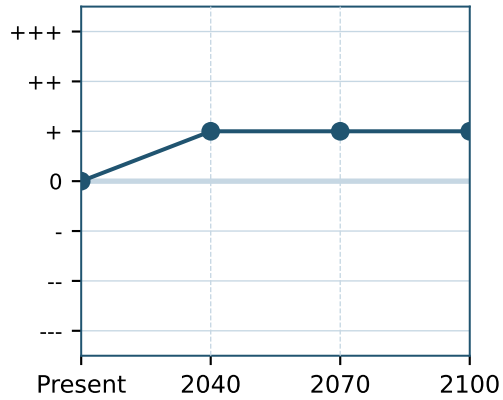


Increases slightly with rising wealth and demand for animal-source proteins.

Society & Diet

Fish consumption

Fish consumption per person

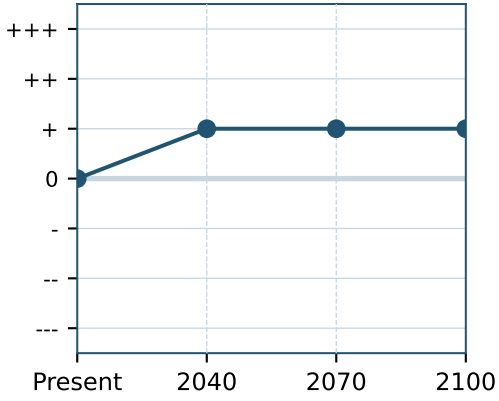


Slight increases driven by demand for protein and growth in aquaculture operations.

Society & Diet

Plant-based meat consumption

Per capita consumption of plant-based meat alternatives mimicking meat taste and texture.

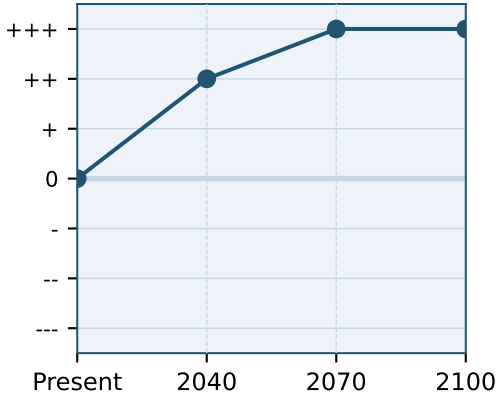


Gradual growth due to technological investment and demand for variety in diets.

Production Systems & Land Use

Technological development

Speed of technological development

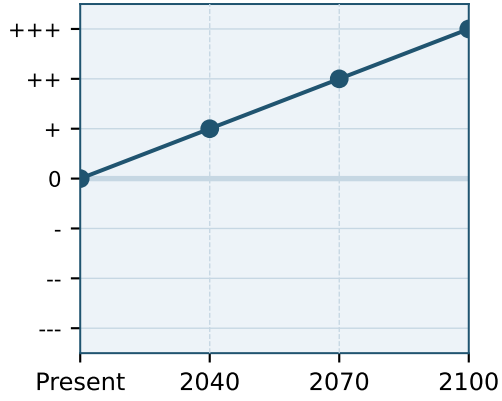


Source: UK-SSP. Widespread investment enables broad R&D and technology advances.

Production Systems & Land Use

R&D effects on agricultural yields

Changes in agricultural yields due to R&D such as crop breeding, agronomy, etc.

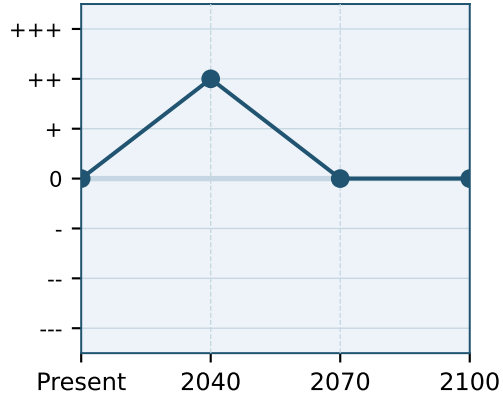


Source: UK-SSP. Significant investments in R&D aim to mitigate environmental impacts that might otherwise negatively affect crop yields.

Production Systems & Land Use

Agricultural area

Area of agricultural land



Source: UK-SSP. Land area increases initially, then falls as intensification and imports meet demand.

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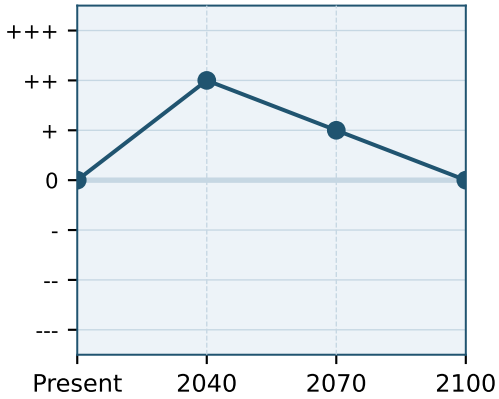
Production Systems & Land Use

Fertiliser use

Amount of fertiliser inputs in agricultural production

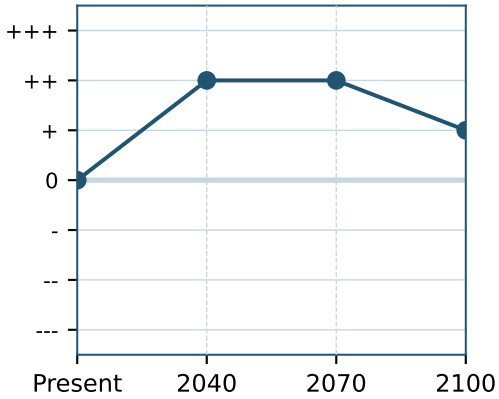


Source: UK-SSP. Yields rise with high use; declines after 2040 due to supply limits, offset by breeding and precision technology.

Production Systems & Land Use

Mongastric production

Total production of monogastric livestock (e.g., pigs, poultry)

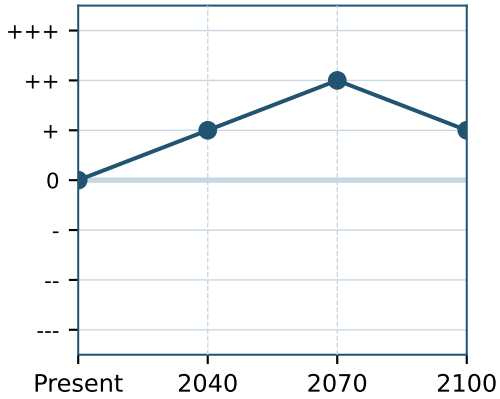


Rapid growth early, declining late century as environmental pressures rise and cultured meat replaces some demand.

Production Systems & Land Use

Ruminant production

Total production of ruminant livestock (e.g., cattle, sheep)

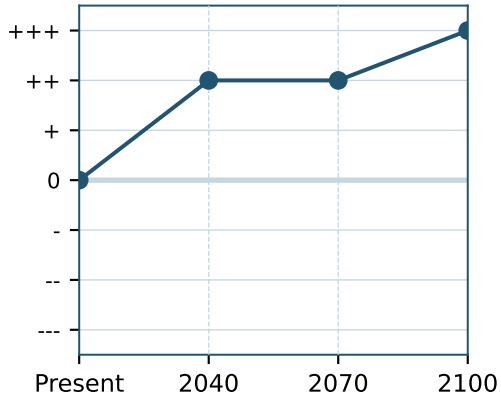


Moderate early growth, late-century decline from land degradation, environmental pressures, and cultured meat expansion.

Production Systems & Land Use

Cultured meat production

Total production of cultured (lab-grown) meat

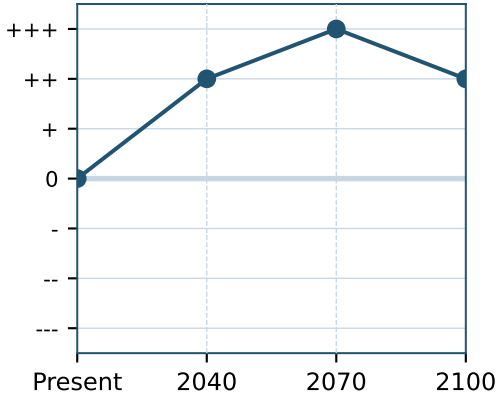


Rapid growth early and sustained throughout century driven by technology investment and demand.

Production Systems & Land Use

Input intensity of monogastric production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

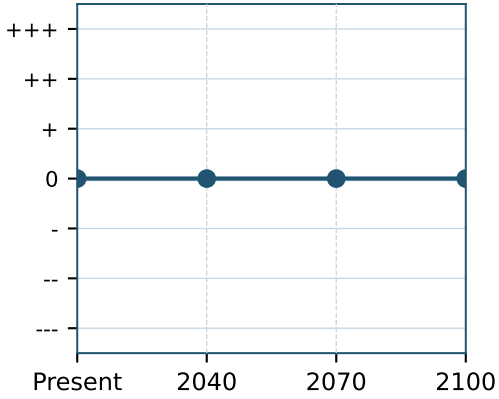


Very rapid high-tech intensification early; later slows with feed/land limits and rise of alternative proteins; extensive systems decline sharply.

Production Systems & Land Use

Emissions intensity of monogastric production

The level of greenhouse gas emissions per unit of output from monogastric systems

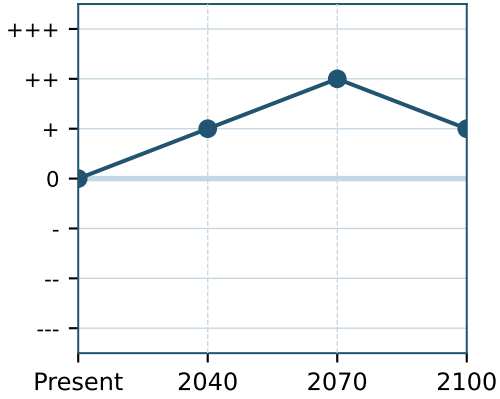


Genetics, housing, and precision feeding slightly reduce emissions, but fossil-based fertilisers, feed, and energy offset gains.

Production Systems & Land Use

Input intensity of ruminant production

Share of production from more high-input, land-efficient (+++ intensive) vs low-input, land-extensive (--- extensive; 0 = current level)

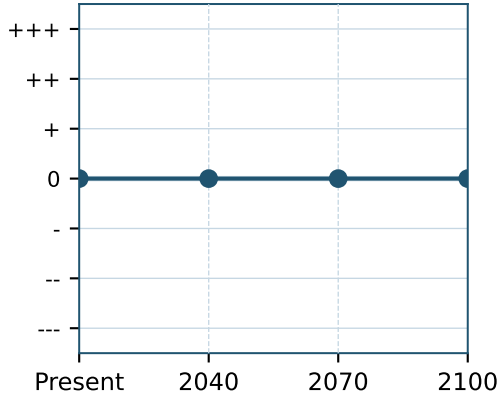


Intensification rises with market demand and efficiency, with late-century slowdown from environmental limits.

Production Systems & Land Use

Emissions intensity of ruminant production

The level of greenhouse gas emissions per unit of output from ruminant systems



Semi-intensive systems with supplementary feed slightly reduce emissions, but continued fossil dependence for feed and energy offsets gains.

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